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William Dinneen April 10, 2023

The Restoration of Rocky Flats: The Environmental Legacy of a Nuclear Bomb Factory

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Abstract

The Restoration of Rocky Flats: The Environmental Legacy of a Nuclear Bomb Factory

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This thesis examines the political formation and the environmental cleanup of the Rocky Flats National Wildlife Refuge, a former nuclear weapons site located near Denver, Colorado. From 1996 to 2006, the United States Department of Energy worked with a private contractor to remediate the area, and by 2007, the Environmental Protection Agency deemed the cleanup complete, transferring ownership of the site to the US Fish and Wildlife Service. Both the political process behind the conversion and the subsequent cleanup were fraught with controversy due to political battles over the distribution of radioactive waste, public fears over shifting safety standards, and general distrust in the nuclear industry and government regulators. This study unravels the social, political, and environmental layers of Rocky Flats, revealing how the legacy of ecologically valuable military sites can be complicated by their history.

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Introduction

About 20 minutes outside Boulder, Colorado, roughly 6,000 acres of open prairie make up the Rocky Flats National Wildlife Refuge. From 1952 until 1991, these same fertile grasslands accommodated the Rocky Flats Nuclear Plant, a Department of Energy (DOE) factory that produced nuclear weapons components for the United States during the Cold War. While the Rocky Flats factory was operating, the surrounding prairie was used as a Buffer Zone between the top-secret nuclear operation and the rapidly growing population of Denver's sprawl. While the United States expanded its nuclear arms capacity for fear of war with the Soviet Union, Denver's suburban expansion staged a local invasion on the easily developed prairie to its west. By the end of the Cold War, in 1991, the Rocky Flats Nuclear Plant had stopped production. When the Nuclear Plant was officially shut down in 1993,[1] the DOE was left with a contaminated site to remediate. The central "Industrial Zone," the area where the nuclear factories had operated, was full of highly radioactive buildings, tools, waste, soil, and water. For decades, radioactive byproducts had also migrated into the surrounding Buffer Zone. However, because this Buffer Zone was largely untouched, it emerged as a potential environmental sanctuary, a remnant of the devoured American grasslands once vast.

After the closure of the nuclear plant, a controversy broke out over the site's future use. National and local politicians, environmental activists, and developers differed sharply in their ideas about whether the site was safe, how it ought to be cleaned up, and how it should be used when that cleanup was completed. While some argued in favor of creating a wildlife refuge in

[1] Although operations at the plant were stopped in the 1989 FBI raid on the site, the possibility of its reopening remained until 1993.

the former Buffer Zone to protect the ecological value of the endangered grassland, others were worried that such a plan would reduce the cleanup standards of what they saw as an irremediable environmental disaster. From 1996 until 2006, the DOE worked with a private contractor, Kaiser-Hill, to remediate the area. By 2007, in accordance with the Rocky Flats National Wildlife Refuge Act of 2001 (RFNWRA), the Environmental Protection Agency (EPA) deemed the cleanup complete, and ownership of the Buffer Zone was transferred to the US Fish and Wildlife Service (FWS) for management as a wildlife refuge. In 2018, the refuge was opened for the public.

This thesis is a study of how the Rocky Flats Buffer Zone was converted into a wildlife refuge following the closure of the Rocky Flats Nuclear Plant. It is also a study of the debate that surrounded its conversion and the different ideas about the environment and about historical commemoration that emerged. Some of these ideas related to the management of defunct military sites: how could a notorious nuclear weapons site become a refuge for field mice and endangered grass? Why a wildlife refuge and not something else? Was this environmental approach merely a way for the DOE to avoid cleaning up years of contamination and protect its reputation? Other ideas related to public health: was the cleanup really successful? Should public access be allowed at the site? Still, others were ethical questions: would the nuclear history of Rocky Flats be forgotten after all physical traces were gone? Due to the Rocky Flat's unique symbolic and scientific importance as a nuclear site, the arguments surrounding these questions were often full of hostility and mutual accusations of bad faith. In this thesis, I hope to lower the rhetorical temperature and explain how different points of view came into conflict at Rocky Flats.

In the first chapter, I track the political process that resulted in the Rocky Flats National Wildlife Refuge Act of 2001, designating the end-use of Rocky Flats. I argue that this

environmental designation was not inevitable. Despite the contamination on the site, the fate of Rocky Flats was uncertain until 2001. In contrast to several critics of Rocky Flats, I also argue that the creation of the refuge was not a ploy by the DOE to reduce cleanup costs, nor was it an intentional strategy to "greenwash" DOE activities by misrepresenting them as environmentally responsible (although this likely occurred unintentionally). Rather, it was a process led by Colorado state politicians who saw and took a political opportunity to bolster their environmental credibility.

In the second chapter, I explore the last five years of the site's cleanup from 2001 to 2006. During this time, most of the radioactive waste was shipped off to a network of DOE waste management sites across the US, all the buildings were demolished, the contaminated soil was remediated, the FWS released its plan for the refuge, and the EPA approved the cleanup. However, some local activists have maintained that the cleanup of Rocky Flats was insufficient. I argue that the cleanup can be considered successful. Yet, despite the operational success, the cleanup of Rocky Flats was marred with controversy. Political battles over the distribution of radioactive waste across a growing US nuclear decontamination complex, public fears over shifting safety standards, and general distrust in the nuclear industry and government regulators amplified disagreements and undermined the credibility of the cleanup. Thus, the cleanup of Rocky Flats was a complex operation, strained by the pressures of political conflict, shifting scientific understanding, and a concerned public vulnerable to the dangers of radiation, both real and imagined.

In the conclusion of this thesis, I also reflect on the history of the Rocky Flats as a wildlife refuge and consider the significance of its existence. After 2007, the former Rocky Flats Buffer

Zone was managed by the FWS as "a sanctuary away from the hustle and bustle of busy urban life where time moves at nature's pace."[2] In light of this rhetoric, which seems to ignore the history of the site, the Rocky Flats National Wildlife Refuge can indeed be considered a memory hole, obscuring its controversial past. Despite the importance of Rocky Flats in the US nuclear weapons complex and in local Colorado history, there is very little memorialization of this history at the site. Although the Rocky Flats National Wildlife Refuge Act of 2001 contained plans for a Rocky Flats Cold War Museum, funding proved elusive.

Near the end of the cleanup, when the FWS was presenting its plan for the future of Rocky Flats, one disconcerted local resident proclaimed: "We should declare the entire site a national sacrifice zone. Rocky Flats is America's Hiroshima."[3] However, when he made that comment, Hiroshima was anything but a "national sacrifice zone." Despite its tragic history, Hiroshima was a thriving city with a population of nearly two million and flourishing efforts to memorialize its nuclear past.[4] Thus, for Rocky Flats to become "America's Hiroshima," it would not require the eternal entombment of the site, barring all human access. Rather, it would require the recognition that Rocky Flats manufactured the descendants of the bomb dropped on Hiroshima, including the thousands of the weapons preserved in today's US nuclear arsenal, which were manufactured at Rocky Flats.[5] Thus, just as it would have been wrong to obscure the military and

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[2] FWS, "Rocky Flats National Wildlife Refuge." *FWS.gov*. Accessed March 24, 2023. https://www.fws.gov/refuge/rocky-flats.

[3] Morson, Berny. "Keep Rocky Flats Closed, Activists Tell u.s. Agency." Rocky Mountain News (CO), March 12, 2004: 8A. NewsBank: Access World News.

[4] Yoshitsugu Kanemoto. "Metropolitan Employment Area (MEA) Data," *Center for Spatial Information Science, The University of Tokyo,* Accessed February 28, 2023. http://www.csis.u-tokyo.ac.jp/UEA/uea_data_e.htm.; Hiroshima Peace Memorial Museum. Hpmmuseum.jp. https://hpmmuseum.jp/?lang=eng. Accessed March 24, 2023.

[5] Iversen, Kristen. *Full Body Burden: Growing up in the Nuclear Shadow of Rocky Flats*. First paperback edition. New York: Broadway Books, 2013. (258)

nuclear history of Rocky Flats, it was equally wrong to blindly refuse any future for the site.

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Thus, this study is situated at the intersection between the history of environmental restoration and the study of military geographies. The Rocky Flats National Wildlife Refuge is an example of how complications with environmental management can arise when that environment has cultural significance in addition to ecological value.

Some scholars, like Marion Hourdequin, argue that military sites that have been converted into nature refuges, also known as military-to-wildlife (M2W) sites,[6] should be treated as fundamentally different from other environmental spaces given their complex histories. Hourdequin describes this combination of cultural and natural elements in certain geographies as "layered landscapes." While she acknowledges that "almost every landscape is a layered landscape,"[7] she argues that the conservation of US military sites is a particularly fruitful area for exploring "the relationships between nature, culture, and history in ecological restoration."[8] Hourdequin argues that environmental restoration must not disregard history, whether it be historical fidelity to environmental baselines, recognizing the role of Native Americans in

[6] Since 1990, the number of acres managed by the US Department of Defense (DOD) has dropped from 20.5 million to 8.8 million. While certainly not all of these are M2W sites, it demonstrates the scale of military sites in the US. Vincent, Carol Hardy, Lucas F Bermejo, and Laura A Hanson. "Federal Land Ownership: Overview and Data," February 21, 2020. *Congressional Research Service*, 28.

[7] Hourdequin, Marion, and David G Havlick. "Introduction: Ecological Restoration and Layered Landscapes." In *Restoring Layered Landscapes*, 2015. 1-10

[8] Hourdequin, Marion. "Ecological Restoration, Continuity, and Change." In *Restoring Layered Landscapes*, 2015. 13–33

restoration, or understanding that the remaking of the environmental world is as much a sociocultural process as it is an environmental one.

In placing historical meaning at the center of M2W sites, Hourdequin creates an overlap between the study of environmental restoration and the study of military geographies more generally. Similar to Hourdequin's argument that M2W sites are distinct from other environmental sites, geographer Rachel Woodward argues that military geographies, "configurations of entities and social relations across space [that] are shaped by militarism,"[9] are distinct from other geographies. Woodward contends that these geographies are preconditioned on the military control over space either through the physical presence of the military, the control of information exerted by the military, the systems of government in place, and the primacy of national security in political discourse. Her description is important to situate the study of a site like Rocky Flats. As a former military site and thus a military geography, Woodward's argument shows that the existence of Rocky Flats is ultimately due to the physical presence of the military. How this presence is exerted and remembered at Rocky Flats and the cultural and environmental effects of this military presence are topics further explored in this thesis.

In many ways, Rocky Flats is a case study of an especially complex M2W site.[10] However,

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[9] Woodward, Rachel. *Military Geographies*. RGS-IBG Book Series. Malden, MA: Blackwell Pub, 2004. 16

[10] It would be wrong, however, to treat M2W sites as a monolith. While similar issues are present at many of these sites, they are more diverse than similar. Examples of the complicated military and environmental relationship like the Green Belt along the former Iron Curtain, explored by historian Astrid M. Eckert in her book *West Germany and the Iron Curtain,* and the Korean Demilitarized Zone (DMZ), studied by anthropologist Eleana Kim in her book *Making Peace With Nature,* are not completely comparable to the Rocky Flats context. The restoration of Rocky Flats was part of a larger post-Cold War cleanup in the United States when many other military production facilities were being closed down. One of the more famous examples is the Hanford Site in Washington, explored by historian Kate Brown in her book *Plutopia.* This context certainly played a role in shaping how Rocky Flats was approached. Similarly, the nuclear contamination at Rocky Flats presents entirely different challenges than the landmines in the DMZ, just as the local context of Rocky Flats is quite different than the transboundary context of

as a historical study, this thesis is distinguished from most existing work on M2W sites, which have mostly been written about by geographers. One geographer, David Havlick, has done valuable work explaining what is at stake in studying M2W sites. Havlick builds upon Hourdequin's notion of "layered landscapes" with an explicit focus on environmental restoration or military sites. He agrees with Hourdequin that M2W sites carry the risk of "erasing important land use histories and the cultural impacts of war and militarization."[11] Moreover, Havlick argues that these sites push forward the idea of military environmentalism, framing "military practices as compatible with and contributing to environmental protection."[12] To Havlick, such framing carries the risk of allowing the organizations responsible for the contamination to "avoid costly, necessary cleanups of contaminated sites" and even offload costs of cleanup to more poorly funded organizations like the FWS.[13] In Chapter One of this thesis, I explore several of these ideas in the case of Rocky Flats. By looking at the political process that led to the Rocky Flats National Wildlife Refuge Act of 2001, I critically examine whether the DOE was responsible for cutting cleanup costs or pursuing military environmentalism for public opinion purposes.

Havlick also explores the hazards at M2W sites. He argues that the unexploded ordinance (UXO), landmines, radioactive contamination, chemical weapons, etc., sometimes present at

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the Green Belt stretching across Europe. Eckert, Astrid M. "Transboundary Natures: The Consequences of the Iron Curtain for Landscape, "In *West Germany and the Iron Curtain.* New York, NY: Oxford University Press, 2019.; Kim, Eleana Jean. *Making Peace with Nature: Ecological Encounters along the Korean DMZ*. Durham: Duke University Press, 2022.; Brown, Kate. *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters*. First issued as an Oxford University Press paperback. Oxford New York: Oxford University Press, 2015.

[11] Havlick, David. *Bombs Away: Militarization, Conservation, and Ecological Restoration*. University of Chicago Press, 2018. https://doi.org/10.7208/chicago/9780226547688.001.0001. 4

[12] Havlick, David. "Logics of Change for Military-to-Wildlife Conversions in the United States." *GeoJournal* 69, no. 3 (October 26, 2007): 151–64. https://doi.org/10.1007/s10708-007-9086-8.

[13] Havlick, David. *Bombs Away.* 2018. 10-11

military sites, complicate the issue further. First, there might be lingering military materials at these sites, even after restoration. If not handled properly, these materials might be dangerous to environmental workers or to visitors. While he recognizes that in cases of severe physical hazards, "agencies can scarcely be faulted for prioritizing remediation and restoration at the expense of the preservation of cultural landscapes," he argues that "even in these settings, there are surely ways to accommodate the latter." [14] Furthermore, Havlick argues that military conversions can result in what he calls "opportunistic conservation," where "habitat and wildlife goals are shaped or constrained by the lingering presence of prior military uses" or by a lack of funding and expertise.[15] In Chapter Two of this thesis, I explore these issues further by taking a closer look at the physical cleanup of Rocky Flats.

Havlick is rightfully cautious about M2W sites, but he is ultimately optimistic about the possibility of attending to "cultural and ecological interests in a way that promotes new understandings about militarized landscapes."[16] In the final chapter of Havlick's book, *Bombs Away,* he gives several examples of successful military-environmental memorialization, like the Hiroshima Peace Memorial Park, the Orford Ness National Nature Reserve in England, and the European Green Belt along the former Iron Curtain. However, in the same chapter, he questions whether Rocky Flats has been properly "represented by developers and others keen to move past

[14] Havlick, David G. "Restoration, History, and Values at Transitioning Military Sites in the United States." In *Restoring Layered Landscapes*, 2015. 160–80

[15] Havlick, David G. "Opportunistic Conservation at Former Military Sites in the United States." *Progress in Physical Geography: Earth and Environment* 38, no. 3 (June 2014): 271–85. https://doi.org/10.1177/0309133314522281.

