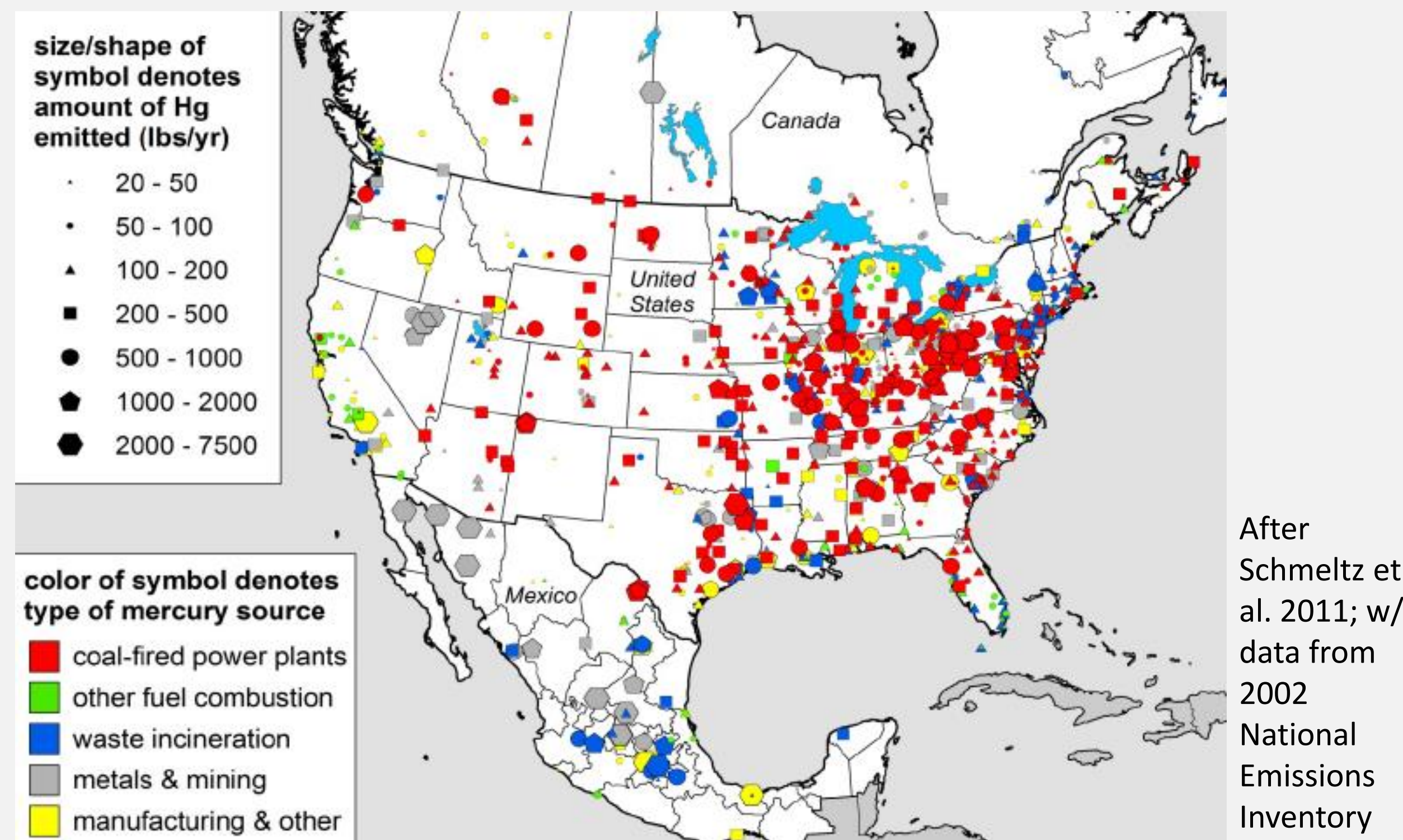


Mercury Accumulation in Soils of Depressional Wetlands in Central Pennsylvania

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Introduction

Atmospheric deposition of mercury (Hg) is a critical environmental stress that affects ecosystems and human health. Deposition originates from trans-boundary air pollution and can affect large geographic areas. Pennsylvania sits downwind of major atmospheric mercury emissions sources (see figure).



We focus specifically on seasonal wetlands, known as vernal pools. These unique features of the landscape are isolated from streams and rivers, and are characterized by a seasonally fluctuating water level – often drying out for part of the year. Vernal pools are recognized as important ecosystems because of the critical habitat they provide for amphibians. Given that vernal pools have large inputs of water via precipitation yet do not have any stream discharge outflow, they are likely spots within a forested landscape to accumulate pollutants that enter via wet atmospheric deposition.

