

Plutonium at the Rocky Flats National Wildlife Refuge: Who is protected?
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The Rocky Flats National Wildlife Refuge came into existence in 2006 after completion of the Superfund cleanup at the nuclear weapons plant site. The Department of Energy transferred almost three-quarters of the roughly 10-square-mile Rocky Flats site to the U.S. Fish & Wildlife Service, the agency that would manage the Refuge. Recent additions to the Refuge bring its size to 9.75 square miles. The Refuge surrounds the former industrial area of slightly more than 2 square miles which has been retained by the DOE (Figure 1).

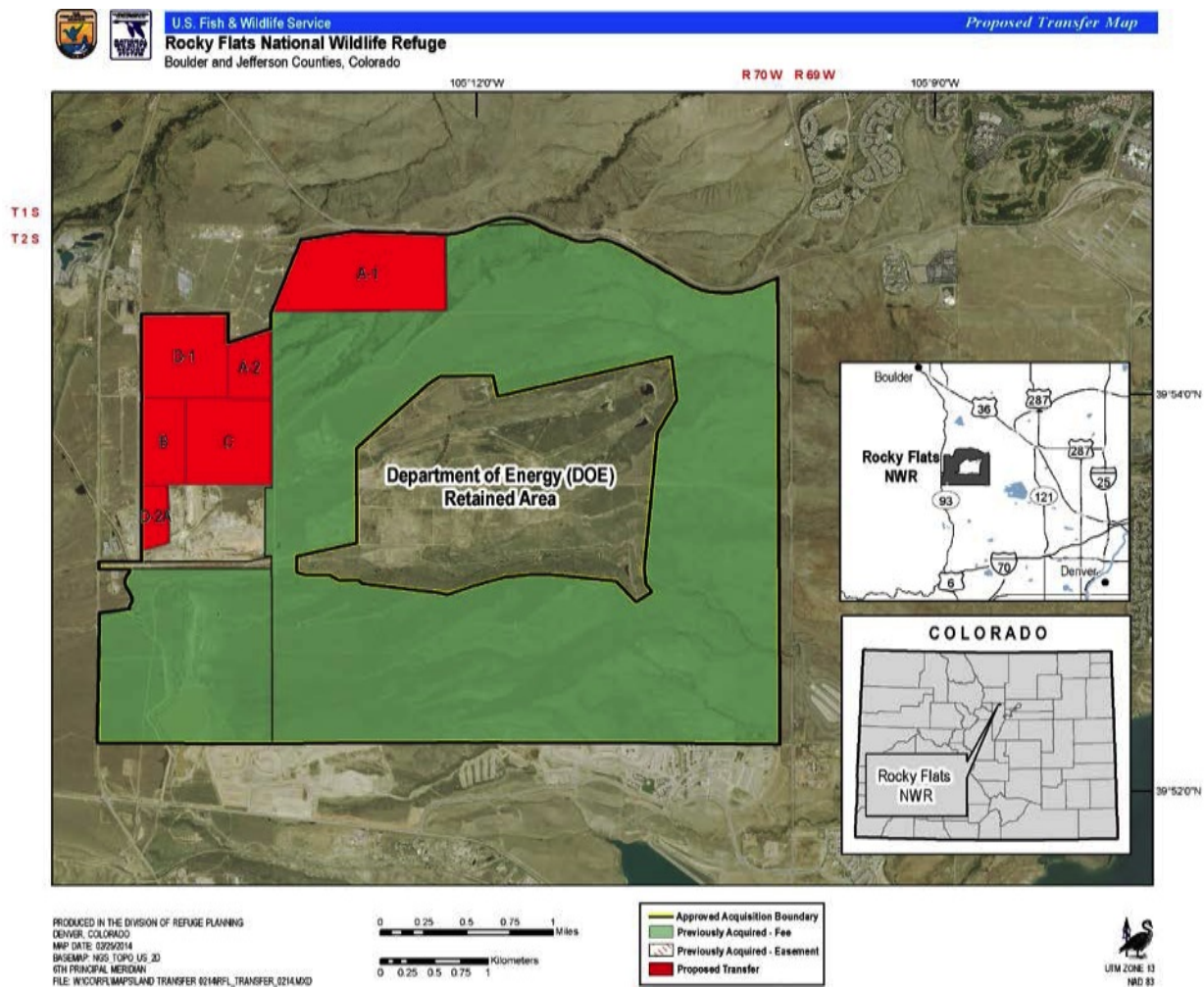


Figure 1: The Refuge in 2015 includes the green and red parcels on this map, an area of 9.75 square miles. The Refuge surrounds a plot of 1,309 acres (about 2.05 square miles) retained by the DOE. The DOE land remains on the Superfund list of contaminated sites. The Refuge was removed from the Superfund list when the cleanup was finished.

Today I will address one question about Rocky Flats: Who is protected by the Superfund cleanup completed in 2005? Stated differently, who did the government agencies responsible for the cleanup decide to protect? Did they pick the right person?

I invite you to consider *ten truths regarding the cleanup done at Rocky Flats*:

1. Of all the contaminants released into the environment from the Rocky Flats plant when it was operating, plutonium-239 is of greatest concern, because it is highly toxic, endangers human health and was repeatedly dusted across the whole site.¹
2. Those responsible for the cleanup knowingly left some plutonium-239 in the environment when the cleanup was finished.²
3. The plutonium left behind is in the form of particles too small to see.³