[16] Havlick. *Bombs Away.* 2018. 10-11.

the site's forbidding history."[17] The conclusion of this thesis examines more closely the case of Rocky Flats and how it has or has not been memorialized since becoming a wildlife refuge.

Other scholars, like geographer Shiloh Krupar and environmental historian Peter Coates, have approached Rocky Flats specifically. Krupar is highly critical of the cleanup, arguing that it "enabled an entrepreneurial remediation industry to profit from basically doing less cleanup for more money with less accountability" and that the resulting refuge "externalizes nature, anonymizes waste, utilizes the management of open space as a way to avoid managing contaminants, and sustains the alienation of Rocky Flats workers from the land through environmental disorientation, cancer, and cultural amnesia."[18] Coates, however, is far less critical. He acknowledges some of the issues raised by Havlick, but argues that, "the story of Rocky Flats suggests that we should also acknowledge [M2W sites'] incontrovertible ecological assets." In direct response to Krupar, Coates maintains that "there is no necessary conflict between awareness of Rocky Flats's 'natural' assets and recognition of its recent human past." [19] He questions whether there really is a dichotomy between the preservation of historical elements and the preservation of ecological elements. Neither Coates nor Krupar, however, take a rigorous historical approach that traces the cleanup of Rocky Flats across time.

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[17] Havlick. *Bombs Away.* 2018. 137-162

[18] Krupar, Shiloh R. "Alien Still Life: Distilling the Toxic Logics of the Rocky Flats National Wildlife Refuge." *Environment and Planning D: Society and Space* 29, no. 2 (April 1, 2011): 268–90. https://doi.org/10.1068/d12809.

[19] Coates. "'Get Lost in the Footnotes of History.'" 2015. 159

Historical Context

The relationship between ecological restoration and nuclear weapons does not begin with Rocky Flats. In her history of ecological restoration, environmental historian Laura Martin describes how the atomic age shaped environmental research during the twentieth century. Fear of nuclear fallout led government researchers, often through environmentally destructive doomsday simulations, to develop ways to hasten environmental recovery and recognize that human action could cause irreversible environmental destruction.[20] By the late twentieth century, humans began to take a more active and scientific role in managing environments. Restoration ecology became a middle ground between environmental conservation, which sought the sustainable use of natural resources for human good, and environmental preservation, which sought to protect environmental spaces by keeping them undisturbed.[21]

In this way, the environmental movement of the twentieth century unfolded parallel to nuclear history. The conversion of Rocky Flats is the result of both. In 1946, President Harry Truman signed the Atomic Energy Act into law, establishing the Atomic Energy Commission (AEC) to manage the US nuclear program. The first task of this program was to develop in the US the capability to manufacture nuclear weapons at scale to meet the demand necessitated by evolving theories of nuclear deterrence. Through the lobbying of Colorado politicians like Senator Edward Johnson, who hoped that a large nuclear facility might spur the Colorado economy, Rocky Flats

[20] Martin, Laura J. *Wild by Design: The Rise of Ecological Restoration*. Cambridge, Massachusetts: Harvard University Press, 2022. 33

[21] The U.S. Fish and Wildlife Service (FWS), which was created in 1940, initially began as an organization dedicated to the protection of commercially valuable species and was heavily influenced by agricultural practices. As support for restoration ecology grew, the FWS took a more restorationist approach to its wildlife management practices. However, the US wildlife refuge system remains full of multi-use refuges that pair environmental conservation with economic and human uses. Martin, *Wild by Design.* 2022. 17, 90; Havlick "Opportunistic Conservation," 2014.

was opened near Denver in 1952, alongside other notorious nuclear sites like Oak Ridge, Tennessee, Los Alamos, New Mexico, and Hanford, Washington. As geopolitical factors and events, like the 1957 launch of the first Soviet satellite *Sputnik*, stoked nuclear anxieties in the United States, the government intensified its efforts to develop nuclear weapons and expand its nuclear arsenal, putting added pressure on production facilities.[22]

At Rocky Flats, the pressure to produce often resulted in unsafe operations with nearly disastrous consequences like the 1957 plutonium fire and the 1969 "Mothers Day" Fire, which, as Rocky Flats historian Len Ackland explains, "could have caused a Chernobyl-scale disaster [in Denver]."[23] Similarly, Rocky Flats operators, restricted by the difficulties of handling radioactive waste, struggled to safely handle waste while keeping up with weapons demand. Although hundreds of barrels of waste were shipped to dedicated disposal sites each month, approximately 55,000 pounds of nuclear waste was haphazardly buried in the Rocky Flats' soil between 1952 and 1962.[24] Some of this waste, like the leaky barrels at the "903 Pad" (described in Chapter 2 of this thesis), contributed to the widespread soil contamination that later had to be cleaned up. While these events at Rocky Flats were kept secret from the public, the anxieties about the dangers of radiation were growing in the public's consciousness. In 1963, the US, the Soviet Union, and the United Kingdom signed the Atmospheric Test Ban Treaty, prohibiting nuclear tests in the atmosphere for fear of environmental contamination. [25]

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[22] Ackland, Len. *Making a Real Killing: Rocky Flats and the Nuclear West*. Albuquerque: Univ. of New Mexico Press, 2002. 115-129

[23] Ackland. *Making a Real Killing.* 2002. 152-159

[24] Ackland. *Making a Real Killing.* 2002. 138

[25] Martin, *Wild by Design.* 2022. 15; Ackland *Making a Real Killing.* 2002. 168-172, 187-202

At the same time, aided by the publication of Rachel Carson's 1962 book *Silent Spring*, the 1960s saw the beginnings of grassroots environmentalism. In 1970, the Environmental Protection Agency (EPA) was established, and legislation like he Endangered Species Act of 1973 ingrained environmental management into government practices. Similarly, the late 1960s and 1970s saw the birth of many anti-nuclear and pacifist movements. At Rocky Flats, a damning 1970 study of plutonium in the soil published by Ed Martell sparked outrage among concerned citizens, and political pressure over the environmental risk of Rocky Flats as a nuclear facility triggered protests and concerns. After the Three Mile Island nuclear meltdown in 1979, thousands of protesters gathered at Rocky Flats multiple times during that year, and protests continued throughout the 1980s.[26]

The 1980s, however, was the decade when Rocky Flats started to face political opposition from above rather than from grassroots organizations. In 1980, the EPA passed The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which established the rules surrounding the cleanup of contaminated "superfund" sites. When CERCLA was amended in 1986, expanding the rigor of its environmental requirements, the waste management practices at Rocky Flats, namely the incineration of waste, drew scrutiny by federal authorities. In 1989, the FBI secretly flew an infrared camera over Rocky Flats to confirm the illegal operation of the site's incinerator and implicate the DOE in environmental crimes. Subsequently, the FBI and EPA staged an unprecedented raid on Rocky Flats and the DOE, halting production at the plant operations and publicly revealing the previously hidden history of Rocky

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[26] Martin, *Wild by Design.* 2022. (15); Ackland *Making a Real Killing.* 2002. 168-172, 187-202

Flats.[27]

At nearly the same time as the FBI raid on Rocky Flats, the Berlin Wall fell, heralding the end of the Cold War in 1991. It was within this context—a deep mistrust of the DOE, widespread anti-nuclear sentiments, growing sympathy for environmental legislation, and public exposure of the hazardous past of Rocky Flats—that discussions over the future of Rocky Flats began.

[27] Ackland *Making a Real Killing.* 2002. 204, 215; EPA, OLEM. "Superfund: CERCLA Overview." Overviews and Factsheets, May 14, 2019. https://www.epa.gov/superfund/superfund-cercla-overview; EPA, OLEM. "The Superfund Amendments and Reauthorization Act (SARA)." Overviews and Factsheets, May 14, 2019. https://www.epa.gov/superfund/superfund-amendments-and-reauthorization-act-sara.

Chapter 1: Bombs into Birds

Twenty miles outside of Denver, the Rocky Flats National Wildlife Refuge sits between the Rocky Mountains and the high Great Pains. It is home to one of North America's only surviving tall upland shrublands and the largest undisturbed tract of dry (xeric) tallgrass grassland in the country.[28] This type of prairie only exists on the Colorado Piedmont, a narrow band of land east of the Rocky Mountains.[29] The ecological value of the site is amplified by the large-scale loss of grasslands in the United States. Grasslands, one of the more vulnerable ecosystems in the world, are particularly susceptible to growing human populations that depend on them for agriculture, grazing, and urban development. A 1998 study by the US Geological Survey found that only about 20% of North America's central grasslands remained undeveloped or used for agriculture.[30] In comparison, roughly 80% of the US forest land remained in the United States by 2016.[31] Likewise, Rocky Flats supports abundant animal life consisting of roughly 250 species of mammals, birds, fish, reptiles, and amphibians. Importantly, that list includes the threatened Preble's meadow jumping mouse (*Zapus hudsonius preblei*), which had lost 90% of its natural habitat to

[28] Additionally, it supports other vegetation communities including "riparian woodland, riparian shrubland, wetlands, mesic mixed grassland, xeric needle and thread grassland, reclaimed mixed grassland, and ponderosa pine woodland." FWS, "Rocky Flats National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Impact Statement." *US Fish and Wildlife Service*, September 2004

[29] FWS, "Invasive Plant Distribution in Xeric Tallgrass Prairie at Rocky Flats National Wildlife Refuge." *US Fish and Wildlife Service*, February 2021

[30] Ceballos G, Davidson A, List R, Pacheco J, Manzano-Fischer P, Santos-Barrera G, et al. (2010) Rapid Decline of a Grassland System and Its Ecological and Conservation Implications. PLoS ONE 5(1): e8562. https://doi.org/10.1371/journal.pone.0008562

[31] Eight hundred million acres in 2016 over 1 billion acres in 1630. US Department of Agriculture, "Forest Inventory and Analysis: Fiscal Year 2016 Business Report." *United States Department of Agriculture*, August 2017.

development by 1992.[32]

After the Treaty of Fort Wise in 1861 and the subsequent Sand Creek Massacre of the native Cheyenne and Arapaho populations in 1864, the area became Colorado territory. For the next hundred years, until the creation of the Rocky Flats nuclear plant in 1951, the space was used as rangeland for Colorado cattle ranchers. Over-grazing encouraged the proliferation of invasive plant species, injuring the region's ecosystem.[33] After the creation of the nuclear plant, the rare biome survived within the Rocky Flats Buffer Zone, free from the threat of commercial development but without any active environmental management. However, the Atomic Energy Commission (AEC) did not choose this patch of grassland as the location for a nuclear plant because of its environmental value. In 1951, the AEC selected the Rocky Flats location for three main reasons. First, Colorado Senators won a political battle to construct the plant in hopes of economic growth.[34] Second, it was close enough to the growing Boulder and Denver populations to count on a sufficient workforce and access to water, gas, and electricity while still being isolated enough to avoid jeopardizing public safety or site secrecy. Third, it was deemed safe in regard to a shortsighted understanding of wind patterns at the site.[35] Little regard had been given

[32] As Peter Coates describes, "the mammals and birds include mule deer, whitetail deer, porcupine, striped skunk, coyote, American badger, bald eagle, prairie falcon, great-horned owl and Swainson's hawk; mountain lion, American elk, and black bear." The Preble's mouse was especially consequential as it had been added to the endangered species list in 1998. Coates. "'Get Lost in the Footnotes of History.'" 2015. 137; FWS, "Preble's Meadow Jumping Mouse (*Zapus Hudsonius Preblei*) | U.S. Fish & Wildlife Service." FWS.gov. Accessed March 24, 2023. https://www.fws.gov/species/prebles-meadow-jumping-mouse-zapus-hudsonius-preblei.; Comprehensive Conservation Plan. *US FWS*. 2004.

[33] For a more in-depth account of the pre-colonial history of Rocky Flats and how the AEC acquired the land there, most notably from the Church family, see Ackland*Making a Real Killing.* 2002. 5-26

[34] For the full story of how Colorado was chosen for Rocky Flats with the help of Colorado Senators Ed Johnson and Eugene Millikin, seeAckland *Making a Real Killing.* 2002. 27-51

[35] As Len Ackland described, the wind patterns at Rocky Flats "blew from two mountain canyons to the west, at

to environmental concerns like underlying geological structures, to the future disposal of radioactive waste, or to the wildlife that had lived or had once lived at the site. The Buffer Zone had not been created to protect rare grasslands and biodiverse animal populations, nor were such concerns considered during Rocky Flat's four decades of operation. In 1951, when construction on the nuclear plant began, a 2,136-acre Buffer Zone was included to serve as space for firebreaks, holding ponds, effluent monitoring stations, and gravel pits. It served to separate the "Industrial Zone" where plutonium manufacturing occurred from the surrounding area. In 1975, the site was expanded, and the DOE increased the size of the Buffer Zone to roughly 6,000 acres for added safety, privacy, and security in the face of a rapidly growing Denver population. It wasn't until the 1970s, after twenty years of accidental environmental preservation within the Buffer Zone, that the native species began to re-established themselves in the Buffer Zone.[36]

In this way, the Buffer Zone's environmental integrity had inadvertently been preserved by the US nuclear complex, whose demand for the plutonium pits produced at Rocky Flats was as insatiable as the growing population of Denver's demand for easily developed grassland. While the zone's existence helped the United States wage a Cold War with the Soviet Union, the economic growth of Denver, partly fueled by government investment into Rocky Flats, had mounted an invasion by land on the surrounding prairies. In 1940, Denver's population had been roughly 322,000. By 1960 it had increased to 494,000, a growth of nearly 50%. Similarly, the population of Boulder, only 20,000 people in 1950, had increased to 66,870 people by 1970, an increase of over 300%. Other surrounding areas, like Jefferson County and Arvada, had seen

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velocities frequently exceeding 100 miles per hour, and right towards Denver and its northern suburbs." Ackland *Making a Real Killing.* 2002. 51-67

