

Modeling frameworks for soil pH across the US

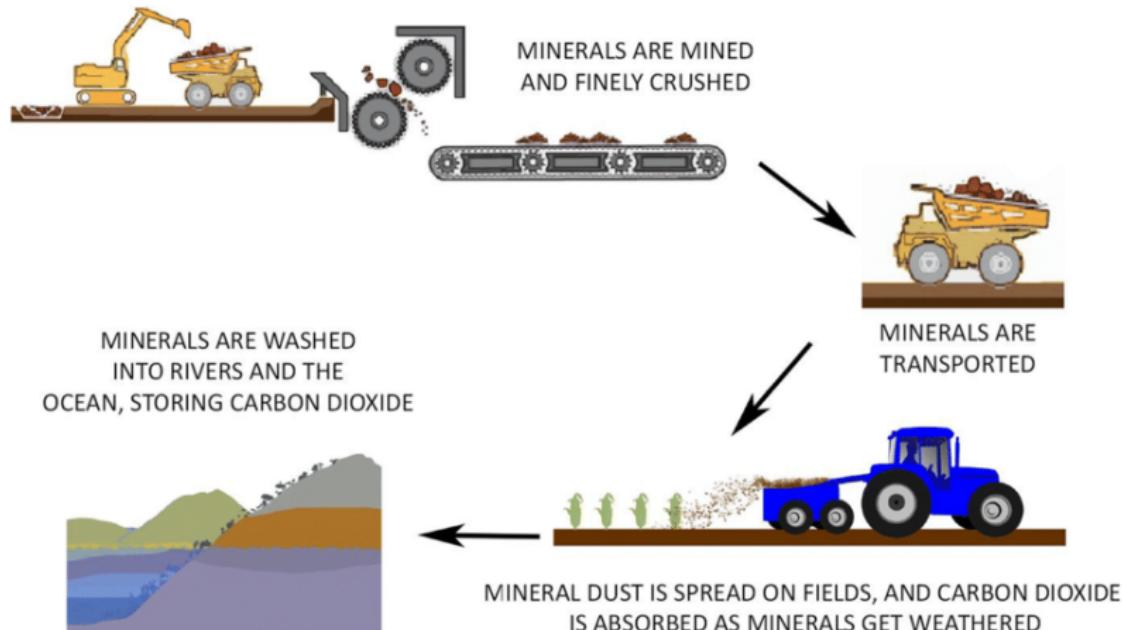
2024 EDF Intern Symposium

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Planavsky, Shuang Zhang
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Motivation

Enhanced rock weathering (ERW)



Building Models

National Cooperative Soil Survey (NCSS) Dataset

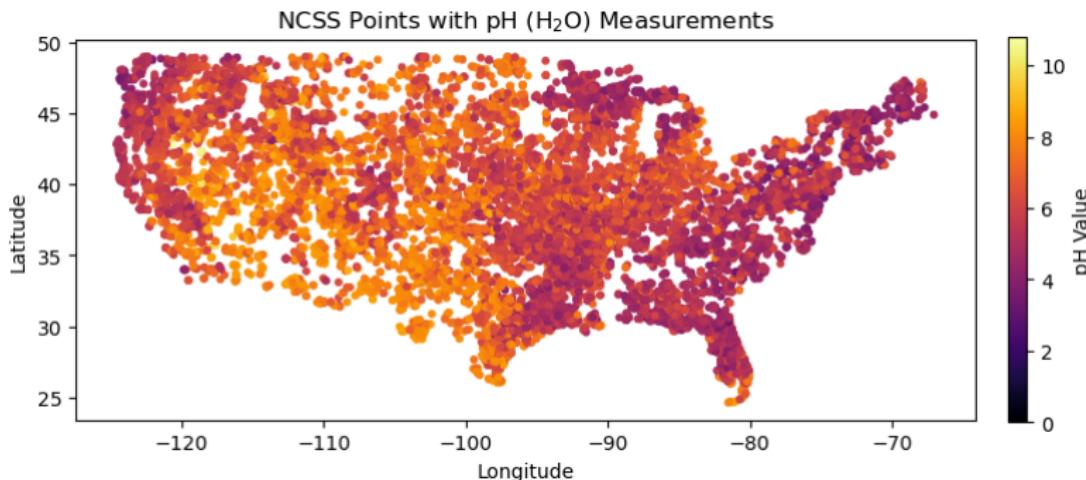


Figure: Refined NCSS dataset used to train our models; $n = 22,719$ points.

