

Rock Creek gate  
(in progress, closed)

Oct 22 2024  
0.149 microSv/hr avg

Northeast  
main entrance

Rock Creek bridge  
(under construction)

Walnut  
Creek loop

Apr 23 2019  
0.143 microSv/hr avg

Lindsay  
Ranch loop

GREENWAY



November 2024

Eastern entrance  
(Indiana St bridge)

GREENWAY

Woman Creek bridge  
(under construction)

20 Oct 2024  
0.160 microSv/hr avg

Old main trail

GREENWAY

GREENWAY

3 Nov 2024  
0.154 microSv/hr avg

Caprock  
Mine trail

24 Oct 2024  
0.152 microSv/hr avg

South Woman  
Creek trail

18 Apr 2018  
0.141 microSv/hr avg

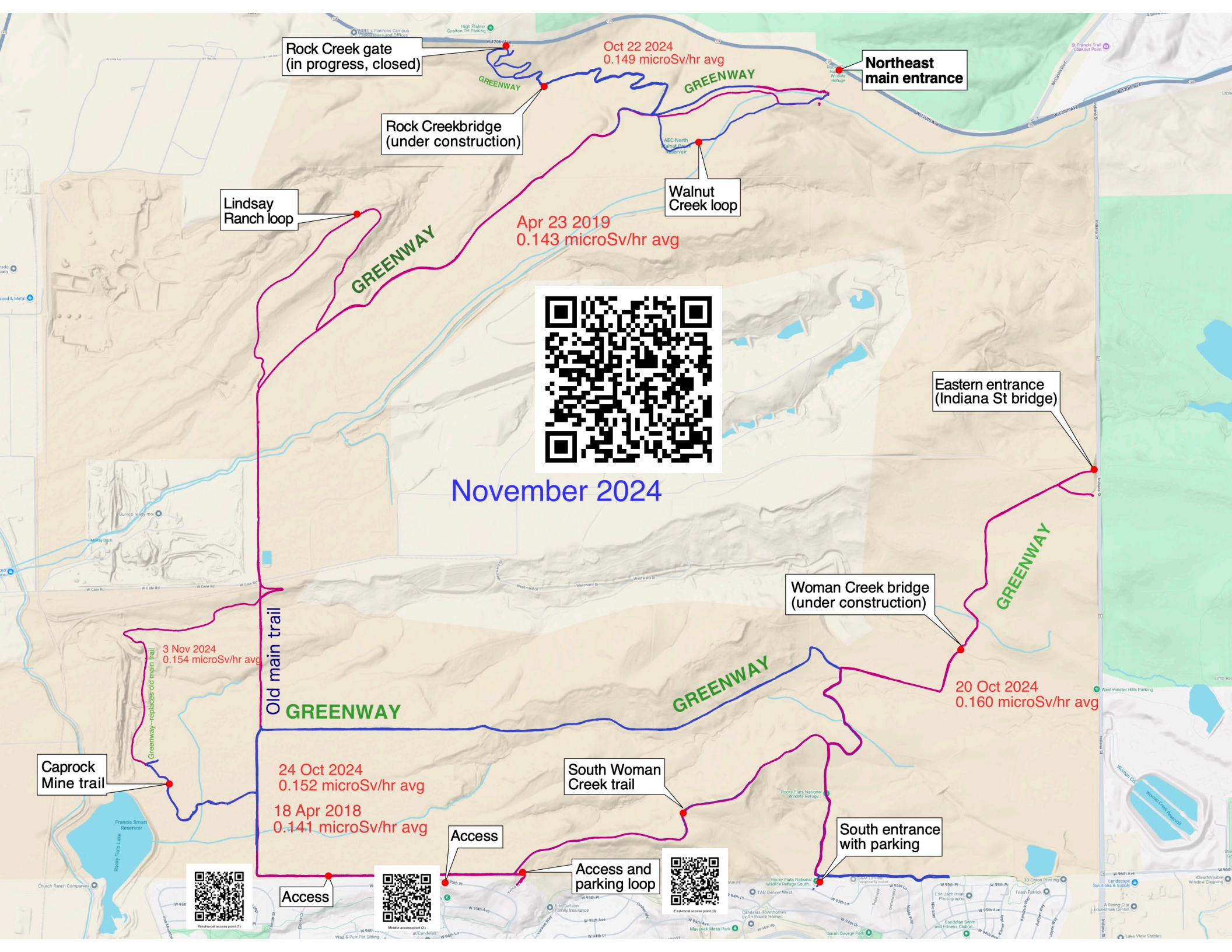
Access

Access and  
parking loop

South entrance  
with parking



Access





No one using the Refuge or the Rocky Mountain Greenway should have any hesitation because of its history, despite what you'll see on social media or anti-nuclear websites. Three questions will help you identify conspiracy theories and misinformation. Ask Refuge opponents:

1. **How much does plutonium contribute to total soil radioactivity as a percent?** [Answer (from NIST): about 0.8%, less than the fallout isotope <sup>137</sup>Cs. In terms of alpha particle activity: about 0.6%.]
2. **What is the radiation dose from plutonium in comparison to background radiation?** [Answer: inhaled and swallowed dirt near the east entrance about 1.4 μSv per year if you lived outside 24/7. Measured background levels give about 1,230 μSv/year. (See the 'ambient dose equivalent rate' [ADER], hourly dose rates in red on the Refuge map.) Total annual dose (with unmitigated radon) living near the east entrance would be about 17,200 μSv/year.]
3. **Can you cite a post-1981 scientific journal article which supports claims the Refuge poses any danger?** [Answer: No. Articles in 1981 claimed elevated cancer rates downwind of Rocky Flats. These claims were disproved the same year and 7 later journal articles found (i) no excess cancers and (ii) cancers found were uncorrelated with distance from Rocky Flats. Continued monitoring by the Colorado Department of Public Health and Environment confirm no excess cancers downwind.]

If they can't or don't answer these, you shouldn't believe them. A checklist for pseudo-science is [here](#). Want to know more, see the details, and see what the peer-reviewed scientific literature says about Rocky Flats? Visit [rockyflatsneighbors.org](#).

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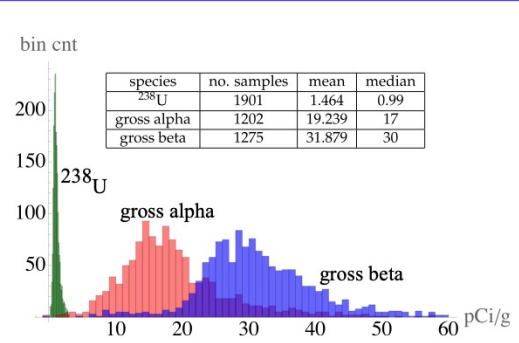
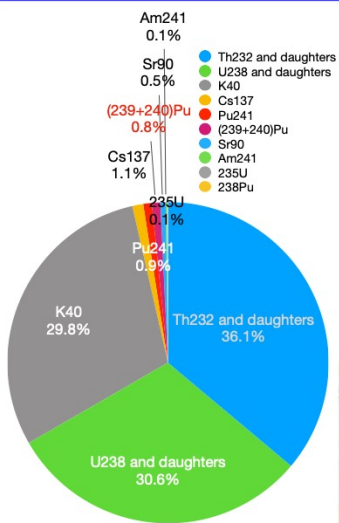


website



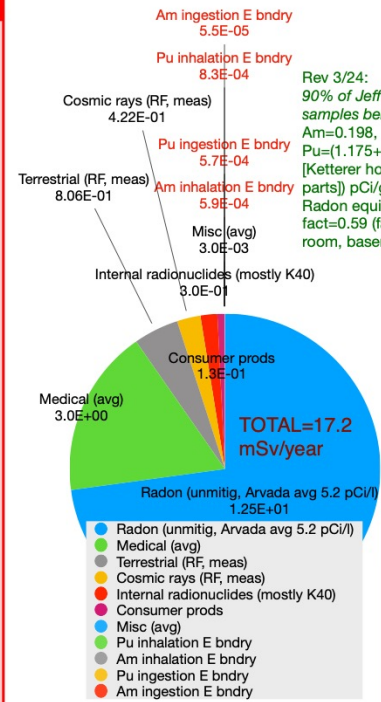
flyer/bibliography

- The International Commission on Radiological Protection [ICRP, founded 1928] consists of experts from around the world. Essentially all radiation regulations in all countries stem ultimately from ICRP findings, published and updated frequently. The EPA, DOE, and other agencies all rely on carefully vetted ICRP 'dose coefficients' which relate measured radioactivity to radiation dose. These reflect the mode of exposure (inhalation, swallowing, or whole-body exposure from gamma rays), including very extensive biokinetic information. These always include a safety margin and are available for a very large number of radioactive compounds of different chemical forms. Rocky Flats worker data (graphic shown) directly impacted ICRP guidelines.
- The ICRP also maintains risk coefficients based on the total impact of radiation exposure, often in the form of lifetime (70-year) risk of developing cancer. These are based on often revised epidemiological studies, e.g., the INWORKS study (10.7 million person-years of followup among nuclear workers in multiple countries).
- ICRP Publication 150 is *Cancer risk from exposure to plutonium and uranium* was published in 2021.