[36] Coates. "'Get Lost in the Footnotes of History.'" 2015. 135-136

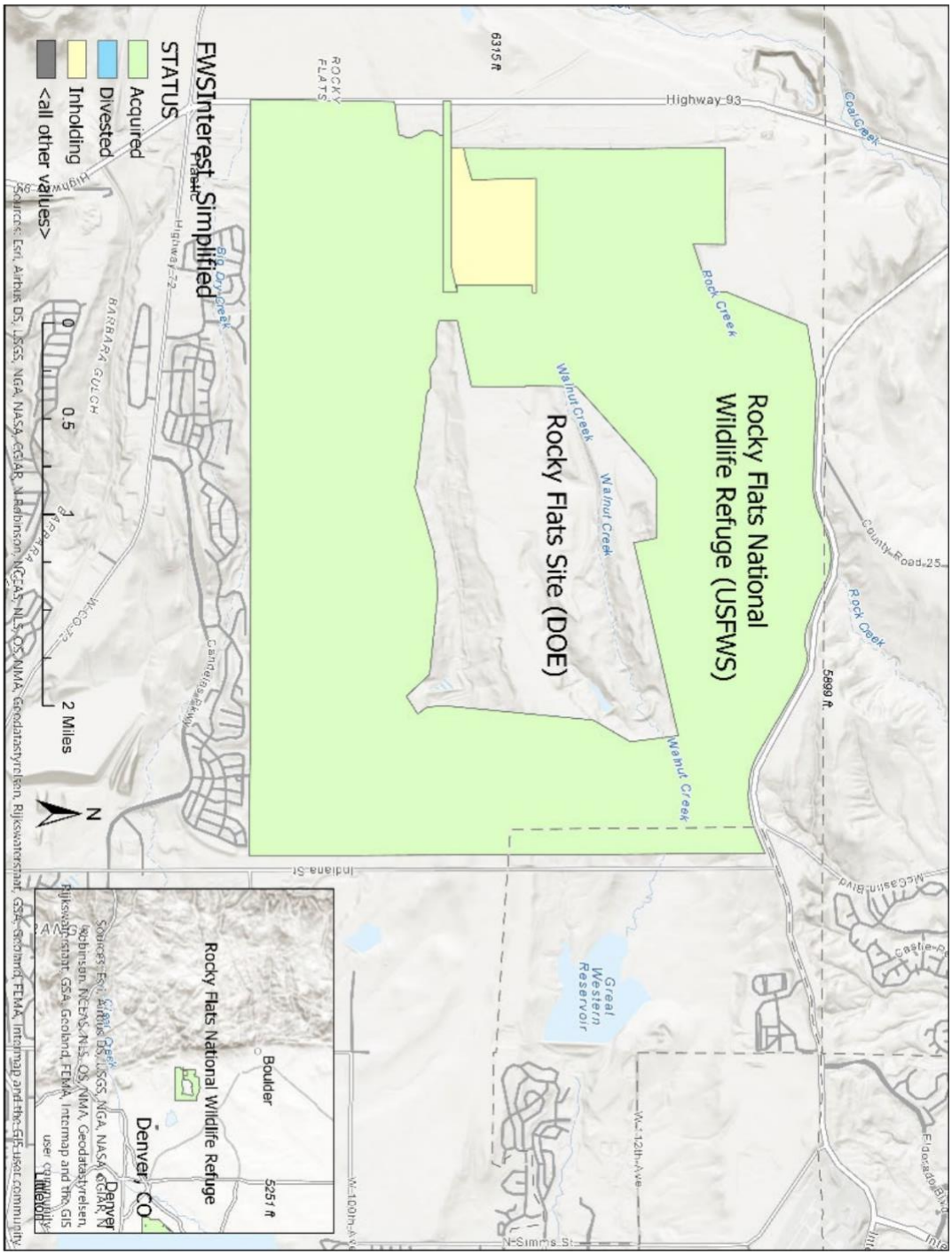

Figure 1: A 2021 US Fish and Wildlife Service map of the Rocky Flats National Wildlife Refuge. The 600-acre area in the middle of the Refuge is the DOE-controlled "Industrial Zone" where the plant operations occurred. The area in the bottom right shows Rocky Flats in relation to Denver, CO.[37]

[37] FWS, "Invasive Plant Distribution in Xeric Tallgrass Prairie at Rocky Flats National Wildlife Refuge," *US Fish and Wildlife Service*, February 2021

similar growth. From 1950 to 2000, the Denver metropolitan area had expanded from 150 square miles to 499, increasing by over 37 times the land area of the Rocky Flats Buffer Zone. Much of this newly developed land had been grassland, like the Buffer Zone.[38] As environmental historian Peter Coates explains, "each time another undeveloped acre was consumed [by sub-urban and other developments], the ecological value of Rocky Flat's Buffer Zone lands crept up a notch."[39]

For the Rocky Flats ecosystem, the disappearance of the Soviet threat began a new war. In 1989, nuclear production at Rocky Flats was halted following the FBI raid on the plant.[40] From 1990 to 1992, amid intense controversy, the DOE pushed to resume production at the plant. However, on January 28, 1992, after a State of the Union Address in which President Bush announced the end of the production of new nuclear warheads, appeals to reopen Rocky Flats as a nuclear plant subsided.[41] By 1995, under the final Rocky Flats Cleanup Agreement (RFCA) between the DOE, the Environmental Protection Agency (EPA), and the Colorado Department of Public Health and Environment (CDPHE), the Kaiser-Hill Company took over the site's cleanup as a DOE contractor. The site's ecological value had been recognized in the RFCA, and using the

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[38] Coates. "'Get Lost in the Footnotes of History.'" 2015. 136; Daily Camera, "Boulder Population Nearly Doubled in the 1950s." 2010. *Boulder Daily Camera*. January 12, 2010. https://www.dailycamera.com/ci_14128205/.; US Geological Survey, "Denver's Urban Expansion." *United States Geological Survey*. October 15, 2021. https://www.usgs.gov/media/before-after/denver-s-urban-expansion.

[39] Coates. "'Get Lost in the Footnotes of History.'" 2015. 137

[40] The raid was sparked by agent John Lipsky's investigation after an infrared camera was secretly flown over the site to confirm the illegal operations of an incinerator. The Department of Energy (DOE) was implicated in environmental crimes. For a full account of this historic FBI raid on Rocky Flats, the first ever of one US government agency on another, and the subsequent closure of the plant, see. Ackland *Making a Real Killing.* 2002. 203-229.

[41] Ackland. *Making a Real Killing.* 2002. 224-227, 239; Miller Center, "January 28, 1992: State of the Union Address." *Miller Center*. October 20, 2016. https://millercenter.org/the-presidency/presidential-speeches/january-28-1992-state-union-address.

Buffer Zone as an open space was considered a minimum standard for cleanup. As the contract explains, "at a minimum, given current technology and resources, Rocky Flats will be cleaned up to allow open space uses in the Buffer Zone, restricted open space or industrial use for most of the existing Industrial Area, and other appropriate uses. […] Rocky Flats contains a unique ecological habitat that cannot be easily replaced. Its ecological values will be preserved and protected to the maximum extent possible during cleanup and closure activities."[42] However, the DOE, EPA, and CDPHE also agreed that the ultimate use of the land would not be limited to environmental purposes but that it should be "consistent with community preferences, although opportunities for residential use will be restricted" and that "most of the land should be able to accommodate a wide range of appropriate future uses and economic opportunities."[43] Their approach—a scientific cleanup followed by a community-driven land use decision—left the ultimate land use at Rocky Flats undetermined, thus making the issue a political one. Interest groups like the Rocky Flats Local Impact Initiative (RFLII) and the Rocky Flats Future Site Use Working Group (FSUWG) tried to balance safety, economic, and environmental issues while local media joined the debate. While many groups supported using the Buffer Zone as open space, they continued to debate issues of public access to that space.[44]

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[42] EPA, "Rocky Flats Cleanup Agreement." *The Environmental Protection Agency and the State of Colorado*, July 19, 1996. (Appendix 9); DOE, "Rocky Flats Closure Legacy: Accelerated Closure Concept." Department of Energy, 2006. https://lmpublicsearch.lm.doe.gov/NonEktron/1406-01%20-%20Accelerated%20Closure.pdf.

[43] "Rocky Flats Cleanup Agreement." EPA. 1996

[44] Ackland. *Making a Real Killing.* 2002. 239-240*;* Abelson, David M. "From Cleanup to Closure: The History of the Rocky Flats Coalition of Local Governments," October 2006. http://www.rockyflatssc.org/rfclog_history_final.pdf.; Gerhardt, Gary. "Rocky Flats `refuge' Opens For Visitors \ Auto Tours Show Off Remarkable Slice Of Tall-grass Ecosystem." Rocky Mountain News (CO), March 23, 1997: 37A. NewsBank: Access World News.; Rocky Flats Futue Site Use Working Group. "Future Site Use Recommendations." *Rocky Flats Future Site Use Working Group*, June 1995. https://lmpublicsearch.lm.doe.gov/NonEktron/1397-005-RF%20Future%20Site%20Use%20Working%20Group.pdf.

By 1999, the end use of the site remained unclear. Whether the zone would ever be safe and a full cleanup was possible were contentious topics. Some critics, like anti-nuclear activist Leroy Moore, argued that the zone would never be fit for human use due to presumed nuclear contamination. Others, like the neighboring Arvada County, held on to hopes that the 6,000 acres of empty prairie might still be commercially or residentially developed. Colorado Representative Mark Udall, who had been elected to the US House of Representatives in 1998 to represent Colorado's 2nd district, had other ideas. As a lifelong outdoorsman and Colorado native, Udall had a deep appreciation for the Colorado wilderness.[45] After six months in office, Udall was proposing ambitious legislation to protect that wilderness. On June 10th, 1999, when Udall's first opportunity came to take the floor, he did not hesitate to state, "Mr. Speaker, today I am introducing the Rocky Flats Open Space Act."[46] In his speech, Udall made the first official attempt to set aside the 6,000-acre Rocky Flats Buffer Zone as open nature space. As Udall later explained, "[Rocky Flats] is really one of the last great opportunities we have in the Denver area to preserve a natural environment. I love the idea that we once built weapons out here, but now we can maybe preserve the wildlife or, as somebody else said, 'We can turn bombs into birds.'" [47]

Mark Udall's environmental platform was nothing new to the Udall family. His father, Morris (Mo) Udall, had served in Arizona as a House Representative from 1961 to 1991. Mo had

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[45] Easley, Jonathan. "Sen. Mark Udall Conquered Many Mountains before Climbing Capitol Hill." 2011. Roll Call. October 9, 2011. https://rollcall.com/2011/10/09/sen-mark-udall-conquered-many-mountains-before-climbing-capitol-hill/.

[46] US Congress. "106th Congress's 1st Session"*Congressional Record*, July 10, 1999.; US Congress. "Mark Udall Tributes: In The Congress of the United States." S. DOC. 113–37. *Congress of the United States*, 2015.

[47] Able, Charley. "Udall Promotes Rocky Flats Open-Space Bill." Rocky Mountain News (CO), August 31, 1999: 23A. NewsBank: Access World News.

gained widespread recognition for his environmental legislation, notably with the Alaska Lands Act of 1980, protecting more than 100 million acres of the Alaskan wilderness, and the Nuclear Waste Management Policy Act of 1982, which had initiated the development of repositories to store radioactive waste.[48] Mark's uncle, Stewart Udall, had served as Secretary of the Interior from 1961 to 1969 under John F. Kennedy and Lyndon B. Johnson, playing a pivotal role in the creation of landmark environmental legislation, including the Endangered Species Act of 1973 and the Solid Waste Disposal Act of 1965 among others.[49] Mark Udall thus fit comfortably in his family's legacy when, on the same day as the Rocky Flats Open Space Act, he proposed two other bills. The first sought to protect 250,000 acres of alpine backcountry in Rocky Mountain National Park; the other to protect 22,000 acres of wilderness around the magnificent James Peak and Saint Mary's Glacier.[50] In relative terms, the Rocky Flats' 6,000-acre Buffer Zone of seemingly empty grassland was insignificant in size, but the controversy surrounding its creation dwarfed the other two proposals.

Already, the cleanup of Rocky Flats was well underway, and remediation was in sight. Udall's bill sought to "provide for the management of the Buffer Zone at the Rocky Flats site as

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[48] Pearson, Richard. "Environmental Leader Rep. Mo Udall Dies." *Washington Post*, December 14, 1998. https://www.washingtonpost.com/wp-srv/politics/daily/dec98/udall14.htm.; Alaska Department of Fish and Game. "Alaska National Interest Lands Conservation Act (ANILCA) - Native Allotments" *Alaska Department of Fish and Game*. Accessed January 19, 2023. https://www.adfg.alaska.gov/index.cfm?adfg=habitatoversight.anilca.; DOE, "Nuclear Waste Policy Act As Amended." *US Department of Energy, Office of Civilian Radioactive Waste Management*, March 2004. https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf.

[49] Stewart Udall submitted the Endangered Species Preservation Act of 1966 to Congress, paving the way for the better-known 1973 bill.; Graaf, John de. "Stewart Udall: A Remembrance." Accessed January 19, 2023. https://www.sierraclub.org/sierra/stewart-udall-remembrance.; Martin. Wild By Design. 2022. 153

[50] Davant, Charles. "Udall seeks permanent Flats buffer." The Denver Post, June 11, 1999: B-01. NewsBank: Access World News.

open space" and to establish a process for managing that space. Management of the Industrial Zone at the center of Rocky Flats was not decided in the bill. Notably, the bill specified that the federal government would retain ownership of the land and that cleanup standards would not be reduced from the standards agreed upon under the RFCA.[51] Six out of the seven municipalities surrounding Rocky Flats quickly spoke in support of Udall's proposal. However, Arvada, the lone dissenting municipality, refused to back the bill on the grounds that it would result in a lower level of cleanup at the site. Arvada's dissent caused a wave of speculation that Arvada was hoping to use the Buffer Zone for commercial development. Without a bill like Udalls, the DOE could become obligated to sell the land, providing an opportunity for Arvada to annex it.[52]

With the open space bill in a precarious position, Mark Udall found an unlikely ally across the aisle in Republican Colorado Senator Wayne Allard. Allard had been raised on a ranch in a small town in northern Colorado. He received a doctorate in veterinary medicine from Colorado State University and, with his wife, Joan, ran an animal hospital in Loveland, Colorado. Most importantly, Allard had a history of success in Congress and a soft spot for protecting Colorado's environment. In 1992, Allard had written the legislation that had converted the Rocky Mountain Arsenal, a chemical weapons manufacturing plant near Denver, into the Rocky Mountain Arsenal National Wildlife Refuge. In April 2000, he began circulating a draft of similar legislation for Rocky Flats. Allard's 1992 Arsenal legislation had passed with the help of Democrat Representative Pat

[51] Rocky Flats Open Space Act, Pub. L. No. H.R. 2179, § Committee on Commerce, Committee on Resources, 42 U.S.C. 6901 (1999). https://www.govinfo.gov/app/details/BILLS-106hr2179ih.

[52] Gerhardt, Gary. "Arvada Eyeing Flats Land? Neighbors See Its Vote Against Buffer, Designs On Fire Department At The Site As Clear Tipoffs." Rocky Mountain News (CO), March 6, 2000: 5A. NewsBank: Access World News.; Denver Post, The. "Udall Flats plan is wise." *The Denver Post,* (CO), March 7, 2000: B-10. NewsBank: Access World.

Schroeder, and Allard was hoping to repeat the process with Udall's help.[53]

Allard's proposal was similar to Udall's bill but with an important difference. Instead of an open space managed by local communities, Rocky Flats would become a National Wildlife Refuge (Colorado's seventh at the time) managed by the US Fish and Wildlife Service (FWS). Under Allard's plan, wildlife would come first. Human visitors would not be the first priority, and the FWS would be able to take an active role in restoring the Buffer Zone. While Udall's bill sought ecological preservation, taking a passive part in wildlife management, Allard's leaned towards ecological restoration and active ecological intervention.[54] The bill was more thorough than Udall's, had a precedent in the Rocky Mountain Arsenal Refuge, and promised bipartisan support. Udall joined Allard, and in the summer of 2000 and again in the spring of 2001, the two politicians introduced the legislation to Congress.[55]

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[53] Able, Charley. "Plan Places Animal Refuge At Rocky Flats Proposed Bill Would Take Effect After Massive Cleanup." Rocky Mountain News (CO), April 17, 2000: 28A. NewsBank: Access World News.; Boyle, Mary "Rocky Flats: From refuse to refuge." *Gazette, The* (Colorado Springs, CO), April 22, 2000: 4. NewsBank: Access World News.; Mark Udall Tributes. *Congress of the United States*, 2015.

