Agriculture

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Soil Series: Elevation and Agricultural Soil Test Survey of the Godfrey Dryland Experimental Farm, Clarkston, Utah

Ryan Hodges, Robert Clawson and ***Grant E. Cardon***
(Graduate student, research technician and professor, respectively, PSC Department)

The Godfrey Dryland Experimental Farm (approximately 29 acres situated 1.5 miles south of Clarkston, Utah, on State Route 142) is the most recent addition to the research farm resources of the Utah Agricultural Experiment Station. Because it is the most recent experimental farm, there is no previous survey of the topographical and agricultural properties of the site and soil from which to make decisions on experimental study layout, equipment loading and access-way siting, suitability of soil physical and chemical conditions for specific study planning, etc. This survey details the areal distribution of soil type, topographical variation across the site and key agricultural soil test results to serve as baseline guidance information to potential researchers and farm managers.

Data for surficial features (topographic iso-lines, soil sampling site locations, and soil series distribution, respectively) are shown in Figures 1-3.

Agricultural soil test analyses were performed on 50 soil cores that were taken to a depth of 3 feet and divided into foot increments from the locations noted in Figure 2. The soil tests results were then mapped with each foot increment represented by a separate map. The analyses performed on these soils were as follows:

- Ammonium Bicarbonate (Olsen) extractable Phosphorus (P) – Figs. 4-6.
- Ammonium Acetate extractable Potassium (K) – Figs. 7-9.
- Saturated Paste extractable Sulfur as Sulfate (S) – Figs. 10-12.
- DTPA extractable Copper (Cu), Iron (Fe), Manganese (Mn) and Zinc (Zn) – Figs. 13-24.
- Saturated Paste extractable salinity – Figs. 25-27.
- Organic Matter (OM) by Loss on Ignition – Figs. 28-30.
- Saturated Paste pH – Figs 31-33.

The soil at the site is highly eroded Mendon series soil (with various slope sub-classes), with the exception of a small area in the northwest corner that is mapped as the Avon series. Both soils are lake terrace deposits of ancient Lake Bonneville and are derived from sandstone and limestone. The Avon series is closely related to the Mendon series with Mendon having a slightly higher lime content in the lower reaches of the argillic (high clay content) horizon, making it a calcic horizon at about 60 cm below the surface.

The fact that much of the topsoil on the steep side-slopes on the farm has been eroded exposing the highly calcareous subsoil horizons, the native fertility of these eroded regions is quite low. This is especially true for P, which is as low as 0.5 mg/kg in the most eroded areas. Organic matter (OM) levels are illustrative of the erosional and depositional areas within the farm. Native OM levels for the Mendon series are 2-3% in the upper horizons. Depositional areas have surface soil OM levels > 3% while erosional areas are < 2%. To help reduce further erosion at the site, a permanently vegetated waterway was established in the large channel running south to north in the west half of the farm.

DATA MAPS

Figure 1. Godfrey Farm topographic iso-lines (meters).

