



Spatial Variation of Soil Characteristics in Upper Provo River Watershed

Andrew Luymes, Brigham Young University

Research Mentors: Dr. Greg Carling, BYU; Brian Packer, BYU; Colin Hale, BYU

Introduction

Nearly all of the water that enters the Provo River has had some interaction with soil. During precipitation and snowmelt events soil is flushed, mobilizing trace metals such as Mercury and Strontium. The chemical and physical properties of soil can have a significant impact on the mobility of these trace metals.

Objectives:

- Make an early effort to characterize the soil in the Upper Provo River Watershed.
- Through soil chemistry and physics, gain insight into areas of interest where further sampling should be conducted.



Methods

- Twenty sample sites were selected, including one lake for sediment samples.
- All samples were collected on the same day, and prepped for analysis in the BYU Environmental Analytical Lab.
- Soil tests included: Texture, Organic Matter (OM), pH, Nitrate, Electrical Conductivity (EC), Total C/Total N.



Results

- Tests showed that overall soil conditions were high in OM, and the dominant soil texture to be Loam.
- No significant differences were observed at different elevations.
- Early efforts to measure special variation in the soil will guide future testing.

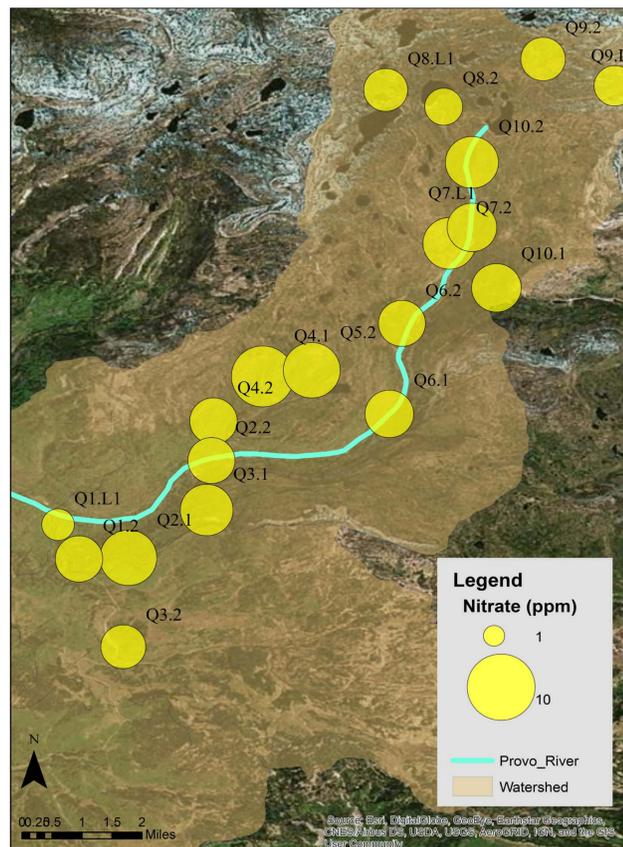


Figure 1. Testing Nitrate using the CTA method. The range for Nitrate was from 2.34 ppm – 14.70 ppm. The mean was 7.12 ppm.

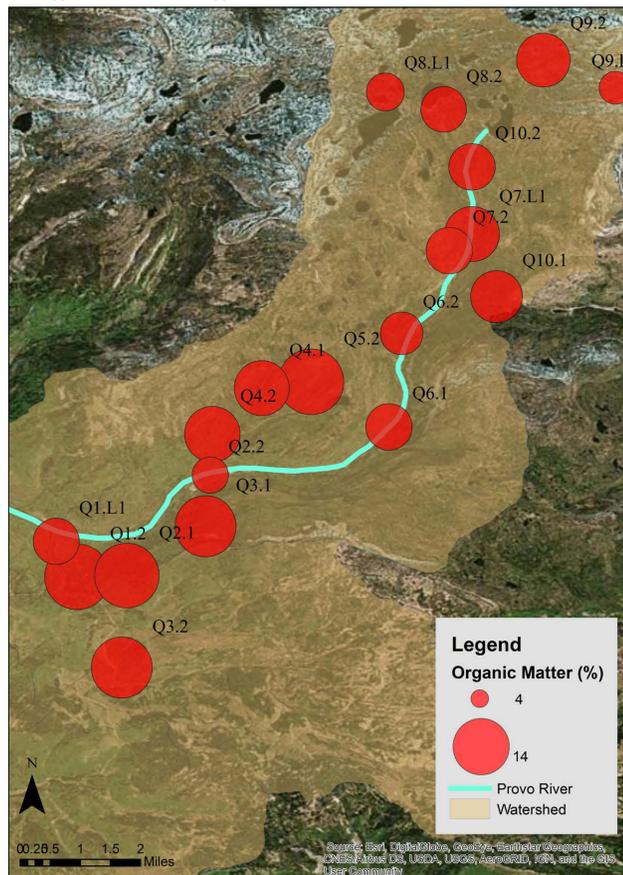


Figure 2. Organic Matter has a strong relationship with Mercury, both from microbial activity and as a medium for buildup. The range for OM in the watershed was from 3.45% - 13.65%. Commonly in soil science, anything above 4% is considered very high.