Building Models

Empirical Bayesian Kriging (EBK) Method

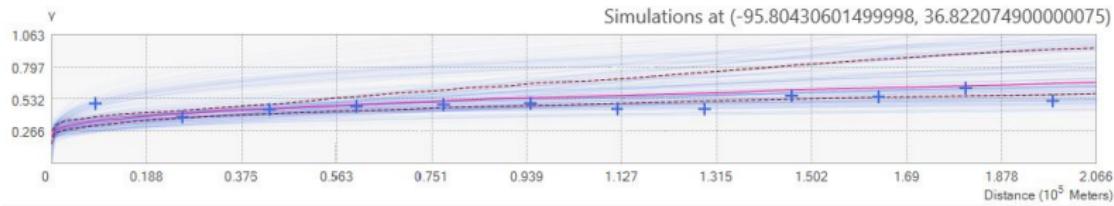


Figure: Semivariogram from EBK where the nugget ≈ 0.266 , range $\approx 0.2 \times 10^5$ meters, and sill ≈ 0.5 .

Building Models

Empirical Bayesian Kriging (EBK) Output

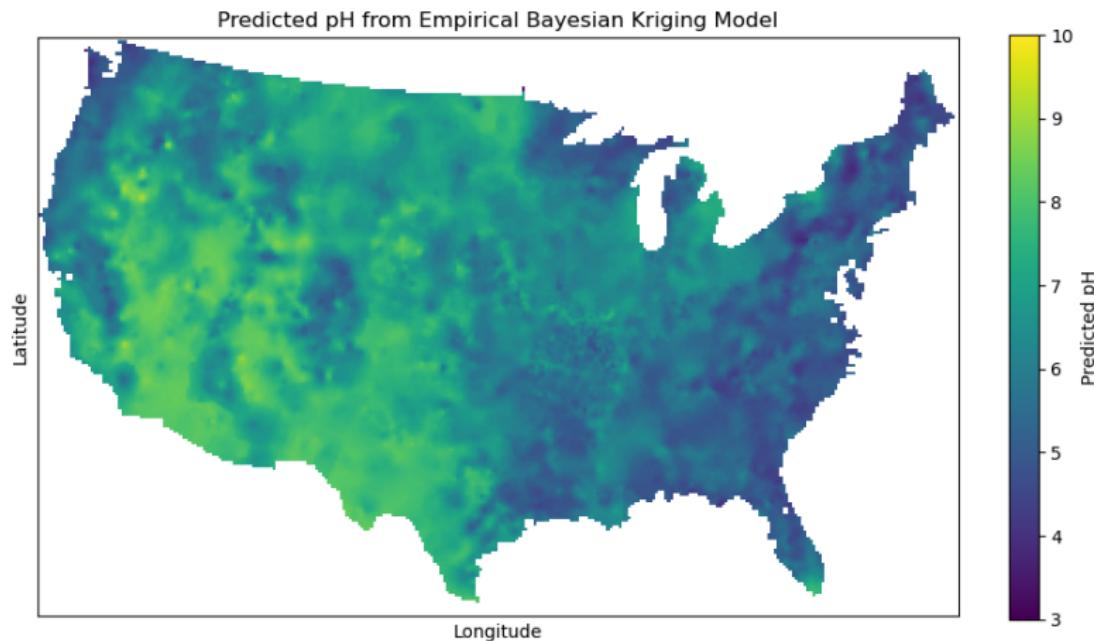


Figure: pH map from EBK model at 10 km resolution.