[54] Laura J. Martin defines these terms best in her history of ecological restoration, *Wild by Design*: "Preservation, in its simplest terms, assumes that extractive capitalism and development will continue unabated, and that reserving places from these forces is nature's best shot at survival. Preservationists do not seek to control nonhuman species within the confines of protected areas. Nor do they try to control human behavior, instead excluding people from certain places entirely and allowing them free rein everywhere else. Conservation, in contrast, assumes that humans can develop enlightened ways of using nature more gently. Conservationists seek to control both human decisions and nonhuman lives. Restoration pursues a middle ground: it asserts that human care can help to undo some forms of human-caused environmental damage, while also respecting the autonomy of other species. Ecological restorationists strive to enable other species to thrive while, ideally, minimizing human intervention." The trend towards restoration via the FWS began with the combination of the National Wildlife Refuge System Administration Act of 1966 and the Endangered Species Preservation Act of 1966, which together gave the FWS a federal mandate for restoration work within Wildlife Refuges. As Martin explains, "by the 1990s, the majority of managers and ecologists believed that physical and legal protection were not enough to maintain natural areas." Martin, *Wild by Design.* 2022. 13-14, 190-191, 242-243

[55] Able, Charley. "Plan Places Animal Refuge At Rocky Flats Proposed Bill Would Take Effect After Massive Cleanup." Rocky Mountain News (CO), April 17, 2000: 28A. NewsBank: Access World News.; Romano, Michael. "Lawmakers Seek Wildlife Refuge At Rocky Flats Allard, Udall Push Bipartisan Bill To Preserve After Cleanup." Rocky Mountain News (CO), August 27, 2000: 4A. NewsBank: Access World News.; Hamilton, Jennifer. "Flats Wildlife Refuge Proposed." Broomfield Enterprise (CO), June 21, 2000: 15A. NewsBank: Access World News.; Boyle, 2000;

The new refuge bill received pushback from multiple directions. Colorado Attorney General Ken Salazar supported the idea of the bill but thought the refuge was too small. In the spirit of protecting grassland, Salazar argued that local governments ought to purchase thousands of acres of private land surrounding Rocky Flats to extend the refuge even further.[56] From a different perspective, Arvada had doubts about the new bill and requested several concessions. First, the county wanted the bill to include the possibility of creating a Cold War Museum on or nearby the site. Ultimately, provisions were made for constructing a Rocky Flats Museum in Arvada "to commemorate the contribution that Rocky Flats and its worker force provided to the winning of the Cold War and the impact that the contribution has had on the nearby communities and the State of Colorado." Second, Arvada wanted to protect plans for a proposed regional highway that would cut through the corner of the site. Allard and Udall compromised by agreeing to allow for the limited expansion of adjacent Indiana Street.[57]

Arvada was also concerned about cleanup standards under a wildlife refuge designation. They were not alone in this concern. The bill allowed for the eventual public access to "compatible outdoor recreational and educational activities" in the refuge. While Arvada's

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Stein, Theo. "Flats touted as wildlife refuge Allard, Udall will re-introduce proposal for former arms plant." The Denver Post, February 22, 2001: B-01. NewsBank: Access World News; Allard, Wayne. Rocky Flats National Wildlife Refuge Act of 2001, Pub. L. No. S.425, 9 (2001).

[56] The Gazette. "Salazar supports proposal for Rocky Flats open space." *Gazette, The* (Colorado Springs, CO), May 30, 2000: 6. NewsBank: Access World News.; Morson, Berny. "Open Space At Flats Touted Salazar Says Buy Land To Head Off Developers." *Rocky Mountain News* (CO), June 6, 2000: 5A. NewsBank: Access World News.; The Denver Post, "Splendor in the grass." *The Denver Post*, June 11, 2000: I-04. NewsBank: Access World News.

[57] McCullen, Kevin. "Bills Would Protect Land, Cut Fire Danger." Rocky Mountain News (CO), August 2, 2000: 30A. NewsBank: Access World News.; Flynn, Kevin. "Arvada Backs Flats As Refuge But City Is Adamant That The Site Receive `the Highest Level Of Decontamination.'" Rocky Mountain News (CO), August 29, 2000: 18A. NewsBank: Access World News.; Flynn, Kevin. "Allard, Udall Team Up On Flats Bipartisan Effort Seeks To Create Animal Refuge At Old Nuke Plant Site." Rocky Mountain News (CO), September 1, 2000: 32A. NewsBank: Access World News.; Rocky Flats National Wildlife Refuge Act of 2001 (2001).

concerns were addressed by new clarifying language added to the bill,[58] other critics, such as former Rocky Flats employee Jim Stone, believed that, even though the refuge bill had no impact on existing cleanup agreements, the cleanup would inevitably be insufficient under those agreements and thus the refuge would be complicit in putting visitors and local residents in danger.[59] These critics believed the refuge plan would allow for a "dirty cleanup" of radioactive contamination at the site by the DOE.

While controversy about the refuge plan continued well into the late 2010s and beyond, it reached its editorial peak in August 2001, when *The Denver Post* pitted Wayne Allard and Mark Udall directly against Arjun Makhijani, the president of the Institute for Energy and Environmental Research, and LeRoy Moore, a pacifist and anti-nuclear activist who had been publishing articles criticizing Rocky Flats since the early 1970s. In the four-page spread titled "Coming clean at Rocky Flats," Udall and Allard defended their bill under the heading "Wildlife refuge does not shortchange cleanup," while Makhijani and Moore criticized it under the heading "Fed plan is weak; subsistence farmer scenario the way to go." The congressmen argued that the refuge designation was optimal for cleanup because it required cleanup standards sufficient to protect refuge employees while not being so extensive that "development supporters" would demand a return on investment via the development of the Buffer Zone. In contrast, Makhijani and Moore argued that any environmental legislation might only "last as little as an election cycle" and would never be sufficient to account for the 24,000-year half-life of Plutonium. They argued

[58] Specifically: "nothing in this Act affects the level of cleanup and closure at Rocky Flats required under the RFCA or any Federal or State law."; Rocky Flats National Wildlife Refuge Act of 2001 (2001).

[59] Hamilton, Jennifer. "Udall, Allard Join To Support Flats Plan." Broomfield Enterprise (CO), September 2, 2000: A8. NewsBank: Access World News.

that cleanup standards should be based upon a hypothetical subsistence farmer "who lives on the land, consumes local water, and eats only locally produced food."[60] Notably, neither side acknowledged the difference between the Rocky Flats Buffer Zone and the Industrial Zone.

By the time of the publication of *The Denver Post* debate, however, the fate of the Rocky Flats Buffer Zone was clear, and the RFNWR Act had been resubmitted to Congress in March. In the summer of 2001, the *Rocky Mountain News* wrote, "We don't read tea leaves, but we can confidently predict the future of Rocky Flats. It's going to be preserved as open space. A wildlife refuge. Probably managed by the U.S. Fish and Wildlife Service."[61] In September of that year, Senator Allard moved to attach the refuge bill to the larger National Defense Authorization Act for Fiscal Year 2002, which would effectively ensure its passage. By October, the Senate had unanimously voted to approve the move. In early December, the defense bill was passed by both houses of Congress, and on December 28, 2001, President Bush signed it.[62] Just in time for his 2002 reelection, the success of the Rocky Flats National Wildlife Refuge Act was a win for Senator Allard. In a speech at the Rocky Flats site, he pitched it as "a victory for Colorado, for open space,

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[60] Arjun Makhijani, LeRoy Moore and Wayne Allard, Mark Udall. "Coming Clean At Rocky Flats While Congress Believes That The Standards For A Wildlife Refuge Are Good Enough For The Cleanup Of Rocky Flats, Others Say The Federal Government Isn't Going Far Enough. Wildlife Refuge Does Not Shortchange Cleanup." The Denver Post, August 12, 2001

[61] Rocky Mountain News, "No Highway For Rocky Flats The Issue: State Official Considers Highway Through Rocky Flats Our View: It's Going To Be A Wildlife Refuge." Rocky Mountain News (CO), July 11, 2001: 26A. NewsBank: Access World News.

[62] Allard, Wayne. "S.Amdt.1701 to S.1438 - 107th Congress (2001-2002)," September 26, 2001. 2001-09-26.; The Denver Post, "Wildlife refuge plan for Flats nears passage." The Denver Post, September 9, 2001: B-02. NewsBank: Access World News.; Human, Katy. "Flats likely to become refuge - Senate approves bill that would keep site undeveloped." Daily Camera (Boulder, CO), October 3, 2001: A1. NewsBank: Access World News.; Rocky Mountain News. "Proposed Wildlife Refuge At Rocky Flats On Fast Track." Rocky Mountain News (CO), December 13, 2001: 18A. NewsBank: Access World News.

and for our wildlife."[63]

Missing from the discussion was an acknowledgment of the role played by the military in the refuge's creation. The site had depended for decades on theories of nuclear deterrence during the Cold War. Ultimately, the Refuge Act was passed in Congress as part of a larger defense spending bill. Furthermore, the Buffer Zone would likely have been used for urban development had it not been for the enduring presence of radioactive contamination. The multifaceted history of the site, initially described by Mark Udall as "bombs into birds," thus fits squarely into David Havlick's idea of military environmentalism, the notion that "military production and environmental protection are compatible and, more directly, that military activities create conditions to logically transition these sites to ecological preserves." Havlick highlights the risk of such environmentalism, arguing that it carries the risk of "greenwashing military activities," "avoiding costly, necessary cleanups of contaminated sites," and jeopardizing "cultural preservation."[64] These issues were surely at play in the creation of the Rocky Flats National Wildlife Refuge; however, the notion of military environmentalism is incomplete without acknowledging that military-to-wildlife conversions are not inevitable. The history of the Rocky Flats National Wildlife Refuge Act demonstrates that just as bombs might be turned into birds, they can be turned into buildings.

Similarly, as this narrative has shown, the decision to turn the Rocky Flats Buffer Zone into a wildlife refuge was a political decision. While the site is an example of military

[63] Stein, Theo "Flats refuge bill hailed as 'victory' for wildlife." The Denver Post, December 18, 2001: B-01. NewsBank: Access World News.

[64] Havlick. *Bombs Away.* 2018. 10-11

environmentalism, it is not an example of an intentional attempt by the DOE or the military to "greenwash" its activities. Rather, it was a process led by Mark Udall and Wayne Allard, two congressmen who both saw a political opportunity in pursuing an environmental outcome. In this way, this chapter adds to the conversation around military-to-wildlife (M2W) sites by casting them as a public and political phenomenon rather than as a unilateral decision by a military entity. Like Rocky Flats, many M2W sites have what environmental historian Peter Coates calls "incontrovertible ecological assets."[65] As the conversion of Rocky Flats shows, these assets can become incontrovertible political opportunities. Although the Rocky Flats example may not have validity across all M2W sites, it does demonstrate that decisions about the end uses of closed military bases are not necessarily limited to the military.

Still, the political decision to create the Rocky Flats National Wildlife does not address many of the risks that come with M2W sites. Whether or not its environmental status resulted in a reduction in the quality of the cleanup and whether the cleanup of the site resulted in a loss of historical or cultural meaning remained unclear in 2001 when the Refuge Act was signed. The next chapter, which covers the cleanup of Rocky Flats following the 2001 Refuge Act, addresses these issues.

[65] Coates. "'Get Lost in the Footnotes of History.'" 2015.

Chapter 2: Plutonium Winds

On December 28, 2001, the day that the Rocky Flats National Wildlife Refuge Act was signed into law, *The Charlotte Observer* published an article referred to the over 12 metric tons of weapons-grade plutonium that were still being stored at Rocky Flats, which were set to be removed and shipped to the Savannah River nuclear site in South Carolina so that the cleanup of Rocky Flats could move forward.[66] However, several months before, South Carolina Governor Jim Hodges had announced, "if it is necessary for me to lie down in front of the trucks, I'll do that." Hodges was worried that an underfunded Savannah River site would become the final destination for the plutonium. He threatened to use South Carolina troopers to blockade all shipments from Rocky Flats. With a tight timeline and limited funding, the cleanup of Rocky Flats, led by DOE contractor Kaiser-Hill, was at risk of being derailed by Hodges's opposition.[67]

Although it was the most important and most expensive, the weapons-grade plutonium at Rocky Flats was not the only material that had to be shipped away from the site. In fact, as geographer Shiloh Krupar explains, between 2000 and 2006, 62,000 shipments of hazardous waste at Rocky Flats were "redistributed on the interstate nuclear highway for burial across the US nuclear landscape in a massive federally choreographed shift in the spatial division of waste."[68]

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[66] According to the DOE's 2012 Report, *The United States Plutonium Balance, 1944-2009*, the total US plutonium stockpile in 1994 was 99.5 metric tons. DOE. "Second Five-Year Review Report for the Rocky Flats Site." *US Department of Energy, Office of Legacy Management*, September 2007.; DOE. "The United States Plutonium Balance, 1944-2009." *US Department of Energy*, June 2012.

[67] "The United States Plutonium Balance, 1944-2009." *US Department of Energy*, June 2012.; Borger, Julian. "Carolina Police May Block Bush's Nuclear Waste." *The Guardian*, August 13, 2001, sec. World news. https://www.theguardian.com/world/2001/aug/13/usa.julianborger.; Charlotte Observer, The. "Deadline Presses Colo. Plant - Rocky Flats Must Start Shipping Plutonium Hodges Still Balking." Charlotte Observer, The (NC), December 28, 2001: 1Y. NewsBank: Access World News.

[68] Krupars continues on to describe the nature of the waste, including 600,000 cubic meters of radioactive waste,

Moreover, Rocky Flats was not the only DOE facility participating in this redistribution of waste, but rather one of eighty-one defunct DOE sites being managed by DOE Secretary Spencer Abraham. [69]

Abraham had just completed his first full year as DOE Secretary. Faced with a largely disused nuclear complex, he set out to create a revamped nuclear decontamination complex. His plan, contingent on an $800 million funding boost to the DOE's environmental management efforts, was to drastically reduce the timeframe of nuclear cleanup from 70 years to around 10. Central to his plan was to consolidate all nuclear material into several contained, secure facilities. By doing this, the money spent on widespread maintenance and security could instead be spent on other cleanup efforts. Despite the controversy with Jim Hodges, Abraham based this new approach on the work done at Rocky Flats. He claimed, "for skeptics who say this approach can't work, I point to our Rocky Flats, Colorado site, which we have used as a testing ground for our ideas while formulating our plan."[70]

Since 1999, Rocky Flats had already been shipping radioactive detritus to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The WIPP facility had been opened in 1999 to dispose of economically or technically unrecoverable radioactive waste, especially

30,000 liters of plutonium and uranium solution, 21 tons of weapons-grade nuclear material, 106 metric tons of plutonium residue, 512,000 tons of miscellaneous waste, and 800 buildings making up over 3.6 million square feet. Krupar. "Alien Still Life" *Environment and Planning D: Society and Space*. 2011

[69] Nolan, John. "Quicker Nuclear Cleanup Sought - Energy Secretary Wants $800 Million A Year For Work At Weapons Plants." Charlotte Observer, The (NC), February 1, 2002: 4Y. NewsBank: Access World News.