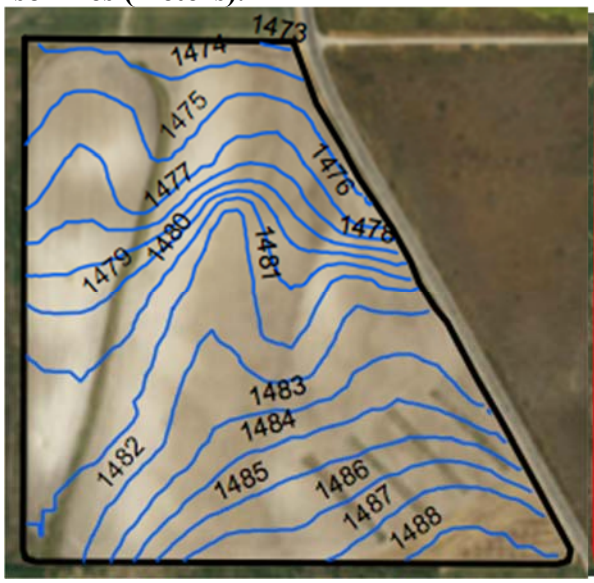
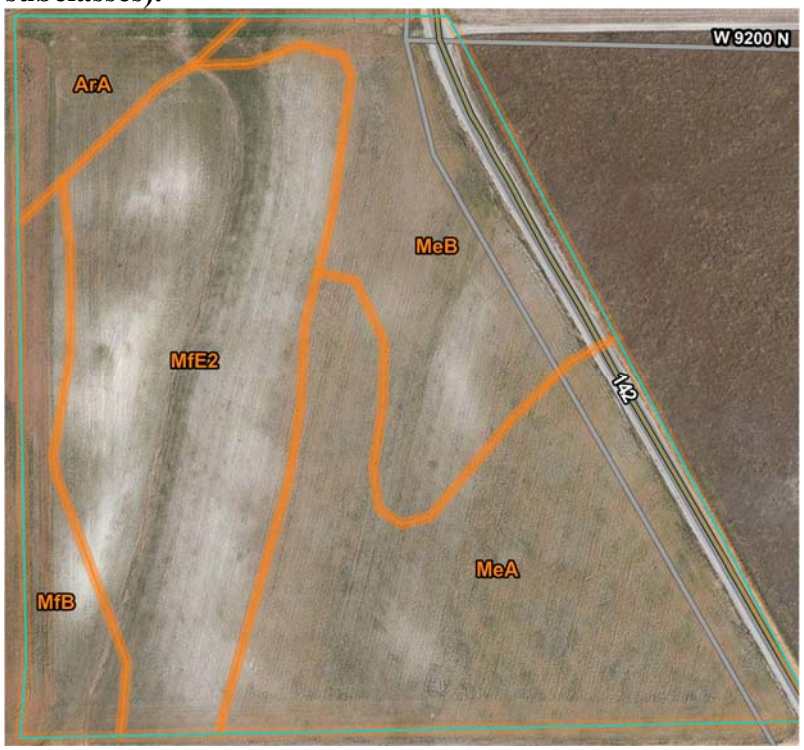


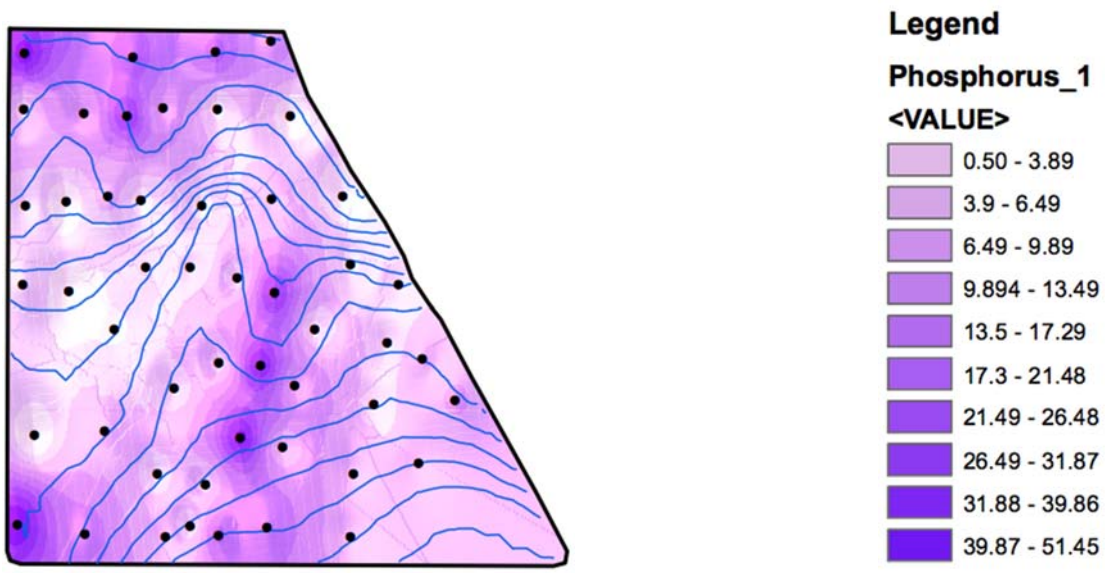
Figure 2. Sample site locations.

Figure 3. Soil series distribution (M = Mendon, A = Avon, other letters indicate slope subclasses).



PHOSPHORUS (Ammonium Bicarbonate Extractable; mg/kg)

Figure 4. P levels at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 12 mg/kg.

Figure 5. Phosphorus at 2 feet.

