A System of Soil Analysis for Restoration

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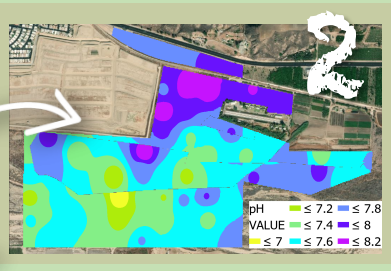
Introduction

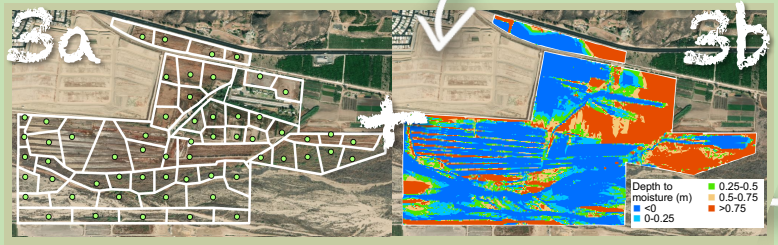
The Sespe Cienega, a site with potential for restoring an important groundwater dependent ecosystem on the Santa Clara River, has diverse soil conditions created by agricultural land use changes and flood history. Understanding these soil conditions is important for determining appropriate composition and placement of native plant species across the site.

Methods

At 60 sampling sites, three shallow cores were tested for bulk density, salinity, pH, and texture.



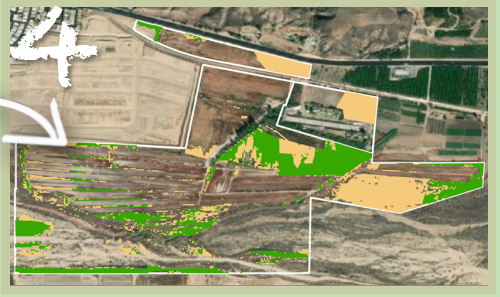
Maps for each soil property were created using IDW in ArcGIS Pro. Linear models were also created in R.



Theisen polygons around each sample site in were manipulated to follow geographic barriers (3a) and combined with a moisture availability map created from a shallow well array (3b) to identify appropriate areas for native species.

Results

Ideal conditions for California sagebrush shown in green, adequate conditions shown in orange.



Statistical Analysis Results

- Electrical conductivity (salinity), pH and % clay were all significantly related to distance from the channel ($p<0.0002$)
- Conductivity is best modeled using only % clay ($R^2=0.46$), while pH is best modeled using % clay and distance from the channel (adj. $R^2=0.35$)

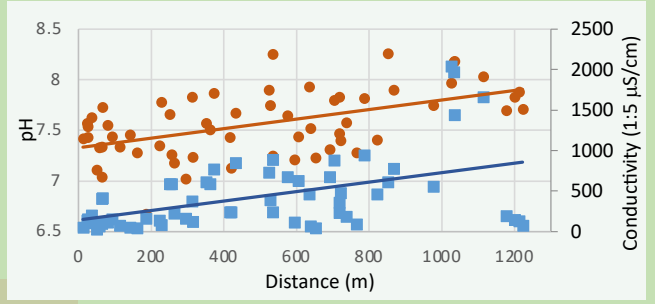


Figure 1. Distance from the river channel vs pH (orange) and conductivity (blue, measured in 1:5 ratio with DI water) for 60 soil samples

Link to Detailed Methods

Significance

This process of soil analysis provides a suitable model for future projects to employ in making informed restoration decisions based on local site conditions, thus improving restoration success.

References: USDA. *Soil Bulk Density*. Guides for educators, https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053260.pdf.