[70] Tollefson, Jeff. "DOE proposes to expedite cleanup nationally." Santa Fe New Mexican, The (NM), February 1, 2002. NewsBank: Access World.; Abraham, Spencer. "DOE cleanup plan stresses accountability." Oak Ridger, The (TN), February 12, 2002. NewsBank: Access World.

transuranic waste,[71] which was created from the production of nuclear weapons. In addition to WIPP, the DOE planned to consolidate nuclear material at several other sites, most importantly the Pantex Plant in Amarillo, Texas, the Los Alamos Lab in New Mexico, and the Savannah River Site in South Carolina. Unlike the unusable waste at WIPP, the Savannah River Site would be used to store usable plutonium and convert it into fuel for nuclear reactors. If the Rocky Flats plutonium could not be sent to South Carolina, not only would the Rocky Flats cleanup be at risk, but the premise of Abraham's new decontamination complex would be in question.[72]

By March 2002, five months after the planned shipping date, none of the plutonium had left Rocky Flats, and Kaiser-Hill was spending roughly $4 million a month for security. Although the Savannah River Plant had the capacity to store and convert plutonium, approximately one ton of Rocky Flats plutonium was too impure to be used as fuel. Governor Hodges was concerned that, without an established plan for the impure material and without officially secured long-term funding for the rest, the plutonium would end up permanently in an expensive vault. Hodges wanted a legally binding agreement guaranteeing the removal of plutonium if future plans fell through or future funding dried up.[73]

By April, tensions were increasing rapidly. Abraham, hoping to satisfy Hodges, sent a letter

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[71] According to the DOE, transuranic waste is "radioactive waste that contains more than 100 nCi/g of alpha-emitting isotopes with atomic numbers greater than 92 and half-lives greater than 20 years." The United States Plutonium Balance. *DOE*. 2012.

[72] The United States Plutonium Balance. *DOE*. 2012.; DOE, "First Five-Year Review Report For Rocky Flats Environmental Technology Site." US Department of Energy, Rocky Flats Field Office, July 2002.

[73] The Denver Post. "Politics imperils cleanup." The Denver Post, February 7, 2002: B-06. NewsBank: Access World News.; Human, Katy. "Rocky Flats officials fearing further delays - Dispute between S.C., Energy Department slows cleanup, closure." Daily Camera (Boulder, CO), February 8, 2002: B1. NewsBank: Access World News.; Human, Katy. "Rocky Flats closure slowed - Political, technical delays threaten timeline." Daily Camera (Boulder, CO), March 10, 2002: A1. NewsBank: Access World News.

promising to remove the plutonium if it could not be processed on schedule. Hodges, wanting a legally binding document, doubled down on his commitment to block the shipments with lawsuits and state troopers. Abraham, not wanting to jeopardize his new decontamination complex, signed papers to begin shipments without South Carolina's consent, saying, "I will proceed to take the steps I believe necessary to meet our national security and environmental cleanup objectives." Promptly, Hodges, who still rejected the plan, sued the DOE for an insufficient environmental analysis under the National Environmental Policy Act. Wayne Allard and Udall, who still had a political stake in the cleanup, introduced their own legislation to fine South Carolina and the DOE if shipments were delayed any longer. In May, Hodges had the South Carolina Highway Patrol stage a blockade drill near the Savannah River plant. In June, U.S. District Judge Cameron Currie denied Hodges' lawsuit.[74] Several days later, on June 14, 2002, Hodges declared a state of emergency and set up a blockade at the intersection of US 278 and SC 19. Quickly, Judge Currie ordered Hodges not to interfere with the shipments.[75] On August 2nd, 2002,

[74] The ultimate verdict, published on June 20, 2002 in the US District Court of South Carolina was based upon the "Supremacy Clause" of the United States Constitution (art. VI, § 2), it states: "Given that (1) federal law directs DOE to safeguard, manage, and dispose of nuclear materials, (2) DOE's action pursuant to this mandate implicates both national security and foreign policy interests in this case, and that (3) DOE will use federal employees and federal vehicles to transport the surplus plutonium from Rocky Flats to SRS — both federal facilities — the court finds that the proposed shipments of Rocky Flats surplus plutonium to [the Savannah River Site] are clearly federal functions that cannot be interfered with by state action. Governor Hodges' Executive Order, prohibiting DOE's shipment of plutonium into South Carolina and directing various physical means to stop it, is illegal, null, and void under the Supremacy Clause of the United States Constitution." *Abraham v. Hodges*, 255 F. Supp. 2d 539 (D.S.C. 2002)

[75] Fretwell, Sammy. "S.C. To Be Force-fed Plutonium." State, The (Columbia, SC), April 12, 2002: A1. NewsBank: Access World News.; Morson, Berny. "Plutonium Ready To Go - Radioactive Material From Rocky Flats Gets Official Ok To Leave For S.C. After May 14." Rocky Mountain News (CO), April 16, 2002: 22A. NewsBank: Access World News.; Soraghan, Mike. "Udall's bill pressures S.C. on Flats waste Sanctions threatened for delaying shipments." The Denver Post, May 16, 2002: B-02. NewsBank: Access World News.; Seabrook, Charles. "Hodges' War On Plutonium Move Igniting Political, Pr Meltdown." State, The (Columbia, SC), May 6, 2002: A1. NewsBank: Access World News.; Gettleman, Jeffery. "Potential standoff looming Lawyers Meet Today: Huge nuke shipments could start Saturday Colorado senator's dream could become S.C.'s problem." Herald-Journal (Spartanburg, SC), June 13, 2002: A1. NewsBank: Access World News.; Human, Katy. "Flats shipments OK'd - S.C. governor plans to appeal judge's ruling on plutonium." Daily Camera (Boulder, CO), June 14, 2002: A1. NewsBank: Access World News.;

Senator Allard announced that the shipments had officially begun, although the specifics of their itinerary remained top-secret. For the first time since the signing of the Refuge Act, the Rocky Flats cleanup was fully on schedule. The South Carolina controversy was over, and Kaiser-Hill turned towards the future.[76]

The controversy over the shipment of plutonium to South Carolina is important in understanding the cleanup of Rocky Flats and the cleanup of nuclear sites more generally. It highlights the complexity of dealing with nuclear waste. Although plutonium and waste were removed from the site, they remained within the network of US nuclear plants. Just like the weapons produced at Rocky Flats in the 20th century, many of which make up the current supply of US nuclear warheads, the waste produced at Rocky Flats did not simply disappear.[77] Rather, it was displaced and transported to other locations. In this way, nuclear contamination is a unique case in the discussion of military-to-wildlife (M2W) sites and military geographies. Not only is the cleanup itself complicated by radioactive contamination, but the costs are distributed. While most M2W sites share the risk of concealing their historical significance, nuclear M2W sites have the risk of underplaying the long-term management required in dealing with nuclear materials.

The plutonium stored on site had been the top priority for Kaiser-Hill, but after shipments started, more attention was dedicated to the environmental cleanup at Rocky Flats, including the

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Soraghan, Mike. "Blockade set up at S.C. facility Troopers ordered to stop Flats nuclear waste." The Denver Post, June 16, 2002: B-01. NewsBank: Access World News.

[76] Schmidt, Eric. "Rocky Flats shipments begin - DOE says it will have all plutonium off site by end of next year." Daily Camera (Boulder, CO), August 3, 2002: A1. NewsBank: Access World News.; Jacobson, Louis. "Rocky Flats nuclear cleanup effort finally on track." Government Executive: Web Edition Articles (USA), August 14, 2002. NewsBank: Access World News.

[77] Ackland, Len. "The other cleanup at Rocky Flats: We're burying its significance." Denver Post, The (CO), August 7, 2005: E-01. NewsBank: Access World News.

6,000-acre Buffer Zone set to become a wildlife refuge. Although it only became a high priority in the late summer of 2002, the groundwork and justification for the approach used were rooted in research that had begun seven years earlier.

In May 1995, Boulder, Colorado, received over 9.5 inches of precipitation—more than any month during the preceding 100 years. The sudden deluge prompted concern among DOE scientists at Rocky Flats about the effects of surface water on the site's radioactive contamination. Sure enough, when the storms were over, several monitoring locations at Rocky Flats showed increased concentrations of plutonium. The initial hypothesis was that the plutonium had dissolved into the rainwater before being carried to new locations by the runoff. However, the patterns of movement that were observed contradicted the existing models of soluble transport. The DOE and Kaiser-Hill, fearing the unpredictable migration of radioactive contamination, established the Actinide Migration Evaluation (AME) advisory group to study how Rocky Flats pollutants, such as plutonium (Pu) and americium (Am), behave in the air, water, and soil.[78]

From 1995 through 2001, while Mark Udall and Wayne Allard fought for their Rocky Flats Wildlife Refuge and DOE contractor Kaiser-Hill began the cleanup of the industrial area at the center of Rocky Flats,[79] the AME group conducted research to determine how radioactive

[78] Clark, David L., David R. Janecky, and Leonard J. Lane. "Science-Based Cleanup of Rocky Flats." *Physics Today* 59, no. 9 (September 2006): 34–40. https://doi.org/10.1063/1.2364243.; NOAA. *"Boulder Colorado Monthly Precipitation 1893-Present: NOAA Physical Sciences Laboratory."* 2023. *Psl.noaa.gov. https://psl.noaa.gov/boulder/Boulder.mm.precip.html*.

[79] For example, by 2002, Kiaser-Hill had excavated a former uranium waste burial site, began shipping waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico, created several groundwater treatment systems, and demolished buildings 123 and 779. A complete timeline of the cleanup during this period can be found in the DOE's First Five-Year Review Report For Rocky Flats Environmental Technology Site, July 2002. First Five-Year Review. *DOE*. 2002.

contamination was migrating across the site. This issue was particularly consequential in creating the Wildlife Refuge because any contamination in the Buffer Zone, which had never been used directly for nuclear operations, must have migrated there from the industrial area. By 2001 the AME group determined that radioactive contamination at Rocky Flats, rather than dissolving in water, remained in particulate form.[80] The discovery meant that Pu and Am particles were transported around the site almost solely through soil erosion from wind and surface water. Naturally, the cleanup's emphasis shifted towards controlling soil erosion. [81]

On November 12, 2002, motivated by the newfound significance of soil and pressure from local communities, the DOE, the Colorado Department of Public Health and Environment (CDPHE), and the Environmental Protection Agency (EPA) released an updated cleanup plan. It reduced the allowable level of soil radiation at Rocky Flats drastically, from 651 picocuries[82] per gram of soil (pCi/g) to 50 pCi/g in the top three feet of soil.[83] These new standards were designed with future Wildlife Refuge workers and visitors in mind. At the 50 pCi/g level, the lifetime cancer risk of a wildlife refuge worker spending 40 hours per week on-site would only increase by one in

[80] As Clark et al., "Science-Based Cleanup of Rocky Flats.," explain, "from 1998 until 2001, Texas A&M University's Peter Santschi and coworkers examined Pu 239, Pu 240, and Am 241 concentrations in the field and through laboratory studies […]. […] concentrations in storm runoff and pond discharge samples collected during spring and summer from 1998 to 2000 demonstrated that most of the Pu 239, Pu 240, and Am 241 transported from contaminated soils to streams occurred in the particulate (roughly larger than 0.45 µm) and colloidal (roughly between 2 nm to 0.45 µm) phases." This was significant because "particulate" and "colloidal" forms would require alternative models to measure and predict the movement of the contamination. Clark et al. 2006

[81] First Five-Year Review. *DOE*. 2002.; Clark et al. 2006

[82] According to the EPA, a curie (Ci), which is the customary unit of radioactivity, is equal to 3.7×10^{10} nuclear transformations per second. (1 picocurie = 10^{-12} curies). EPA. "Soil Screening Guidance for Radionuclides: Technical Background Document." *Environmental Protection Agency, Office of Emergency and Remedial Response*, October 2000. https://semspub.epa.gov/work/HQ/175427.pdf.

[83] Clark et al. 2006 39

500,000. In other words, if 500,000 refuge workers spent their lives working at Rocky Flats, only one would be expected to be affected by the contamination.[84] Supporters of this new plan drew comparisons between the 50 pCi/g at Rocky Flats and other radioactive sources, like the "1,000 picocuries emitted by smoke detectors" [85] or the "2,500 picocuries a day from naturally radioactive potassium in the diet."[86] One EPA official commented that the new standards were "as low as I've seen achieved on any Superfund site."[87]

Despite this improvement in soil standards, some critics remained skeptical.[88] Particularly, they focused on two aspects of the new standards. First, some were concerned about setting the standards for a worker instead of subsistence farmers. LeRoy Moore, for example, argued that although the contamination in the soil was reduced, it would remain for thousands of years and might not be safe for a distant future in which the site was used for farming. Second, some were concerned about the distinction between surface and subsurface soil. For example, one member

[84] Morson, Berny. "Flats Cleanup Levels Set - They're 'as Low As I've Seen Achieved,' EPA Official Says." Rocky Mountain News (CO), November 13, 2002: 6A. NewsBank: Access World News.; Second Five-Year Review, *DOE*. 2007.

[85] Morson, 2002

[86] Rocky Mountain News. "Impressive Cleanup." Rocky Mountain News (CO), November 16, 2002: 24B. NewsBank: Access World News.

[87] Morson, 2002.

[88] Some research has been done on the difference between public perception of risk and expert perception of risk. In a 1987 study, Paul Slovic found that radioactive waste, nuclear weapons, and nuclear fallout were rated highest for "dread risk," defined by the "perceived lack of control, dread, catastrophic potential, fatal consequences, and the inequitable distribution of risks and benefits." As he explains, in the general public, this "dread risk" is highly correlated with a desire for strict regulation. In contrast, experts perceived risk from a more empirical standpoint "as synonymous with expected annual mortality." Although this study does not speak to the safety of Rocky Flats, it does help explain the disconnect between public concern over soil standards and expert consensus over them. Slovic, Paul. "Perception of Risk." *Science* 236, no. 4799 (April 17, 1987): 280–85. https://doi.org/10.1126/science.3563507.

of the Sierra Club wondered if prairie dogs, burrowing rodents living at Rocky Flats, might dig below the remediated three feet of surface soil and resurface potentially more contaminated soil below.[89] This concern was largely ignored because the soil erosion studies demonstrated that because the soil was moved by wind and surface water, the subsurface contamination remained stagnant. Additionally, areas like the Buffer Zone that were contaminated indirectly were unlikely to have significant levels of radiation below three feet. Regardless, the new soil standards were set, and Kaiser-Hill was already at work implementing them, particularly at the highly contaminated "903 Pad."

