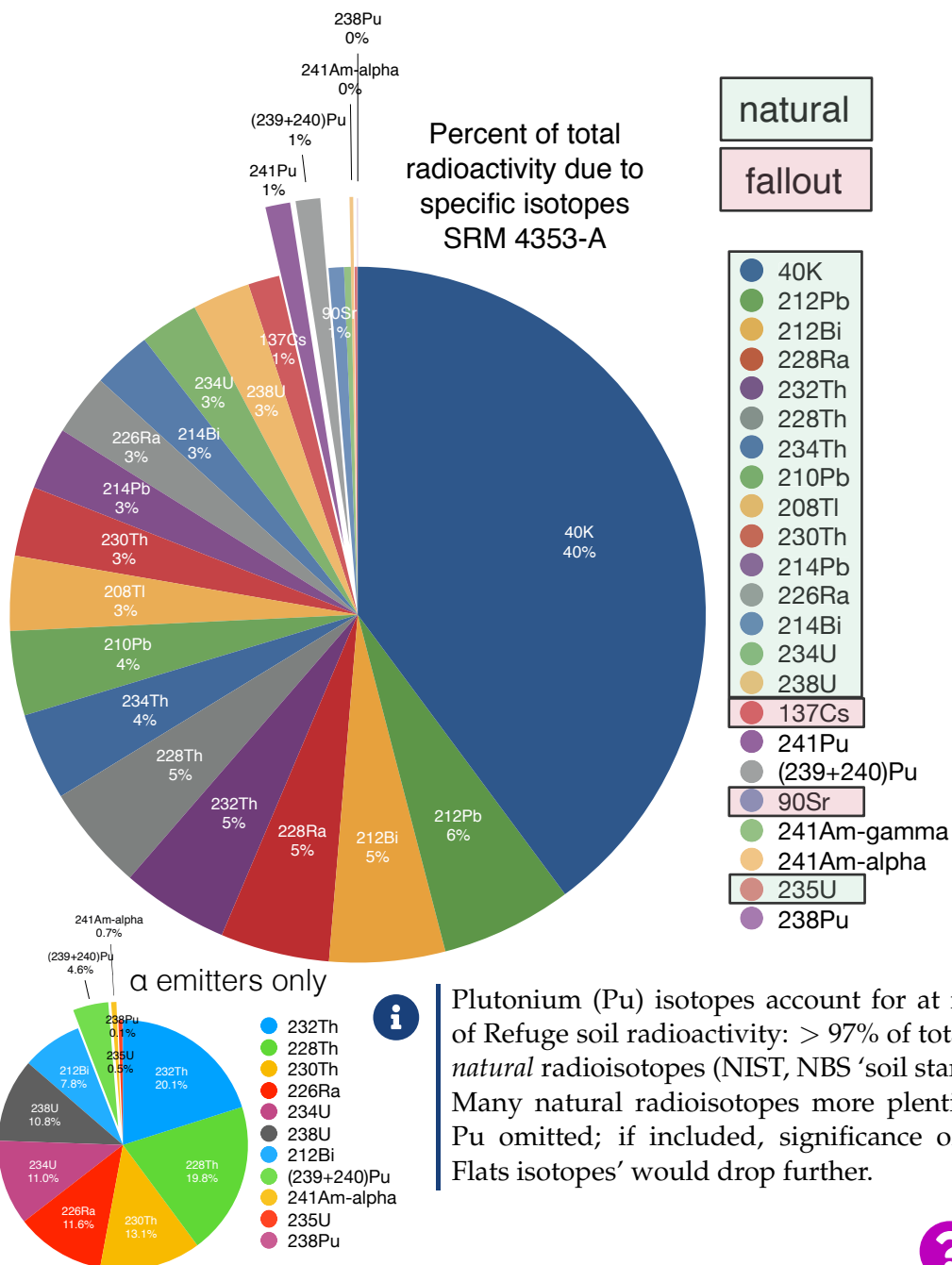
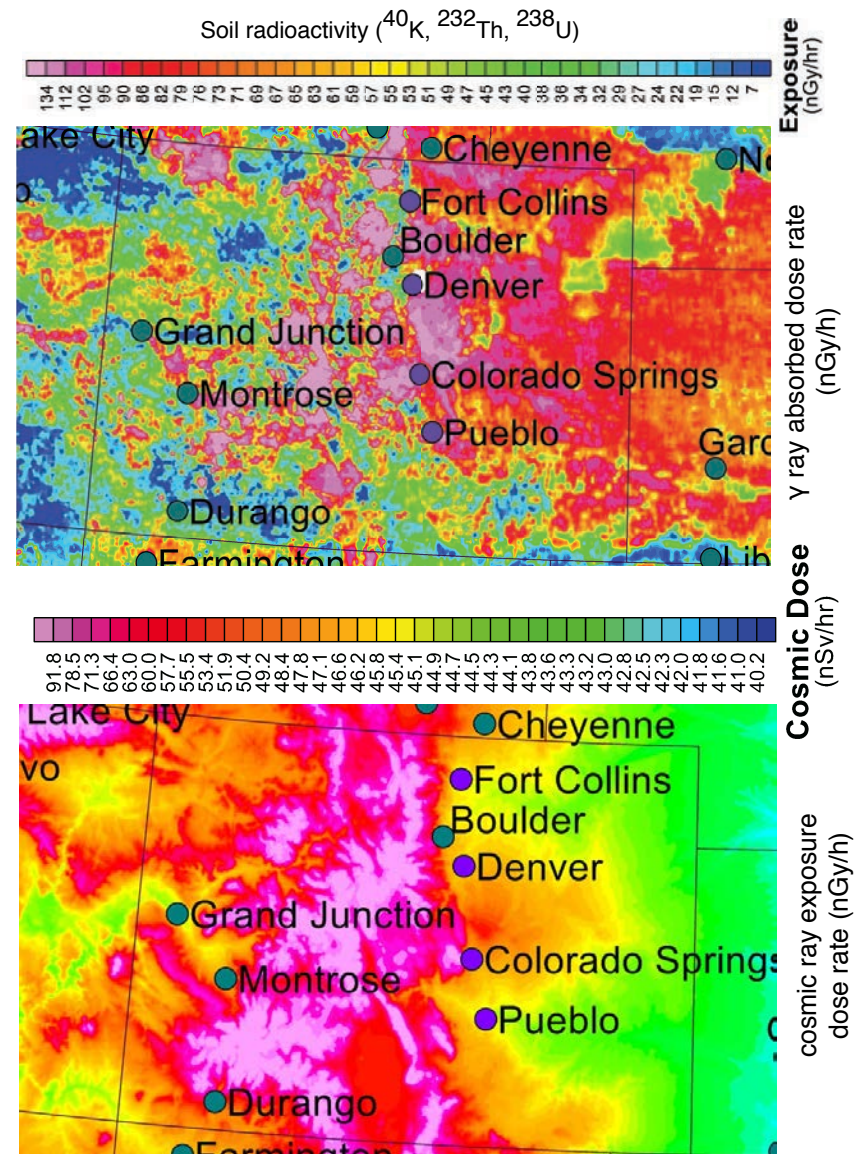