Objectives

We are investigating the accumulation of mercury in seasonal wetland environments, in the first baseline study that we know of in the United States. We address the primary question of **how much mercury has accumulated in vernal pools of central Pennsylvania?** We aim to quantify:

- The magnitude of mercury concentrations vertically in each pool; *we expect soil heterogeneity to play a strong role.*
- The variation of mercury within the wetland (pool) versus the surrounding areas outside of the wetland (upland); *we expect more accumulation within the pools, owing to the hydrology.*
- The differences among wetland environments located in different physiographic provinces having different depositional inputs.
- The relationship of mercury to other elements of chemistry (e.g., carbon, nitrogen, trace metals); *can we predict mercury accumulation from measurements of other elements?*

Methods

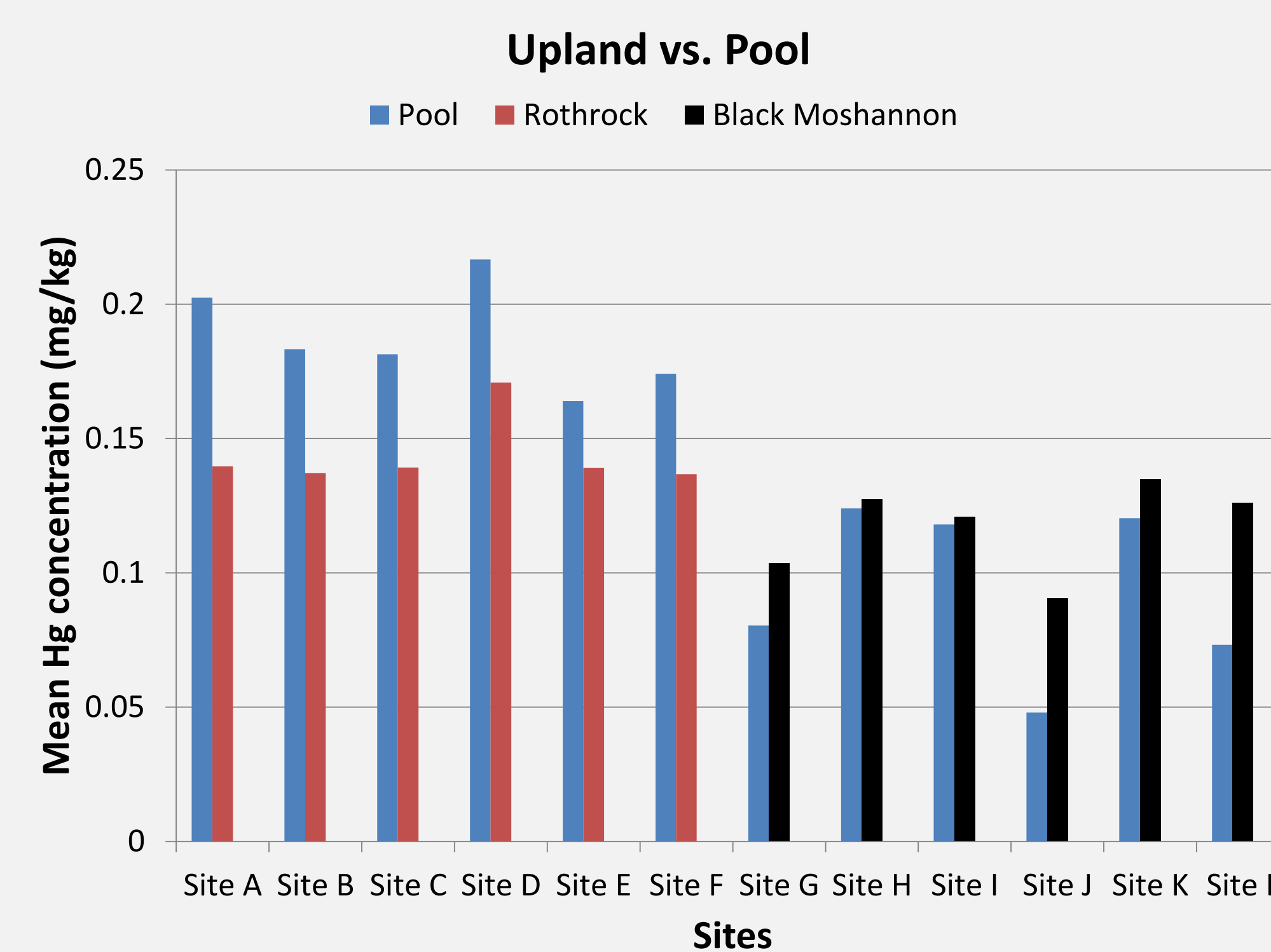
Sampling locations. 6 vernal pool sites were sampled within each the *Allegheny Plateau* and the *Ridge and Valley* physiographic provinces of Pennsylvania.