¹ Harvey Nichols, a specialist on airborne pollen, was hired by the federal government in 1974 to analyze airborne particles at Rocky Flats. He found that routine operations at the plant deposited “tens of billions of plutonium particles per acre” across the site and that the air monitors around the site were deficient and did not measure what was being released. Nichols, *Assessment of the Official Air Sampling Equipment at Rocky Flats during 1974 to 1976*, 2-18-12.

² Final revisions of the *Rocky Flats Cleanup Agreement* allowed the following amounts of plutonium to remain in soil after the cleanup (plutonium is measured in picocuries per gram of soil, abbreviated as pCi/g. A picocurie is a measure of radiation.

- Top 3 feet of soil: up to 50 pCi/g allowed to remain in soil.
- Soil 3 to 6 feet below the surface: 1,000 to 7,000 pCi/g allowed to remain, the amount dependent on the size of the contaminated area.
- Soil 6 or more feet below the surface: no limit on amount of plutonium that may remain in soil.

Cleanup of plutonium elsewhere was more protective, ranging from a low of 8 pCi/g at Fort Dix, NJ, to 40 pCi/g at Enewetak Atoll bomb test site, with 200 pCi/g at a small portion of Nevada Test Site, all without respect to depth. For another comparison, average background deposit of plutonium from global fallout locally is 0.04 pCi/g. The 50 pCi/g allowed in top 3 feet is 1,250 times 0.04 pCi/g; 1,000 to 7,000 pCi/g is 25,000 to 175,000 times 0.04 pCi/g.

Plutonium is not a part of natural background radiation. Natural background has been altered globally by the addition of fallout of plutonium and other radionuclides from the human activity of detonation of nuclear bombs.

4. Though plutonium particles may be too small to see they are not too small to do harm, especially if blown about by the winds common at Rocky Flats.
5. The worst way to be exposed to plutonium – and also the easiest way – is to inhale one or more of these tiny particles.
6. If you inhale plutonium or take it into your body through an open wound it is likely to lodge within your body; once this happens, the plutonium will constantly irradiate surrounding cells in a very small area for the rest of your life (Figure 2).