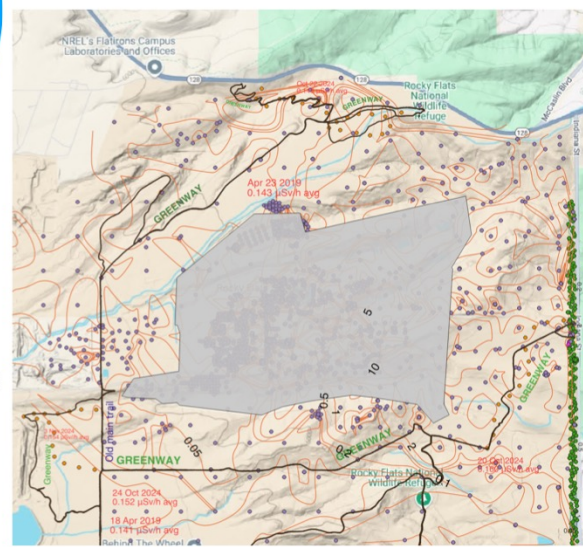


**Soil plutonium and radiation**

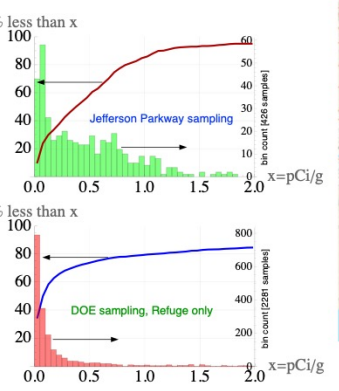
- Radiation levels on Rocky Flats are as expected for the Front Range (since Pu accounts for 0.8% of total soil radioactivity [NIST]). The natural radioisotopes <sup>40</sup>K (half life 1.3 billion years), <sup>238</sup>U (half life 4.5 billion years), and <sup>232</sup>Th (half life 14.2 billion years) and their 'decay daughters' account for almost all of the rest. NIST measurements: there is more fallout isotope <sup>137</sup>Cs from the '60s and '70s than Pu in Rocky Flats soil.
- Pu is very similar to natural radioisotopes but emits very few gamma rays, so only exposure route is inhalation and ingestion.
- Over the Refuge+COU, Pu contributes less than 0.6% of soil alpha radioactivity. Were excess cancers due to alpha radiation found downwind (they have not), the 'attributable fraction' due to natural alpha emitters would be 99.4%.
- The radiation dose from Pu (or Am) in Rocky Flats soil is **physically constrained by scarcity to be very small**.
- More than 80% of Jefferson Parkway samples on the eastern Refuge boundary and DOE samples showed less than 1 pCi/g, 50 times smaller than the negotiated cleanup standard. Total soil radioactivity from NIST-measured standard samples and daughters is about 53.5 pCi/g.
- Ketterer's measured hot particles (9 cases out of 348 samples) contribute not more than 0.5 pCi/g.



Rev 3/24:  
 90% of Jeff Pkwy samples below Am=0.198, Pu=(1.175+0.5 [Ketterer hot parts]) pCi/g Radon equilib fact=0.59 (family room, basement)



trails and very approximate contours of Pu concentration (pCi/g)



Spotting pseudo-science and conspiracy theories

- What are the hallmarks of misinformation and conspiracy theories? [Read the pseudo-science smell-o-meter [here](#)]
- No legitimate credentials to make claims
  - Claim that something's wrong with current standards
  - Claim their viewpoint is being suppressed by authorities
  - Reliance on long-discredited 'experts' [Carl Johnson (1981)]
  - Claims of incompleteness of information about nature. (No claim can ever be supported by lack of information.)
  - Attack the messenger, not the message.
  - Cherry-pick examples out of context.
  - Cite websites, social media, not peer-reviewed articles in recognized journals or using professional channels.

**Physics takeaways**

- The Refuge and Greenway are completely safe. Construction in the Refuge is safe too\*
- The DOE 'Central Operable Unit' is off-limits not because of radioactivity but because monitoring stations, water control and treatment facilities should not be disturbed by the public. Remaining high levels attached to buried foundations are clearly indicated on DOE maintenance maps\*

\* See information with bibliography [QR code above]