
Title: Geochemistry, Stratigraphy and Provenance of the Portland Hills Silt in the Tualatin Mountains, Portland, Oregon

Soil morphology and geochemistry of loess were investigated at nine sites in the Tualatin Mountains west of Portland and at additional sites in The Dalles, eastern Washington and Puget Sound. A total of forty samples were examined using Instrumental Neutron Activation Analysis (INAA).

Stratigraphic relationships and soil development suggest that the PHS ages of Lentz (1977) be revised. The age of the Portland Hills Silt (PHS) ranges from 12,000 to at least 960,000 years before present.

The geochemistry of the PHS supports the Lentz (1977) hypothesis of the PHS as a loess of continental origin. Thorium/scandium ratios in the PHS are in the continental range of 0.8 to 1.2 Th/Sc. This contrasts with the 0.2 to 0.5 Th/Sc ratio more typical of arc volcanics such as Boring Lava.

Soil properties and INAA data suggest that the 53rd Street PHS contains four episodes of loess deposition with
immature soil horizon development. Paleosol clay enrichment is typically less than 25% by weight and shows considerable randomness between paleosol and loess. Harden indices for paleosols ranged from 0.09 to 1.01, similar to the Holocene and late Pleistocene soils of Harden (1982). Large cation mobilization, particularly sodium, appears to be a good indicator of soil formation. Lack of similar eluviation of potassium and rubidium indicate that the 53rd Street paleosols are relatively immature.

The geochemical similarity between the PHS and deeper silty sediments on the West Hills previously described as Helvetia Formation by Schlicker and Deacon (1967) or "Sandy River Mudstone-equivalent" by L.R. Squier (1993) suggests that these sediments are an ancient PHS.

The 12,000 to 15,000-year-old surface soils (Birkeland, 1984) observed at Elm Street and 53rd Street suggest the likelihood that the uppermost one- to five-meter-thick loess may also incorporate sediment from Missoula Flood silts.