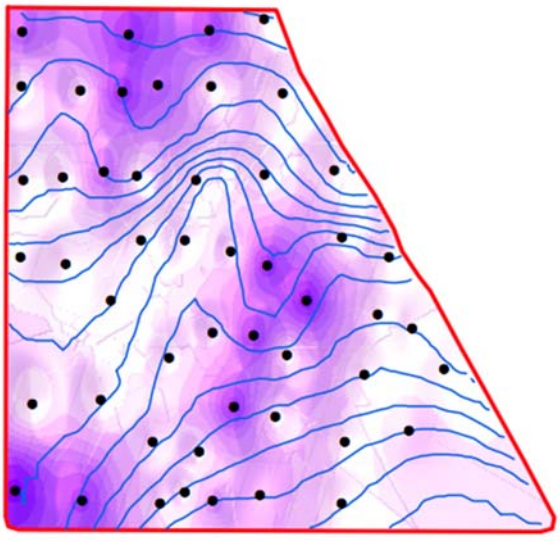
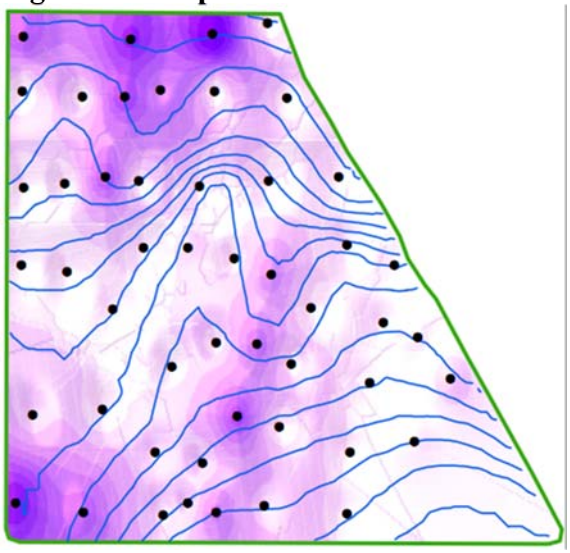
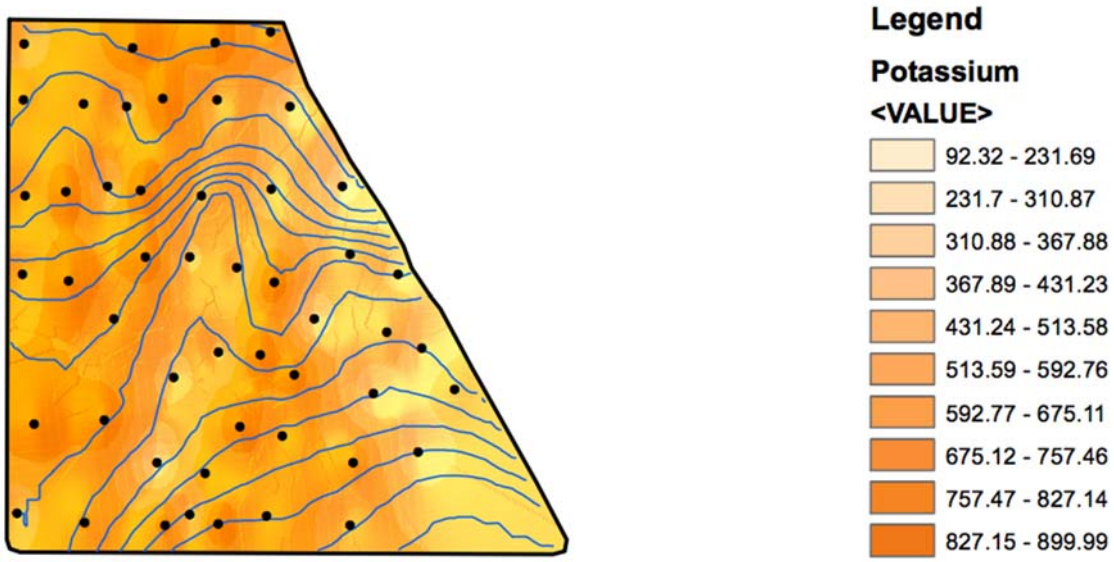


Figure 6. Phosphorus at 3 feet.



POTASSIUM (Ammonium Acetate Extractable; mg/kg)

Figure 7. Potassium at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 100 mg/kg.

Figure 8. Potassium at 2 feet.