Soil sampling.

- At each sampling location, 16 holes were cored – 8 within the vernal pool and 8 in the surrounding uplands. The coring sites were established along transects originating at the center of the pool and radiating outward in 8 directions (N,NE,E,SE,etc.)
- At each hole, 4 (or 5) soil samples were collected from the O_i , O_e , O_a -A, and B horizons (and the E horizon if one existed, in the upland sites)
- Typical maximum sampling depth ranged from 20-50cm

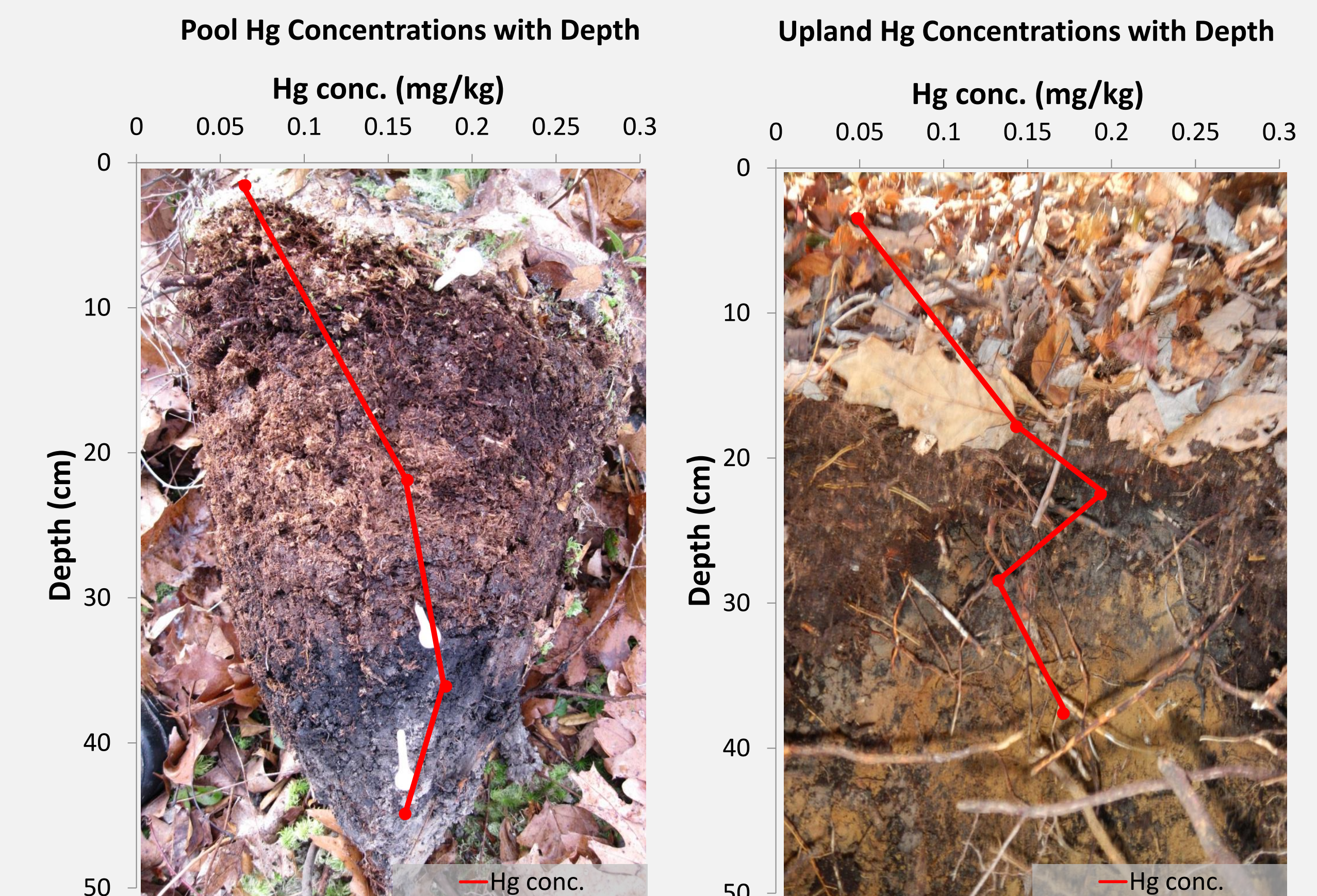
Results



- Analytical results show variability of Hg concentrations within the pool versus outside the pool
