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Isotopic Tracing of Lead Mobilization from Lead-Sheathed Telecom Cables into Urban Environments

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Widespread lead (Pb) exposure remains a critical public health challenge in urban environments. While leaded paint and legacy gasoline are well-documented sources, the geochemical impact of legacy lead-sheathed telecommunication cables—installed from the late 1800s to 1960s—remains largely unrecognized in environmental surveillance and risk assessment. This study investigates the mobility and fate of lead mobilized from these cables across two U.S. cities in Oregon—Portland and Corvallis—using elemental concentrations and high-precision lead isotopes.

Our high-resolution urban moss biomonitoring study in Portland identified significantly elevated lead concentrations in older residential neighborhoods, with the highest lead levels found in locations with lead cables, reaching up to 590 times rural background levels [1]. Similar lead levels have been found in Corvallis moss in locations with lead cables (geomean of 49.6 ppm, n=10), reaching up to 260 ppm and 560 times rural background levels (Fig. 1). Soil lead levels near lead cables in the two Oregon cities reach up to 554 ppm (geomean of 183 ppm, n=30), significantly higher than samples collected across-the-street (79.6 ppm, n=9) and the local urban background (18.2 ppm, n=23; Fig. 1). Notably, 93% and 50% of topsoil samples at lead cable sites exceeded the EPA's 100 and 200 ppm residential screening levels, respectively.

To establish a contemporary mobilization pathway, we analyzed rainwater near lead cables. Rainwater collected directly beneath cables yielded a mean lead concentration of 92.5 ppb, compared to background levels of <1 ppb, providing direct evidence of active mobilization (Fig. 1). Matching of the lead isotopic signatures of rainwater, soils, and moss near lead cables provides evidence for source.

These findings demonstrate that legacy infrastructure is a persistent, active source of environmental lead. By integrating isotopic tracing with rainwater and soil analysis, we establish a direct pathway from these lead cables to soils and dust that may be ingested or inhaled. This research highlights the need for targeted mitigation strategies to address overlooked outdoor lead sources such as lead cables in populated areas.

[1] Shiel, Jovan & Murphy (2024), *Commun Earth Environ* 5. https://doi.org/10.1038/s43247-024-01534-0

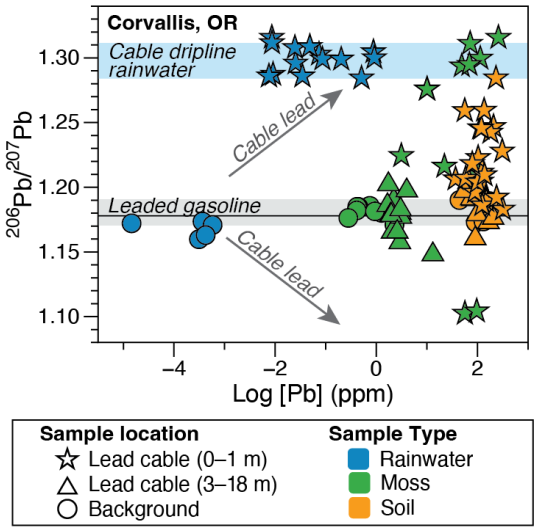


Fig. 1 Impact of lead cables on lead concentrations and isotope ratios for Corvallis rainwater, moss, and soil.