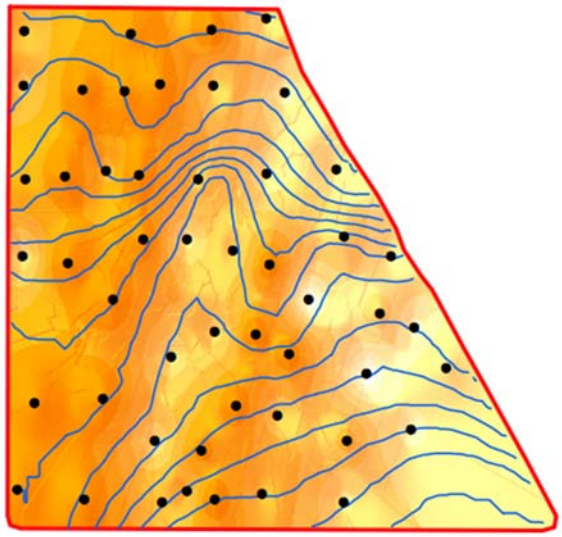
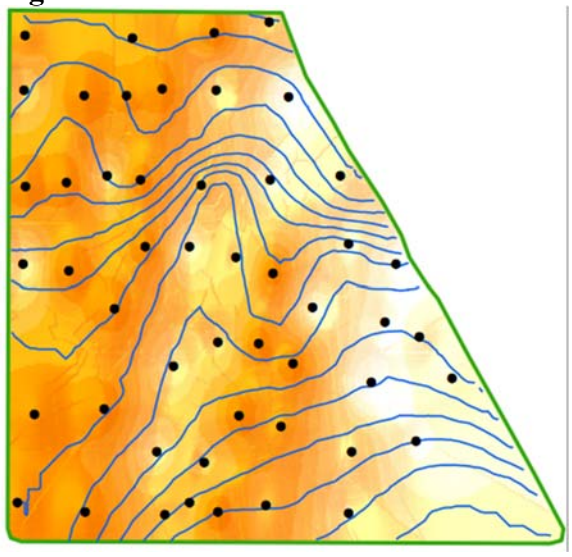
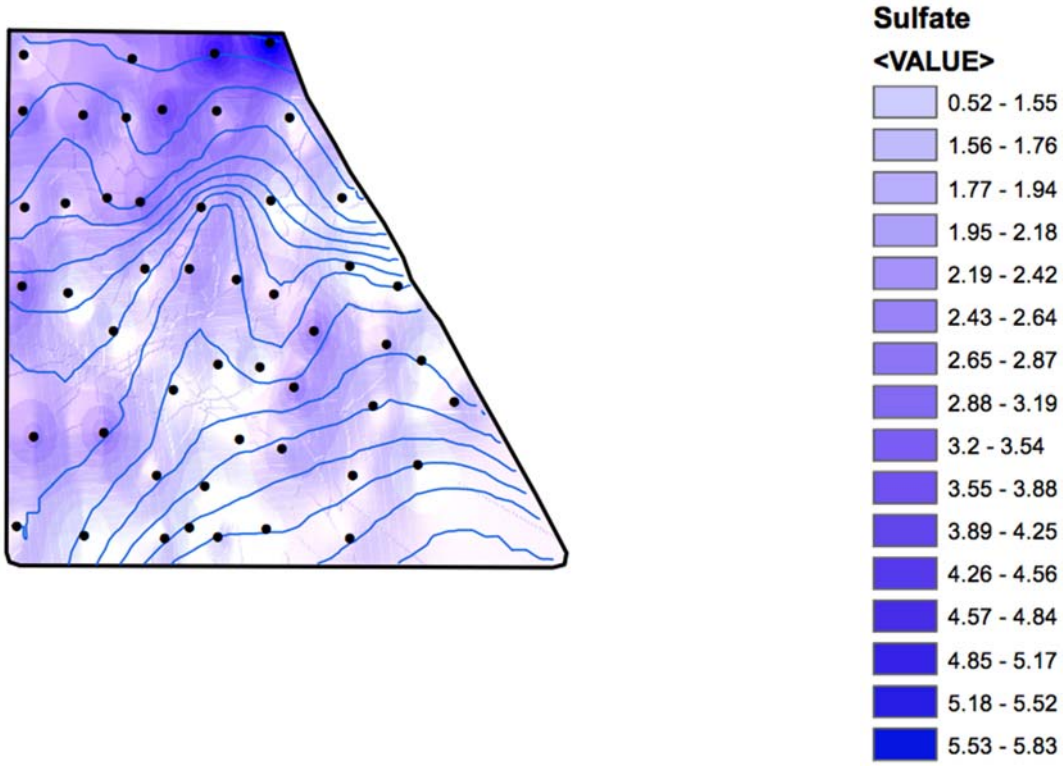


Figure 9. Potassium at 3 feet.



SULFUR as SULFATE (Saturated Paste Extractable; mg/kg)

Figure 10. Sulfate at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 8 mg/kg.