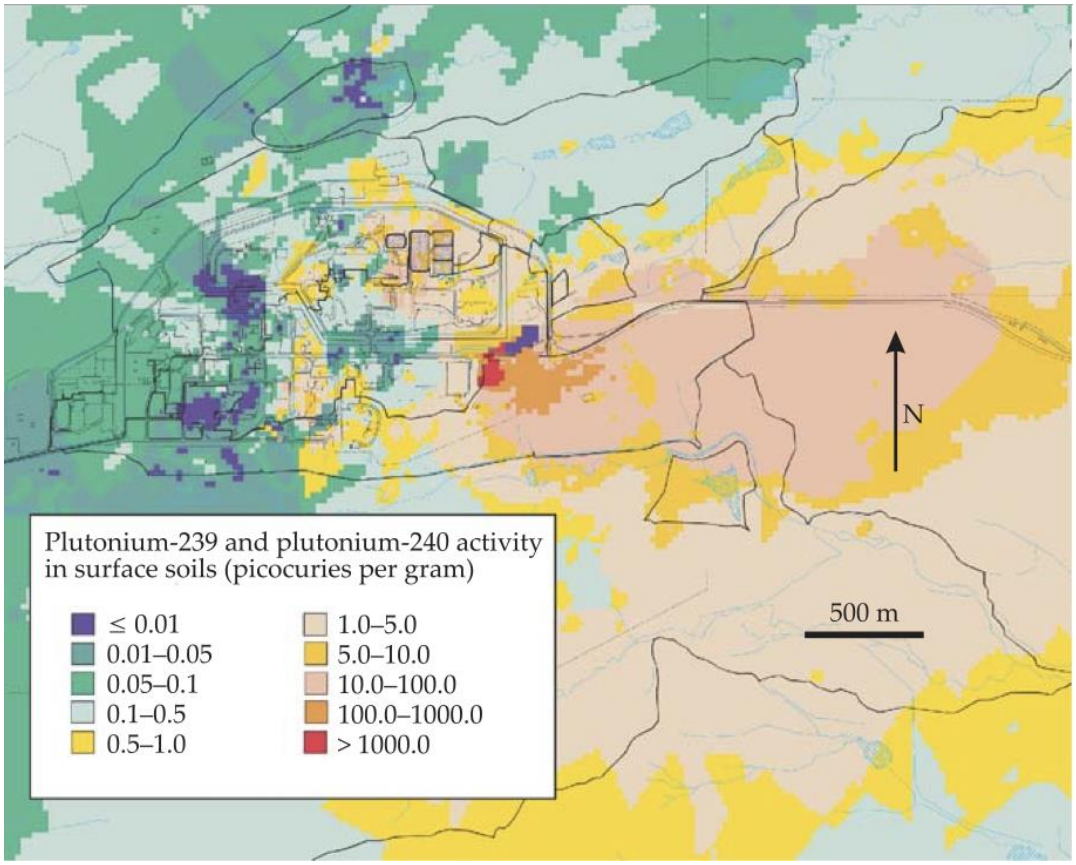

Figure 2: Picocuries per gram at Rocky Flats and the Buffer Zone before remediation. The highly contaminated area

[89] Human, Katy. "Rocky Flats reveals new plan - Surface soil cleanup will be more rigorous." Daily Camera (Boulder, CO), November 13, 2002: B1. NewsBank: Access World News.

in the center of the map is the location of the 903 Pad, where drums of radioactive waste had been leaking for over a decade.[90]

Contamination from the 903 Pad was responsible for nearly all of the soil contamination in the Buffer Zone. Since around 1955, barrels containing radioactive waste, including plutonium waste, had been stored on the 903 Pad on the southeast corner of the plant. In 1959 and again in 1967, workers discovered the drums had been leaking, contaminating the surrounding area with radioactive waste. By 1969, the 903 Pad was covered with asphalt, but the damage had been done. The contamination from the leaky drums had blown from the northwest to the southeast by the prevailing winds at Rocky Flats, spreading radioactive contamination across the southeastern Buffer Zone (See Figure 2).[91] In September 2002, Kaiser-Hill began the cleanup of the 903 Pad by erecting two large plastic tents to prevent the spread of further contamination while they dug up the contaminated soil and asphalt before shipping it off to a waste storage site in Utah.[92] With the new soil standards set and the 903 Pad cleanup underway, the role of Kaiser-Hill became a mere matter of execution. Soon, the focus would shift toward the US Fish and Wildlife Service (FWS) and the specifics of the environmental conversion following the

[90] According to Clark et al., "Science-Based Cleanup of Rocky Flats." To estimate concentrations of [plutonium] in surface soil, researchers applied a geostatistical modeling technique known as Kriging analysis that used nearly 2,500 surface soil samples collected and analyzed between 1991 and 1999. 17 The highest [plutonium] activities in excess of 1,000 picocuries per gram of soil, colored red on the map—were found at the 903 Pad, where plutonium-contaminated solvents had leaked for more than a decade. A clear plume of [plutonium and americanium] contamination tracks roughly with the prevailing winds from the northwest to the southeast."

Clark et al., "Science-Based Cleanup of Rocky Flats," 2006

[91] The 903 Pad was not the only source of contamination at Rocky Flats as a whole; however, it was the main source of contamination beyond the central Industrial Zone. Contamination in the central zone was also caused by the famous 1957 and 1969 plutonium fires, various disposal trenches and waste dumps, solar evaporation ponds containing wastewater, and two large landfills. Second Five-Year Review. *DOE*. 2007

[92] Human, Katy. "Down to the dirt - Rocky Flats` 903 Pad to be cleaned to strict new levels." Daily Camera (Boulder, CO), October 6, 2002: A1. NewsBank: Access World News.

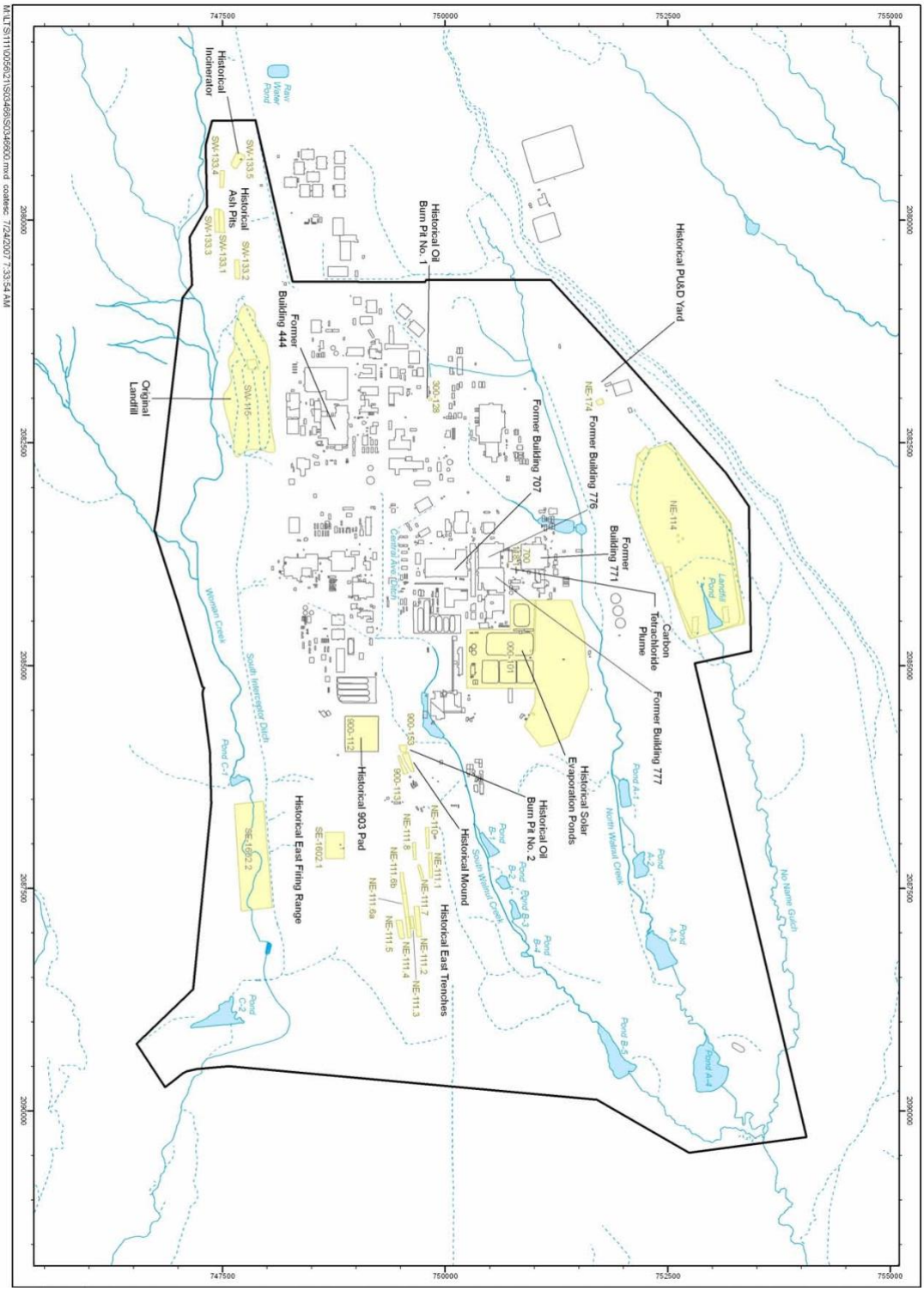

Figure 3: A DOE map of various contaminated sites at Rocky Flats, including the 903 Pad. “OU” stands for “Operable Unit,” which is the same as the Industrial Zone. “IHSSs” stands for “Individual Hazardous Substances

Sites," "PACs" stands for "Potential Areas of Concern," and "UCB" stands for "Under Building Contamination."[93]

completion of the cleanup.

As Kaiser-Hill prepared for the final stretch, the FWS began to think seriously about what it would mean to manage the Rocky Flats Buffer Zone as a wildlife refuge. In September 2002, the FWS hosted its first "public input meeting" to hear local opinions about how the site should be managed as a refuge. To begin the public discussion, Dan Rundle, who would become the manager, made it clear to the audience that "we can't do anything about how you feel about cleanup levels" and that the FWS was not involved with the cleanup process.[94] His remark, although not received well by the largely skeptical audience, indicated a shifting focus at Rocky Flats from the cleanup itself to what would happen afterward. This meeting would be the first of many similar meetings hosted by the FWS to determine the specifics of its "Comprehensive Conservation Plan."[95] While the focus of the plan would be strictly centered on the protection of the Rocky Flats ecosystem, other issues—like public access, bike paths, hiking, hunting, motorized vehicles, visitor centers, warning signs, prescribed fires, mining rights, and more—would become controversial issues. As the cleanup continued in the background, the FWS set out to untangle the specifics of the future.

The first major issue arose for the FWS in early 2003 over privately held gravel mining rights in some areas of the Buffer Zone. Although some refuges did allow oil and gas extraction, gravel

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[93] Second Five-Year Review. *US Department of Energy*. 2007

[94] Human, Katy. "Public speaks out on access, recreation at Flats - Former nuclear weapons facility to be wildlife refuge." Daily Camera (Boulder, CO), September 12, 2002: B1. NewsBank: Access World News.

[95] Comprehensive Conservation Plan. *US FWS*. 2004.

mining would be highly invasive, requiring hundreds of acres of prairie land to be dug up. The FWS was not interested in creating a refuge that might be destroyed by mining. At the same time, the DOE was set on transferring all of the refuge lands to the FWS at once. Unless those rights were purchased, the FWS and DOE would be at a standstill.[96] Meanwhile, the cleanup continued as Kaiser-Hill plugged underground pipes with concrete and finished removing the final plutonium workstations in Building 771.[97]

Despite the unresolved dispute over the mining rights, the FWS pushed forwards with its plan, publishing the first draft in May 2003 and, after public feedback, a more developed plan in February 2004.[98] As a summary of the plan would later explain, "although guided by a 'Wildlife First' mission that promotes the conservation, management, and restoration of wildlife and their habitat, the Refuge System is also committed to investing in public use facilities and programs that foster an appreciation of the Refuge's natural resources."[99] The plan laid out four potential "use options" for the FWS management of Rocky Flats. Option A, the "No Action" option, called for no public use facilities on Rocky Flats save limited guided tours and no "implementation of

[96] Human, Katy. "Officials discuss progress at Flats - Challenges ahead: contaminated building demolition, mineral rights debate." Daily Camera (Boulder, CO), January 7, 2003: B1. NewsBank: Access World News.; Daily Camera. "Turning Rocky Flats into wildlife refuge." Daily Camera (Boulder, CO), March 2, 2003: DD2. NewsBank: Access World News.

[97] Imse, Ann. "More Testing Of Pipes At Flats - Leaks Of Plutonium, Solvents, Acids Could Now Trigger Removal." Rocky Mountain News (CO), April 10, 2003: 30A. NewsBank: Access World News.; Bunch, Joey. "Flats marks cleanup milestone as last glovebox removed." The Denver Post, December 8, 2002: B-04. NewsBank: Access World News.

[98] Human, Katy. "Agency releases Flats plans - Hiking, biking, hunting envisioned at site." Daily Camera (Boulder, CO), May 7, 2003: B1. NewsBank: Access World News.; Jeter, Alisha. "Flats plans call for limited public access - One trail would open in first year, others postponed for five years." Broomfield Enterprise (CO), February 25, 2004: A3. NewsBank: Access World News.

[99] FWS. "Summary of the Comprehensive Conservation Plan." *US Fish and Wildlife Service*, April 2005.

any new management, restoration, or education programs." Option B, the "Wildlife, Habitat and Public Use" option, called for restoring habitats to "pre-settlement conditions" while allowing for roughly 16 miles of public trails and limited hunting. Option C, the "Ecological Restoration" option, would emphasize conservation and restoration while restricting public use to guided tours and limited education programs. Finally, Option D, the "Public Use" option, would allow for more trails, a visitor center, and educational programs. The FWS preferred Option B but explained the impact of each option on management goals, including the Preble's Field Mouse habitat management, pond restoration, grassland management, revegetation, weed management, deer & elk management, and trail development.[100] The plan, however, failed to address the issue of mining rights, explaining only that "the Service will not accept transfer" of the land until the private mining rights were reclaimed.[101]

[100] For the specifics of each of these initiatives, see the online version of the *Rocky Flats National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Impact Statement*, page S8.; Comprehensive Conservation Plan. *US FWS*. 2004. Accessed December 22, 2022. https://www.fws.gov/media/rocky-flats-national-wildlife-refuge-comprehensive-conservation-plan.

[101] Comprehensive Conservation Plan. *US FWS*. 2004.

Figure 4: A photo taken at the entrance to the Rocky Flats National Wildlife Refuge in 2022. The signage on the left gives a brief account of the purpose, history, and safety of the site.[102]

[102] The complete text reads:

"Welcome to Rocky Flats National Wildlife Refuge, home to over 239 species of wildlife and over 630 species of plants. In 2001, the Refuge was created by Congress to protect xeric tallgrass prairie, a globally rare ecosystem, and to protect habitat for threatened and endangered species. The security that once protected the Rocky Flats nuclear weapons plant also preserved this unique expanse of Front Range habitat.
Portions of the Refuge surround a historic Cold War site. For nearly four decades. thousands of women and men worked at the Plant, building weapons components for the United States' nuclear weapons arsenal. In 1989, operations ended and the Rocky Flats Plant was added to the U.S. Environmental Protection Agency's National Priorities List of sites that needed to be cleaned up. Beginning in 1992, many of the same Cold War veterans who had built weapons components at the Plant, assisted with an unprecedented and enormously complex Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") cleanup project to investigate and remediate the site.
Thousands of soil, water, air, and sediment samples were collected and analyzed by laboratories. This extensive evaluation of Rocky Flats was conducted by the U.S. Department of Energy (DOE) and its contractors, overseen by the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE). Based on the results of the investigation, it was determined that no remediation was required on Refuge lands.