- The blue bars represent the mean soil total Hg concentration within a vernal pool while the red and black bars represent the mean soil total Hg concentration of the samples taken from the surrounding uplands
- Sites located in Rothrock State forest contain higher Hg levels within the vernal pool as compared to the surrounding forest. However, sites located in Black Moshannon do not follow this pattern

Results

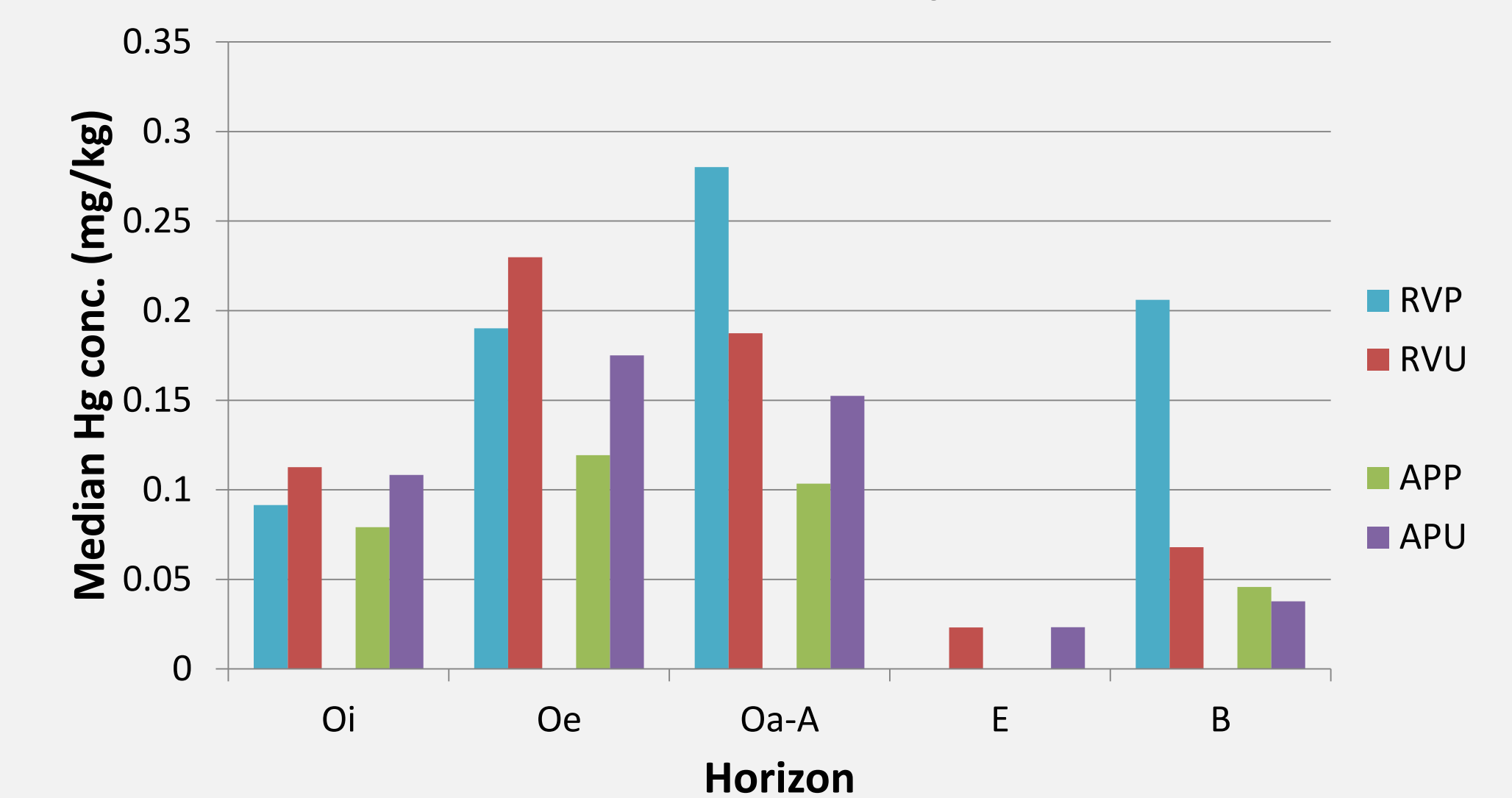
Depth Accumulation Patterns



Mercury content typically increases with soil depth in pool locations.