Building Models

Random Forest (RF) Method

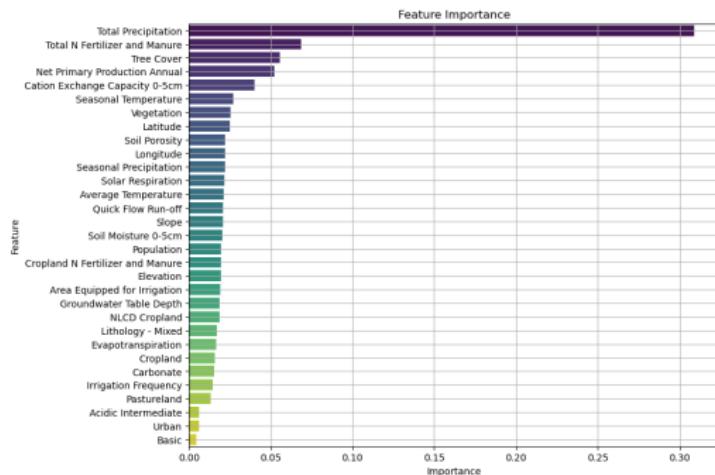
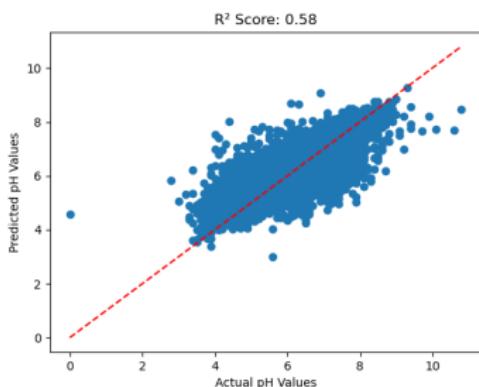
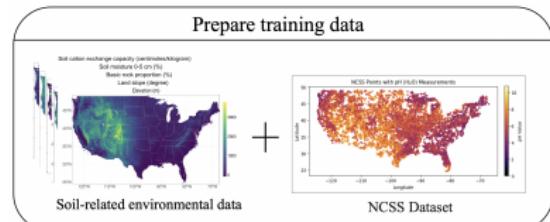


Figure: Feature importance for environmental rasters.

Building Models

Random Forest (RF) Output

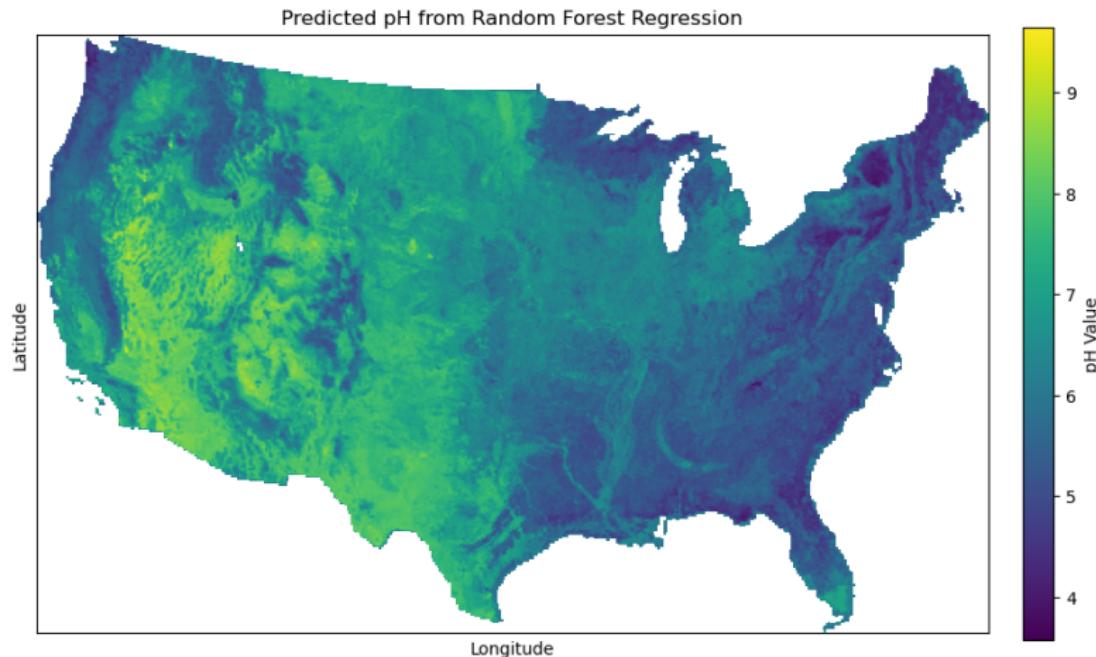


Figure: pH map from RF model at 10 km resolution.