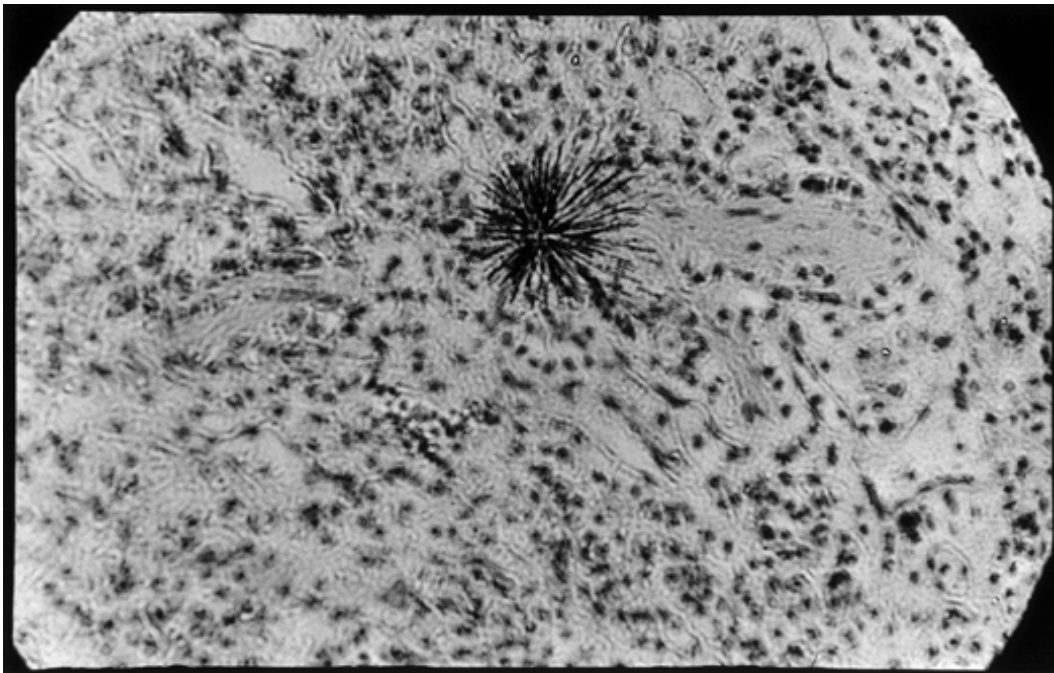


Figure 2: : Plutonium particle in lung tissue: “The black star in the middle of this picture shows the tracks made by alpha rays emitted from a particle of plutonium-239 in the lung tissue of an ape. The alpha rays do not travel very far, but once inside the body, they can penetrate more than 10,000 cells within their range. This set of alpha tracks (magnified 500 times) occurred over a 48-hour period.” Robert Del Tredici, *At Work in the Fields of the Bomb*, NY: Harper & Row, 1987, plate 39.

³ Meteorologist W. Gale Biggs found that the average size of plutonium particles released in routine operations at Rocky Flats was 0.045 microns. The average size of a human hair is 50 microns. Biggs, , *Airborne Emissions and Monitoring of Plutonium from Rocky Flats* (March 17, 2011).

7. This constant irradiation may in time lead to cancer, a compromised immune system or genetic harm to future generations.⁴
8. Taking only one particle of plutonium into your body may produce the bad health-effects just mentioned.⁵
9. Plutonium in soil does not stay in place; it migrates. From time to time tiny particles will be brought to the surface where they can be picked up by the wind.⁶
10. Plutonium-239 in the environment is not a temporary problem, because it remains radioactive for a quarter-million years, or roughly 20 times the 12,000 years of recorded human history. Rocky Flats, thus, is a local hazard forever.

If you have lived in the area for several years and have been paying attention, you already know some or all of these truths. If so, you didn't learn them not from federal and state agencies responsible for Rocky Flats. You learned from people who, like yourself, were paying attention. If, on the other hand, these truths are new to you, it's not too late to join those paying attention.

⁴ Herman J. Muller received the Nobel Prize in 1946 for showing that radiation produced genetic mutations. He later revealed that exposure to a very low level of radiation will eventually harm and prove lethal to future generations. This could result in extinction of the human species. See <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1254569/?page=9>

⁵ Tom K. Hei and colleagues at Columbia University demonstrated that a single plutonium alpha particle induces mutations in mammal cells. Cells receiving very low doses were more likely to be damaged than destroyed. Replication of these damaged cells constitutes genetic harm, and more such harm per unit dose occurs at very low doses than would occur with higher dose exposures. "These data provide direct evidence that a single alpha particle traversing a nucleus will have a high probability of resulting in a mutation and highlight the need for radiation protection at low doses." *Proceedings of the National Academy of Sciences*, vol. 94, April 1997, pp. 3765-3770.