Total C & N by Elevation

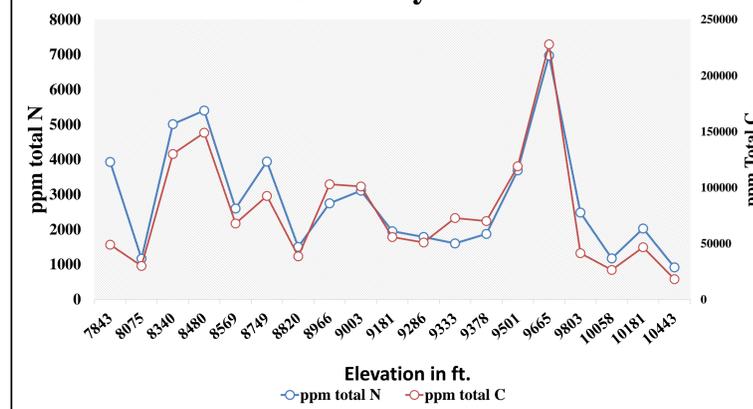


Figure 3. Comparing the C:N ratio by looking at the increase in elevation. Site Q1.L1 was at the lowest elevation at 7843 ft. and site Q9.L1 was at the highest elevation at 10443 ft.

Electrical Conductivity dS/m by Elevation

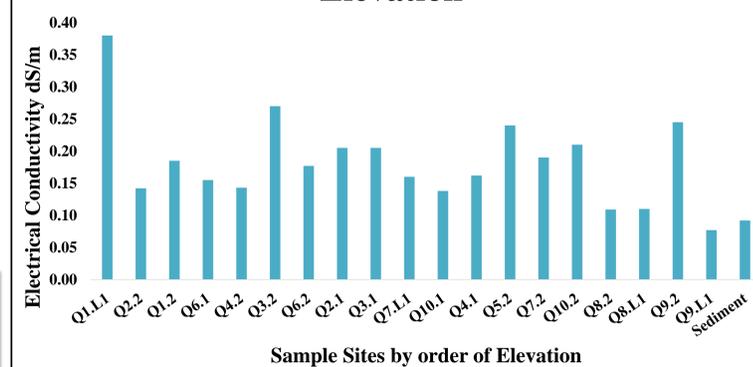


Figure 4. Electrical Conductivity is a measure of salt content in the soil. It is generally considered in soil science that a dS/m of 4 or higher is considered very bad. The soils in the Provo River Watershed have very low salt content likely due to annual snow and precipitation.

Soil Texture by Elevation

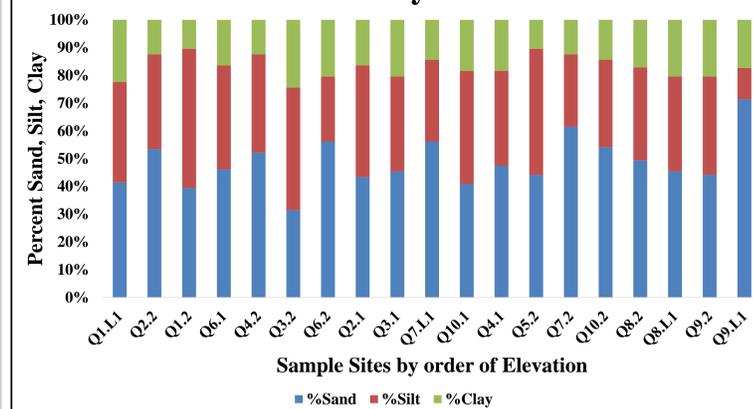


Figure 5. Soil Texture is a measure of sand, silt, and clay particles on the soil, equaling up to 100%. Soil texture has a significant impact on soil physics and chemistry. Affecting water infiltration, and soil water permeability. Soil texture also affects the rate at which contaminants and metals move in the soil.

Conclusion

- Sites at lower elevation show higher OM, suggesting that additional soil tests should be done in this area.
- Additional tests to be done include: ICP-OES, XRD, static leaching.