Figure 5: A photo taken at the restricted entrance to the DOE-controlled Industrial Zone at the Rocky Flats National Wildlife Refuge in 2022. The white sign explains the use restriction within the zone; for example, “surface water may not be used for drinking water or agricultural purposes.”

The Conservation Plan also explained how the land would be transferred from the DOE to the FWS. Most importantly, it stressed the distinction between the DOE-controlled Industrial

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The Site was closed in 2005 after the Plant was torn down and cleanup was completed. DOE Legacy Management staff continue to manage 1,300 acres located at the center of the Refuge where the former Plant was located. Please do not enter this area as groundwater treatment systems are currently operating and two closed landfills are being maintained.
The levels of residual contamination on Refuge land are very low, and meet state and federal cleanup standards and regulatory guidance. While small amounts of contamination remain above background levels, the corresponding radiation dose a visitor receives is small (<1 millrem/year, compared to the average American's annual dose of about 620 mrem). If you visited the refuge hundreds of times in a year, your dose still would be much less than a medical x-ray.
The Refuge is safe for recreation, Refuge workers, and wildlife.”

Area and the FWS-managed land. It remarked on the 50 pCi/g soil standard, pointing out that "the majority of land that will become the Refuge will contain less than 1 pCi/g of plutonium." Additionally, the plan made provisions for "interpretive programs," primarily through signage (see Figure 4), to educate the public about habitat restoration, wildlife, Native American history, the history of plutonium production on the site, and the history of the cleanup and closure of the site.[103] Similarly, it expressed the hope that, per the 2001 Rocky Flats Refuge Act, a Rocky Flats Cold War Museum would be created by 2006.[104]

The dual consideration present in the plan, balancing public use and military realities against environmental restoration, was a clear representation of what geographer David Havlick calls "opportunistic conservation". Havlick explains that many military-to-wildlife (M2W) sites are often a mixed blessing for environmental management: "Management of these sites necessarily takes into account the military hazards and infrastructures that remain, and the institutional limitations that may come with inheriting militarized space. These factors in many cases limit and shape the conservation efforts directed by wildlife personnel. Even as wildlife refuge officials work to take advantage of the real conservation opportunities provided by former military lands, their efforts to open refuges to public uses and restore the sites' ecology face obstacles that challenge managers and their agency."[105]

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[103] Later there would be debates over the wording of that signage. While some, like Wes McKinley, a newly elected Colorado Senator, pushed for more explicit radioactivity warnings, Mark Udall argued such measures were unnecessary. The ultimate wording can be seen in Figure 4. Lowe, Peggy. "Udall Opposes Idea Of Radiation Warning Signs, Consent Forms." Rocky Mountain News (CO), January 6, 2005: 23A. NewsBank: Access World News.

[104] As of 2023, there is still no Cold War Museum. Comprehensive Conservation Plan. *US FWS*. 2004.

[105] Havlick. Opportunistic Conservation. 2014.

In this way, Havlick argues that there are risks in the marriage between military sites and conservation, just as there are risks to "writing off militarized landscapes as unmitigated disasters that must be relegated to permanent status as brownfields." In conclusion, Havlick explains that "opportunistic conservation can thus emerge as a cynical move to cover the tracks of military negligence or as a genuine and creative effort to achieve conservation successes." The question remains, which of these two possibilities best describes Rocky Flats? [106]

In the public response to the published conservation plan, the audience was torn on that question. Activist LeRoy Moore took to calling the FWS "Fission Wildlife" and argued that the FWS was playing a joke on the Denver area public by depicting Rocky Flats as "an unspoiled preserve ideal for the hiking, biking, hunting, and horseback."[107] In a public hearing hosted by the FWS on March 10, 2004, another local resident claimed, "We should declare the entire site a national sacrifice zone. Rocky Flats is America's Hiroshima."[108] However, as one journalist with a local newspaper explained:

"Anybody who lives near Rocky Flats, the now-defunct nuclear weapons plant south of Boulder, owes a debt of gratitude to the activists who for decades have patiently labored in the cause of public health and safety. Thousands protested in the 1970s and '80s over the dangers of radioactive contamination and the ethics of nuclear warfare. They applied much-needed pressure when the government was highly secretive. […] But today, no pragmatist really expects their agenda to rule the day."[109]

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[106] Havlick. 2014.

[107] Moore, LeRoy. "Flats Is No Place For Open Space - Plutonium still contaminates the site, and nobody can guarantee our safety." Daily Camera (Boulder, CO), March 7, 2004: E3. NewsBank: Access World News.

[108] Morson, Berny. "Keep Rocky Flats Closed, Activists Tell U.S. Agency." Rocky Mountain News (CO), March 12, 2004: 8A. NewsBank: Access World News.

[109] Daily Camera. "Don`t fence us out - Rocky Flats will be clean enough for public use." Daily Camera (Boulder, CO),

The article continued to point out that, despite concern over the radiation in the Industrial Zone, the zone would likely remain closed "barring an unforeseen catastrophe such as the collapse of the United States." It argued that, regardless, contamination in the Industrial Zone was not relevant to the conservation of the refuge, made up only of Buffer Zone lands.

While the controversy over the FWS conservation plan brewed, the DOE cleanup. From the first draft of the plan in May 2003 to the draft in September 2004, the Kaiser-Hill finished packing up nearly 2,000 containers of plutonium to be shipped to South Carolina and demolished Building 771, a building made infamous by a nearly catastrophic plutonium fire in 1957.[110] The DOE fought legislative battles with other states over the cleanup of other DOE facilities, and Wayne Allard had even drafted a new bill to resolve the issue of mining rights at Rocky Flats.[111] By late 2004, worry over the site's safety had begun to die down. Quoting from one *Rocky Mountain News* article,

"The Department of Energy has taken hundreds of thousands of soil, air and water samples throughout the 6,400-acre site. The site has been investigated with hand-held instruments, satellite imagery, aerial

March 19, 2004: B6. NewsBank: Access World News.

[110] As historian Len Ackland explains, "Building 771 was the plant's crowned jewel. […] this structure was about the size of a large airplane, but two story and rectangular. It contained equipment to to process plutonium into metal and then shape it into components for bomb pits, or cores." In 1957, this equipment and the plutonium within it caught fire and was contained after an explosion accidentally shut down several exhaust fans. "If the fans had continued running at high speed, much more plutonium would have been sucked through the ducts and released into the Denver area." Ackland. *Making a Real Killing.* 2002. 74, 117-121

[111] Daily Camera. "Flats in last days of packing plutonium - Savannah River Site to take material by the end of the year." Daily Camera (Boulder, CO), July 17, 2003: B2. NewsBank: Access World News.; Fleck, John. "U.S., States Dueling Over Dumping Grounds." Albuquerque Journal (NM), December 14, 2003: A1. NewsBank: Access World News.; Jeter, Alisha. "Demolition marks end of nuclear era - 771 once dubbed 'most dangerous building in America'." Broomfield Enterprise (CO), June 23, 2004: A3. NewsBank: Access World News.; Neff, Todd. "Allard proposes Flats solution - Bill balances Department of Energy, state concerns about site." Daily Camera, The (Boulder, CO), June 16, 2005: A09. NewsBank: Access World News.

surveys, photographs and physical inspections. […] Assertions that this process has missed areas of contamination that could present a hazard to workers or future refuge visitors are simply not credible. […] The public should rest assured that the cleanup will be protective, that the refuge will be safe and that Rocky Flats will not pose a risk to its workers, visitors or its neighbors."[112]

In September 2004, the FWS Final Conservation Plan was published, and the conversion seemed near to its conclusion. In October, the FWS tested local deer populations, confirming that they would be safe to consume[113]. In December, Kaiser-Hill finished removing the last of the 1,457 plutonium gloveboxes, workstations where workers at Rocky Flats had actually handled plutonium during the site's operation.[114] By February 2005, the DOE had hired an independent contractor from Oak Ridge, Tennessee, to evaluate the cleanup,[115] and in March, Building 776, the site of the 1969 "Mother's Day Fire," was demolished.[116] In April, the last shipment of

[112] Lockhart, Frazer. "Flats Cleanup Thorough And Rigorous." Rocky Mountain News (CO), August 27, 2004: 44A. NewsBank: Access World News.

[113] As a local Boulder Newspaper explained, "they based their limit on the amount of contamination needed to elevate cancer risk by one one-millionth, based on Environmental Protection Agency standards, Sattelberg said. To make the test more conservative, the wildlife service assumed that a single person would eat the meat of the entire deer. It also made the testing threshold 10 times more sensitive than EPA limits, Sattelberg said -- such that an increased risk of just one in 10 million would exceed the wildlife service limit." Neff, Todd. "Tests on Flats deer show little radiation - Plans for former weapons plant include hunting." Daily Camera, The (Boulder, CO), October 14, 2004: A1. NewsBank: Access World News.

[114] Gloveboxes, as historian Len Ackland explains, were work areas with "two heavy, long-sleeved rubber gloves [which] reached through portholes into rectangular boxes that stood on legs about three feet off the concrete floor. Each box was about five feet long, four feet high, and threee feet deep." Within these boxes, workers would physically handle and shape plutonium material. Ackland. *Making a Real Killing.* 2002. 74-75; McGuire, Kim. "``Glovebox'' removal heralds new Flats era." Denver Post, The (CO), December 9, 2004: B-01. NewsBank: Access World News.

[115] Neff, Todd. "DOE orders more cleanup tests at Flats - Mactec, Oak Ridge will examine former weapons site." Daily Camera, The (Boulder, CO), February 11, 2005: A01. NewsBank: Access World News.

[116] As Len Ackland explains in his overview of the 1969 fire, "the fire could have caused a Chernobyl-scale disaster seventeen years before that 1986 nuclear accident." Like the 1957 fire, the crisis was averted by dumb luck when a truck outside the plant accidentally backed into a power-line and cut of electricity to the building. Ackland. *Making a Real Killing.* 2002. (152-159); McGuire, Kim. "Site of Flats fire razed with careExtra air monitoring and other

transuranic waste left Rocky Flats in route to the WIPP plant.[117] In May, Kaiser-Hill determined that any further soil sampling would no longer increase the statistical significance and thus switched to aerial scans to verify their work.[118] In June, Wayne Allard introduced his mining rights bill, authorizing the DOE to purchase the mining rights and transfer the land to the FWS.[119] In July, the bill was passed.[120] In August, Building 371, the final building at Rocky Flats, was demolished, and, finally, in October 2005, the last ever shipment of waste from Rocky Flats left the plant, marking the cleanup officially complete.[121]

Over the following year, during the Environmental Protection Agency's (EPA) thorough review of the DOE's efforts, the cleanup was deemed a success by officials. A 2006 report from the Government Accountability Office, commissioned by Wayne Allard, only had several criticisms of the cleanup, the most important being the hope that "lessons learned at cleanup sites are analyzed and implemented as appropriate at other DOE sites." The report claimed that "The Rocky Flats project offers many lessons about innovative techniques, risk- and cost-sharing

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precautions are taken as Building776, scene of a '69 plutonium fire, begins to fall.." Denver Post, The (CO), March 3, 2005: B-01. NewsBank: Access World News.

[117] McGuire, Kim. "Last radioactive scraps slated to leave Flats Bound for N.M. Dump, The shipment is the final one of almost 95,000 barrels of RockyFlats transuranic waste hauled to the dump since 1999.." Denver Post, The (CO), April 19, 2005: B-04. NewsBank: Access World News.

[118] Daily Camera. "Kaiser-Hill scraps random soil tests." Daily Camera, The (Boulder, CO), May 3, 2005: A05. NewsBank: Access World News.

[119] Neff, Todd. "Allard proposes Flats solution - Bill balances Department of Energy, state concerns about site." Daily Camera, The (Boulder, CO), June 16, 2005: A09. NewsBank: Access World News.

[120] Imse, Ann. "Senate OK's Buyout At Rocky Flats." Rocky Mountain News (CO), July 7, 2005: 18A. NewsBank: Access World News.

[121] Morson, Berny. "Steel Jaws Erase Last Flats Building - Hefty Structure Final One To Be Razed At Contaminated Site." Rocky Mountain News (CO), August 2, 2005: 6A. NewsBank: Access World News.; Hartman, Todd. "Rocky Flats Wraps Up Radioactive Cleanup - Last Of 62,000 Shipments Signals 'closure Of An Era.'" Rocky Mountain News (CO), October 8, 2005: 6A. NewsBank: Access World News.

contract provisions, accelerated cleanup processes, involvement of community groups, oversight of contractor controls over data quality, and cleanup verification processes." [122] Finally, on September 29, 2006, the EPA officially signed off on the DOE's cleanup of Rocky Flats, marking the conclusion of the decade-long remediation of Rocky Flats.[123]

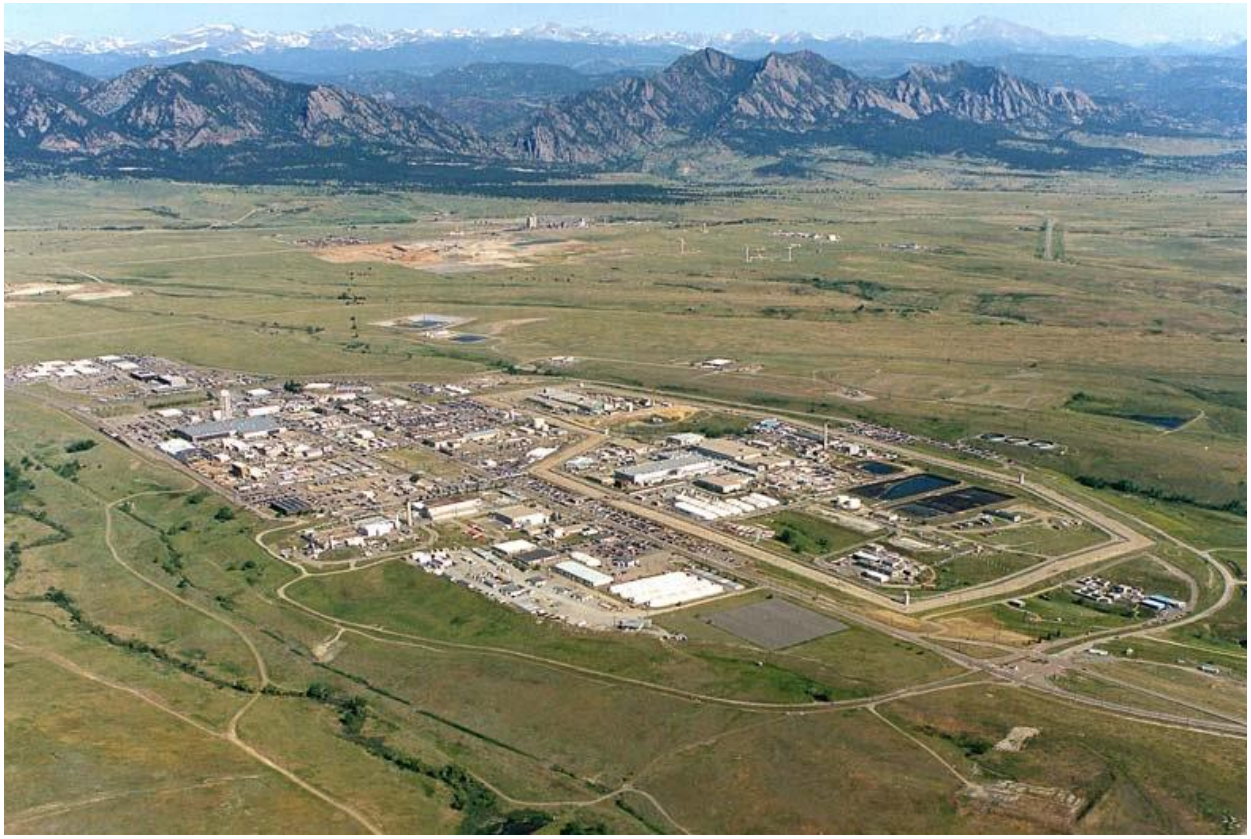

Figure 6: An aerial Photo of the Rocky Flats Site taken in 2001. The buildings depicted make up the "Industrial Zone" as it was before most of the buildings were demolished. [124]

[122] "Nuclear Cleanup of Rocky Flats: DOE Can Use Lessons Learned to Improve Oversight of Other Sites' Cleanup Activities." Government Accountability Office, July 2006.; Hartman, Todd. "Investigators praise cleanup efforts at Flats - New techniques accelerated 10-year project, report says." Rocky Mountain News (CO), July 11, 2006: 19A. NewsBank: Access World News.