⁶ In 1995 environmental engineer Iggy Litaor discovered rapid migration of plutonium in subsurface soil at Rocky Flats. In 1996 ecologist Shawn Smallwood identified 18 species of burrowing animals on the Rocky Flats site that dig down to as much as 16 feet and can bring soil and their contents, including plutonium, to the surface. For full discussion, see Moore, "Science compromised in the cleanup of Rocky Flats." On line at http://media.wix.com/ugd/cff93e_1ae76276c5814bf8aa21dc530da95857.pdf

As for personnel at the government agencies responsible for Rocky Flats, most of them say and do what others in the government strata say and do. If they want to keep their jobs, they have to go with the flow. They can't go against the current. Collectively, they're out of touch with reality.

A crucial example of their lack of realism is how they handled the Superfund cleanup. Superfund is a federal program to ensure that contaminated industrial sites are not simply abandoned when a plant is shut down but are cleaned up. When production ended at Rocky Flats, the site was regarded as one of the most contaminated in the country. Superfund requires that the cleanup of a given site protect future people from exposure to toxins that remain in the environment.

To do this, those responsible for a cleanup must identify the "reasonably maximally exposed individual." The idea is that if you know who can reasonably be expected to be the most exposed individual at a site and the cleanup protects this person, others who would receive less exposure will be protected. At Rocky Flats, those responsible for the cleanup – DOE, EPA and CDPHE – together decided that the "maximally exposed individual" would be a **wildlife refuge worker**, a person who works outdoors at the site for 20 hours a week for 30 years.

U.S. Fish & Wildlife Service, which manages the Rocky Flats National Wildlife Refuge, intends eventually to open the Refuge for public recreation. Allowing public access would very likely mean radiation exposure to wholly innocent people. The agencies responsible for the cleanup regard this as an acceptable risk, since the occasional visitor to the Refuge would be at the site only a fraction of the time spent there by the wildlife refuge worker. In theory, if the refuge worker would be protected, anyone who simply visits the refuge would also be protected.

The refuge worker scenario also had an economic aspect. Cleaning the site to protect a wildlife refuge worker would cost far less than cleaning it to protect, for example, someone living on the site. Turning most of the site into a wildlife refuge and protecting a wildlife refuge worker, thus, became the operating rationale for a quicker and cheaper Rocky Flats cleanup.

But cleaning the site to protect a wildlife refuge worker was unrealistic. It failed to take into account the toxicity and long half-life of the plutonium-239 left in the environment. When the Refuge is gone, when fences fall and memories fade and people move onto the site, who will be protected? Steve Gunderson of CDPHE said in a public meeting that the Rocky Flats cleanup was meant to take care of things for 200 years. But deciding to use

the wildlife-refuge-worker scenario to establish the site's legally binding cleanup standards in effect consigns some people to a slow and untimely death. This is a crime against humanity for which there is no statute of limitation. If Superfund law literally requires protection of the "maximally exposed individual," shouldn't the legality of the Rocky Flats decision be challenged in court?

An alternative was proposed. In 2001 the Rocky Mountain Peace and Justice Center and the Institute for Energy and Environmental Research proposed a cleanup that would protect a farming family that lives on what is now the Rocky Flats site from birth to death, generation after generation, eats only food grown there and drinks local water. This proposal was realistic about the future, but it was rejected by the powers that be. They favored the cheaper, quicker, shortsighted cleanup that left us with a permanent danger.

What should be done? The Rocky Flats Nuclear Guardianship came into being to deal with questions like this. Some day perhaps the cleanup can be redone. But for now, the most straightforward move is to keep the Rocky Flats site closed to the public. We plan soon to ask Congress to enact legislation that will keep all DOE nuclear weapons production sites that undergo Superfund cleanup closed to the public for at least 250 years after completion of the cleanup. This would save some from being exposed to radiation. And it would provide time for all of us to find better solutions to the problem of plutonium in the environment. In the words of Terry Tempest Williams, "The eyes of the future are looking back at us, and they are praying for us to see beyond our own time."