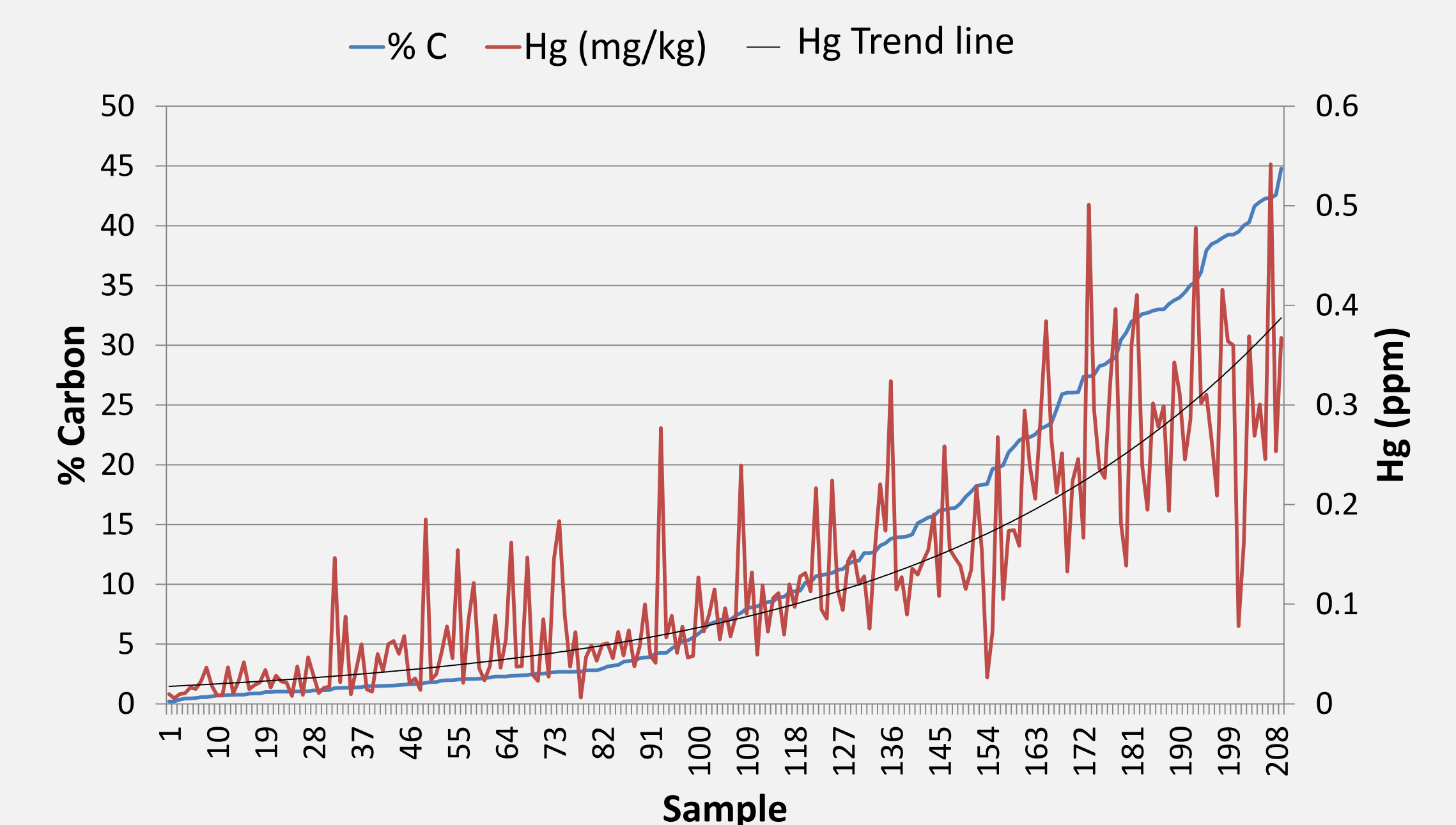
Mercury content typically increases then decreases with soil depth in upland locations.

Province Horizon Comparison



Results

Hg vs. Carbon



- This graphic shows the relationship between %carbon and Hg for all samples collected
- In addition to C, samples were analyzed for N, S, Fe, Pb, As, Ti, K, Cr, and Mn and compared to Hg concentrations