[123] Daily Reporter-Herald. "Agreement sets stage for Rocky Flats' switch to wildlife refuge." Daily Reporter-Herald, The (Loveland, CO), September 30, 2006: 1. NewsBank: Access World News.

[124] Second Five-Year Review. *US Department of Energy*. 2007

Figure 7: An aerial Photo of the Rocky Flats Site taken in 2007, after all of the buildings in the central "Industrial Zone" had been demolished. The area where the buildings once were remained in the DOE's control and permanently off limits to the public due to their higher levels of contamination.[125]

Near the end of the cleanup, in May 2005, The *Rocky Mountain News* published an article telling the story of a northern harrier hawk rehabilitated into the Rocky Flats Buffer Zone: "the northern harrier launched northward into the wind, made a quick circle back to say thanks before banking west and disappearing to freedom."[126] The tone of the article was nothing but

[125] Second Five-Year Review. *US Department of Energy*. 2007

[126] Gerhardt, Gary. "Northern Harrier Back In Wild After Nine-month Rehabilitation." Rocky Mountain News (CO), May 11, 2005: 14A. NewsBank: Access World News.

celebratory, but the environmental depiction of Rocky Flats that was developing troubled critics like LeRoy Moore. To Moore, "the wildlife-refuge idea was a way of greenwashing Rocky Flats - that is, making a dangerously contaminated area look benign, safe, even inviting.[127] Perhaps, without Moore's unyielding activism, his charge that the Rocky Flats refuge was a "dangerously contaminated area" might have been true. After all, he had been a prominent public voice calling for DOE accountability at Rocky Flats since the early 1970s.[128] However, by 2006, his claim no longer held. Not only did Moore fail to make the distinction between the FWS-managed refuge and the DOE-managed Industrial Zone, but he ignored the years of work by Kaiser-Hill that had demolished and decontaminated all buildings on the site, shipped away tons of plutonium and other waste, removed all soil over 50 pCi/g of contamination (with most of the refuge containing far less than that), created a viable habitat for a host of at-risk species, and been approved by the DOE, the EPA, and the CDPHE.

Like with Moore, fears surrounding contamination at Rocky Flats failed to dissipate despite government and scientific reassurance. Throughout the next decade and a half, new controversies emerged and disappeared again, often reiterating the same debates. In 2012, soil testing, which had been sparked by plans for a nearby highway, the Jefferson Parkway, found plutonium contamination near Rocky Flats. Although the levels were well within safety standards and the existence of contamination in that area was entirely expected (Figure 2), the study

[127] Moore, LeRoy. "Flats 'cleanup` is anything but." Daily Camera, The (Boulder, CO), October 22, 2005: B07. NewsBank: Access World News.

[128] Ackland. *Making a Real Killing.* 2002. 218

reignited public concerns over safety.[129] In 2015, a proposed controlled burn to help in the restoration of grasslands at Rocky Flats provoked fears of contaminated smoke.[130] In 2016, proposals for a public trail system running through Rocky Flats were blocked over public concerns about the site's safety. As *The Denver Post* wrote, "critics of access to Rocky Flats fear contamination from plutonium and simply do not trust assurances from federal and state officials that the area is safe and cleanup has been successful."[131] When, in 2018, the FWS announced that the refuge would be opened to the public, a concerned public coalition attempted to sue the FWS over fears of plutonium contamination in the soil.[132]

The persisting controversies surrounding Rocky Flats highlight the need to consider the complexities of Rocky Flats and, more generally, M2W sites. For example, the conflation of the Rocky Flats National Wildlife Refuge and the central Industrial Zone is representative of the confusion that M2W scholars are concerned about. Even though the Refuge was cleaned up, there may be risks in ignoring that the Industrial Zone remains in the control of the DOE and barred from public access. If "Rocky Flats" only refers to the wildlife refuge and not the nuclear facility, the risks of nuclear production are surely obscured. However, this works in both

[129] The controversy over Jefferson Parkway soil samples culminated in a 2019 study done by the Colorado Hazardous Materials & Waste Management Division. Sheets, Monica. "Review of Potential Radiation Doses during Construction of the Jefferson Parkway." *Colorado Department of Public Health & Environment, Hazardous Materials & Waste Management Division*, June 2020.; Snider, Laura. "Study: Rocky Flats contamination still high." Denver Post, The (CO), February 19, 2012: 3B. NewsBank: Access World News.

[130] Finley, Bruce. "Rocky Flats fears - Area residents worry controlled burn could release plutonium in air." Denver Post, The (CO), January 29, 2015: 6A. NewsBank: Access World News.

[131] The Denver Post. "Let science rule on Flats access." Denver Post, The (CO), May 11, 2016: 19A. NewsBank: Access World News.

[132] The Denver Post. "Rocky Flats Wildlife Refuge prepares to open trails this summer at former home of nuclear weapons plant." Denver Post, The (CO), March 27, 2018: 2A. NewsBank: Access World News.

directions. If “Rocky Flats” only refers to the Industrial Zone or the site’s controversial nuclear history, then the successful cleanup and ecological value of the wildlife refuge might be ignored or criticized. Applying Havlick’s question about Opportunistic Conservation at M2W sites leads to a debate about whether the cleanup of Rocky Flats was a “cynical move to cover the tracks of military negligence” or a “genuine and creative effort to achieve conservation successes.”[133] Yet Havlick’s question, while correctly introducing an important dilemma, falls short. First, it does not recognize the fact that a genuine conservation success might simultaneously result in the obfuscation of military negligence. Furthermore, it ignores that this obfuscation may be unintentional rather than motivated, cynically or otherwise. While this distinction does not disentangle the military and environmental layers at Rocky Flats or other M2W sites, it does shift the question in an important way. Instead of asking *whether* closed military sites should be converted into wildlife areas, the question ought to be *how* these transformations should take place under the pressures of political strategy, shifting scientific understanding, and a concerned public.

[133] Havlick, Opportunistic Conservation. 2014

Conclusion

Near the end of the Rocky Flats cleanup, when its conversion into a wildlife refuge was imminent, *The Denver Post* published an article arguing that "the successful closure of Rocky Flats near Boulder [had become] a model for how to clean up" the thirty-two other defunct nuclear defense sites that the Department of Energy (DOE) had to manage across the United States. These DOE facilities, like the Hanford site in Washington, the Pantex site in Texas, and the Los Alamos laboratories in New Mexico, each faced their own unique collection of challenges. Although the closure of Rocky Flats was successful, *The Denver Post* cautioned that "mopping up the Cold War's legacy" must be a "bipartisan priority" and that it was "Colorado's turn to help other states ensure that the remaining cleanups don't vanish from the political radar."[134]

The same year, a different Denver Post article written by Len Ackland, author of the preeminent history of Rocky Flats *Making A Real Killing*, had other thoughts about "mopping up the Cold War's legacy." In the article titled "The other cleanup at Rocky Flats: We're burying its significance," Ackland argued that "the physical cleanup of Rocky Flats is being accompanied by the obfuscation of its most important tangible legacy." While Ackland acknowledged the cleanup as an "impressive feat to watch," he feared the historical significance of Rocky Flats as a key component in the proliferation of nuclear weapons would be lost. As he lamented the lack of funding for a Rocky Flats Cold War museum, Ackland called for "a cleanup of [Rocky Flatss] mess

[134] The Denver Post. "Rocky Flats cleanup a model first step The federal government must clean 32 nuclear defense sites. The successful effort at the Flats could be a template, but some projects will be tougher.." Denver Post, The (CO), December 18, 2005: E-06. NewsBank: Access World News.

without a coverup of its past."[135]

While the first Denver Post article fixated on the physical cleanup at Rocky Flats, Ackland's focused on the cultural and historical meaning of the site. The divide between these two perspectives characterizes the stakes of the Rocky Flats cleanup and the stakes of similar military-to-wildlife (M2W) conversions. This dual significance of Rocky Flats situates it as a quintessential example of a Layered Landscape, a geography made important by both its cultural and natural elements.[136] In examining the cleanup of Rocky Flats through a historical lens, this thesis has demonstrated how these elements can interact and often conflict with each other across time.

From 1996 until 2001, the fate of Rocky Flats was put into question. While its environmental value (e.g., its natural elements) made a wildlife conversion an alluring goal for Colorado politicians, its controversial nuclear history and the mistrust over the DOE's concern for public safety (e.g., its cultural elements) split public opinion about the site. The ensuing debate left both sides questioning the other's sincerity. Although the Rocky Flats National Wildlife Refuge Act of 2001 was successfully passed, it did little to resolve the atmosphere of suspicion surrounding the site.

From 2001 until 2007, when the bulk of the planned cleanup was executed, the disputed interpretations of Rocky Flats continued to resurface. While political debates like the battle over the national distribution of nuclear waste continued, new arguments over the management of Rocky Flats as a wildlife refuge emerged. Shifting scientific understanding of radioactive

[135] Ackland, Len. "The other cleanup at Rocky Flats We're burying its significance." Denver Post, The (CO), August 7, 2005: E-01. NewsBank: Access World News.
[136] Hourdequin & Havlick. *Restoring Layered Landscapes*. 2016.

contamination and a continuously concerned public sparked mistrust over the agencies in charge of the cleanup. Fierce debates about safety standards and public access to the future wildlife refuge escalated, and, for many, the completion of the cleanup, rather than settling these debates, only raised new questions, including, as the two Denver Post articles demonstrate, how the lessons learned during the Rocky Flats cleanup might be applied to other sites, and how Rocky Flats would be remembered following its conversion.

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Despite growing up in Denver, I only heard about Rocky Flats when, by chance, I came across a local news article about whether prairie dogs, relocated to the site, would dig up dangerous plutonium buried in the soil.[137] Curious about my local nuclear bomb factory, I read Kristen Iversen's damning memoir, *Full Body Burden: Growing up in the Nuclear Shadow of Rocky Flats*,[138] which, through Iversen's life story, reveals a controversial history: the mistreatment of workers at Rocky Flats, the nearly-catastrophic plutonium fires that could have rendered Denver a wasteland, the anti-nuclear protests in the 1970s and 1980s, the 1989 "Desert Glow" FBI raid on the site, and the 20-year class action lawsuit by Colorado landowners against the contractor in charge of operating Rocky Flats. Although Iversen's memoir is a highly personalized account, it

[137] FOX31. "New Documents about Plutonium Levels, Relocated Prairie Dogs Filed in Rocky Flats Case." 2019. *FOX31 Denver*. September 5, 2019. https://kdvr.com/news/local/new-documents-filed-in-rocky-flats-lawsuit-about-plutonium-levels-relocated-prairie-dogs/.

[138] Iversen, Kristen. *Full Body Burden,* 2013.

is also the most well know and widely read depiction of Rocky Flats. Near the end of her book, published in 2012, Iversen is clear about her disapproval of its status as a wildlife refuge. She bristles, "the land is not pristine. Some of the most hazardous materials known to mankind remain on the site," and criticizes a US Fish and Wildlife Service (FWS) spokesman who had said, "there is absolutely no reason to warn people about this place. The refuge is safe; it would only scare people."[139] To Iversen, the Rocky Flats National Wildlife Refuge is a dangerous disservice to the growing residential and commercial developments nearby. She considers it an example of "the same troubling pattern of government silence and misinformation" that beset other nuclear disasters like Chernobyl and Fukushima.[140]

In 2022, I decided to visit the refuge myself. After spending the morning mountain biking along the 16 miles of public trails open at the Rocky Flats, I stopped under a tree to eat lunch and looked out at the open prairie. Between me and the sheer face of the Flatiron mountains, about a 20-minute drive away, there appeared to be nothing except the summer wind and the shadows of the clouds above. In the distance, I could see a small herd of elk traveling across the plains. A western meadowlark sang to me as I ate. Despite the beauty of the site, Iversen's frustration was not surprising. Over twenty years after the Rocky Flats National Wildlife Refuge Act of 2001 had made provisions for a Rocky Flats Cold War museum, little had been accomplished towards its construction. The only public commemoration, it seemed, existed as a modest website seeking donations in hopes of one day establishing the museum. [141]Similarly, the FWS website's Rocky

[139] Iversen. 250-251

[140] Iversen. 258

[141] Rocky Flats Cold War Museum. Accessed March 24, 2023. http://www.rockyflatshistory.org/.

Flats home page still described the refuge with no reference to its past:

"Rocky Flats National Wildlife Refuge is a sanctuary away from the hustle and bustle of busy urban life where time moves at nature's pace. With its expansive views, wildlife viewing opportunities, and recreation activities, it's easy to take a nature escape!"[142]

While this historical oversight may seem, at best, myopic and, at worst, dishonest, it is also fully aligned with the FWS's mission to "conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people."[143] Whether it is conservation, preservation, or restoration, there seems to be a struggle to apply sustainability to both the environment and to history.

However, the lesson to draw from the narrative presented in this thesis is not that environmental benefits should be ignored for fear of cultural amnesia. Rather, the cleanup of Rocky Flats should be considered a case study that demonstrates the complicated connection between environmental concerns and historical ones. It might also serve as a guidepost for future attempts to ensure that the cultural legacy of these sites is preserved while also creating sustainable and thriving environments for future generations.

[142] FWS. "Rocky Flats National Wildlife Refuge." *FWS.gov*. Accessed March 24, 2023. https://www.fws.gov/refuge/rocky-flats.

[143] FWS. "Mission and Vision | U.S. Fish & Wildlife Service." *FWS.gov*. https://www.fws.gov/about/mission-and-vision.

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