What's in Refuge soil? Ask NIST and the USGS! What are ambient radiation levels in the Refuge? Measure.



Plutonium (Pu) isotopes account for at most 2% of Refuge soil radioactivity: > 97% of total due to *natural* radioisotopes (NIST, NBS 'soil standards'.) Many natural radioisotopes more plentiful than Pu omitted; if included, significance of 'Rocky Flats isotopes' would drop further.



Cosmic rays

USGS data (online) compares hourly radiation dose due to natural soil radioisotopes and from cosmic rays—Colorado gets 'double whammy' because of altitude and lots of radioactive minerals



What do *direct measurements* in the Refuge show?



pancake tube

bGeigie Nano data logging, geo-tagging Geiger-Müller counter used



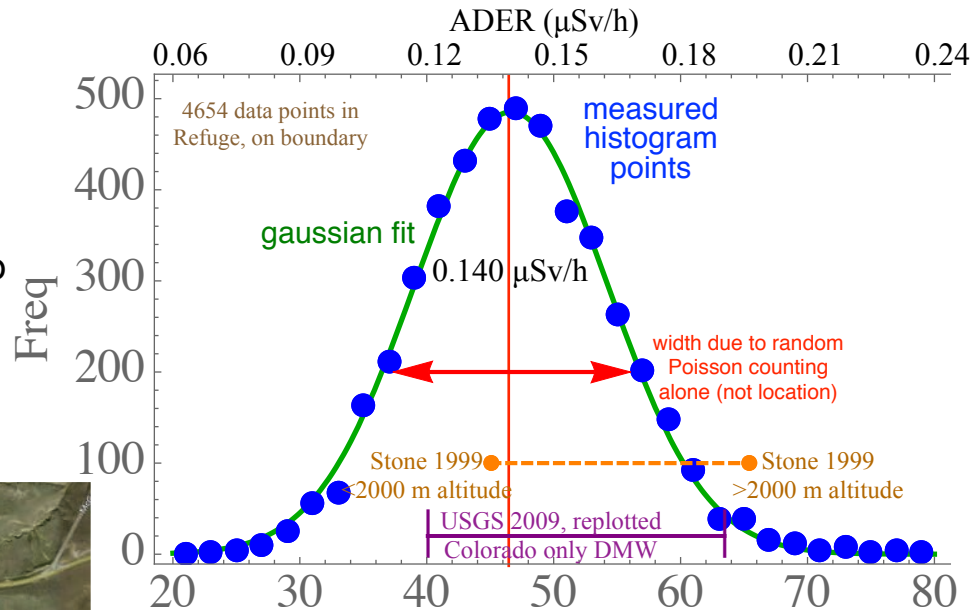
SAFECAST



SAFECAST map

non-governmental source of reliable measured global radiation info

Freq



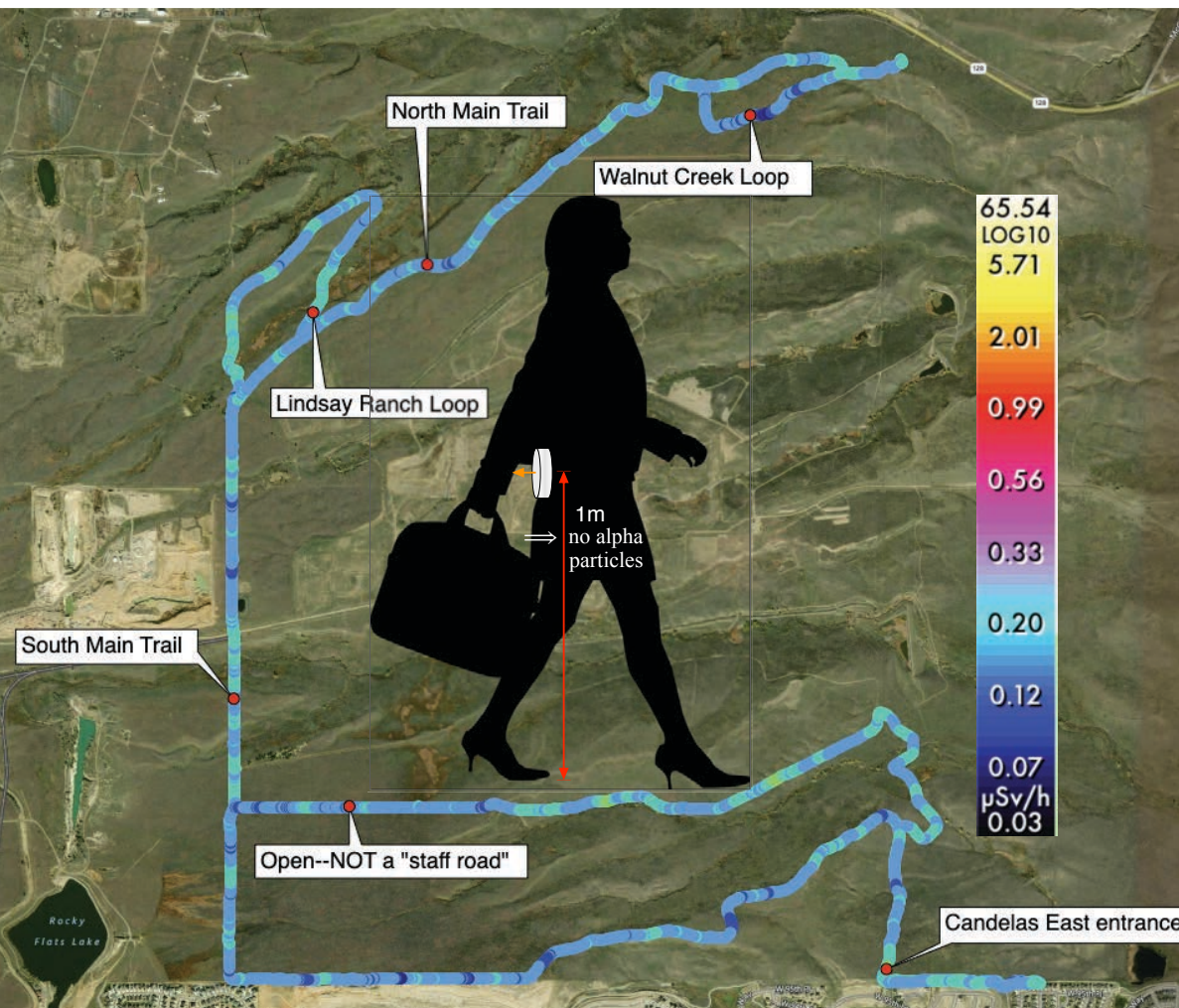
- Pu isotopes account for at most 2% of Refuge soil total radioactivity. Pu and Am no different radiologically than hundreds of other naturally-occurring radioisotopes.
- 'Ambient dose equivalent [radiation] rate', measured April 2019 on Refuge trails, is 0.140 microSieverts per hour; place to place variability < 2%.
- Values are *completely consistent* with ordinary background (soil + cosmic rays) radiation along Front Range. Also consistent with DOE and Colorado Department of Public Health and Environment data.

The Refuge is safe for all users.



Friends of Refuge web site

- Nour, S., Inn, K., Filliben, J., "Development of the NIST Rocky Flats Soil Standard", J. Radioanalytical and Nuclear Chem., 277 (1), pp. 161-168 (2008). [radionuclides in soil]
- U.S.G.S. open file report 2005-1413 (revised 2009). Maps for Colorado only redrawn by DMW from data from aerial γ -ray measurements of ^{40}K and decay daughters of ^{232}Th and ^{238}U [background radiation]
- Stone, J. M., Whicker, R. D., Ibrahim, S. A., Whicker, F. W., "Spatial variations in natural background radiation: absorbed dose rates in air in Colorado", Health Physics 76 (5), pp. 516-523 (1999).



Don't get your info from conspiracy theorists!

Ask for their data and references.

D.M.Wood, May 2019