Model Comparison

Across NCSS validation points

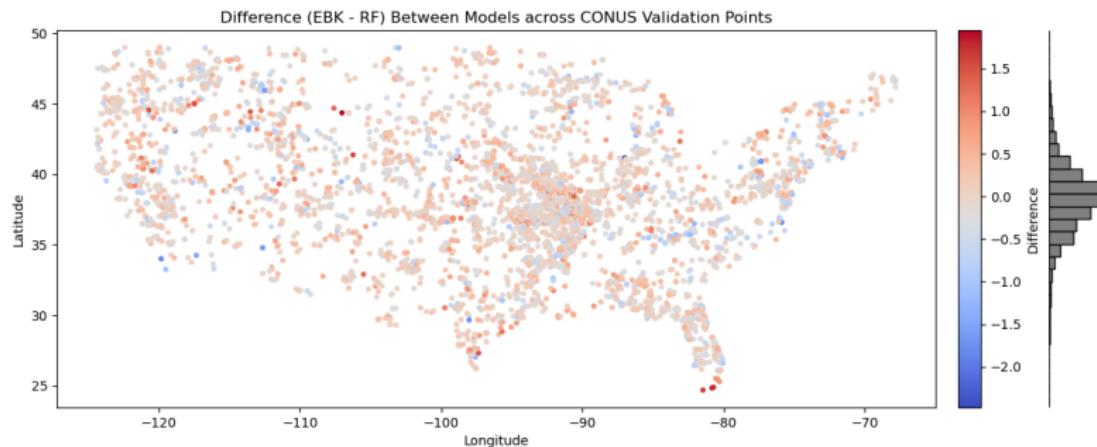


Figure: Difference map between model predictions on validation points; $n = 5866$.

Application

County-wide analysis

Percentage of Cropland Below Recommended pH (EBK, Avg. pH Rec)

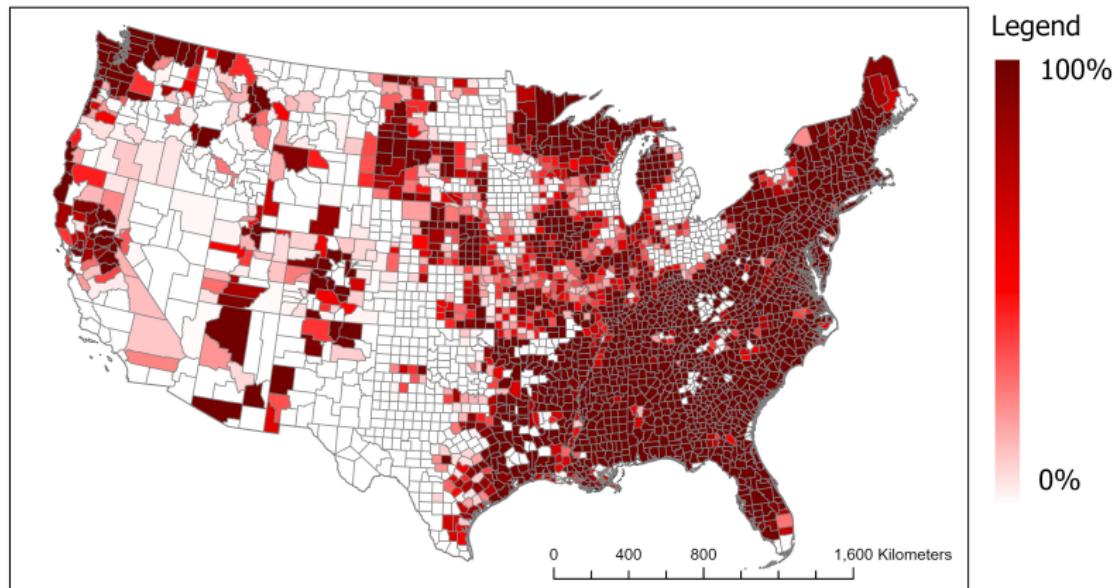


Figure: Cropland below pH has increased potential for ERW. We find 38% of acres to be below county recommendations.

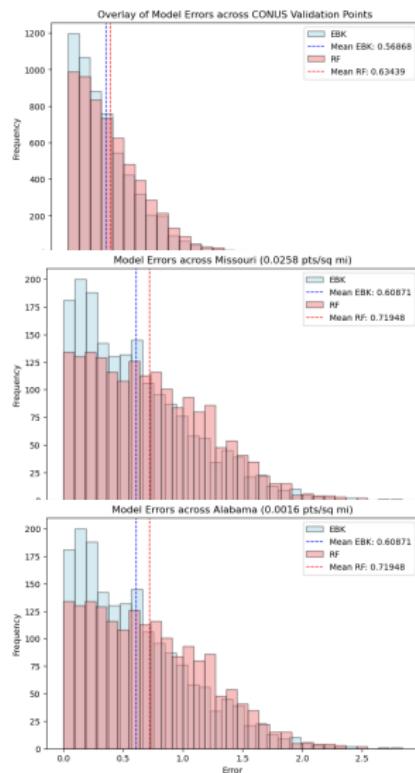
Thank you!
Questions?

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Model Comparison

At various scales and land types

Models at various scales



Models on various land types