Figure 11. Sulfate at 2 feet.

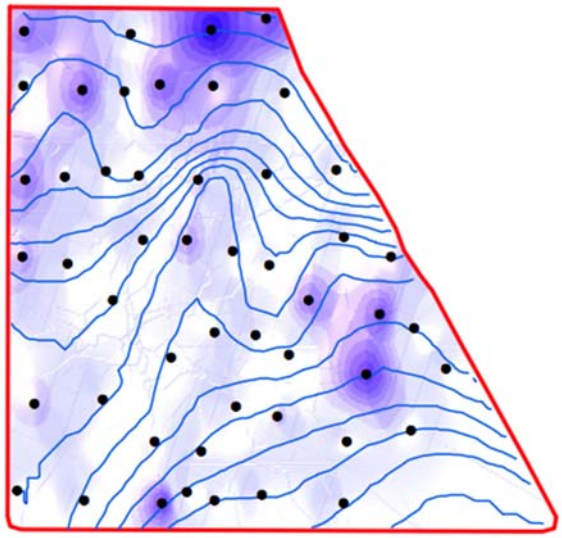
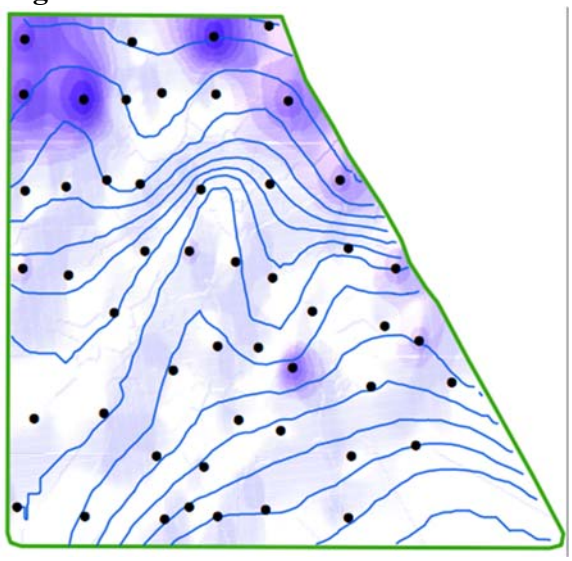
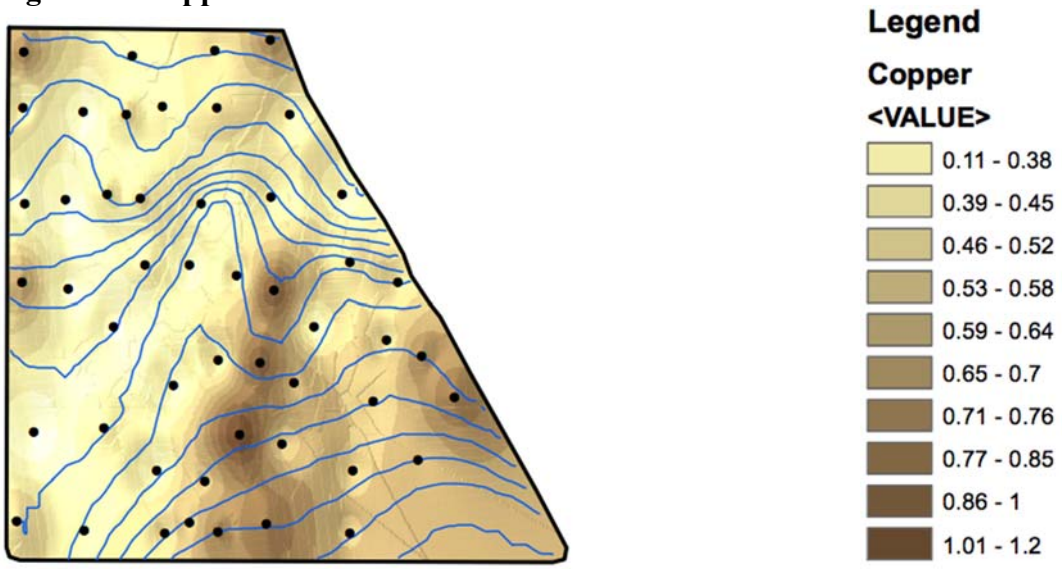


Figure 12. Sulfate at 3 feet.



COPPER (DTPA Extractable; mg/kg)

Figure 13. Copper at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 0.2 mg/kg.

Figure 14. Copper at 2 feet.

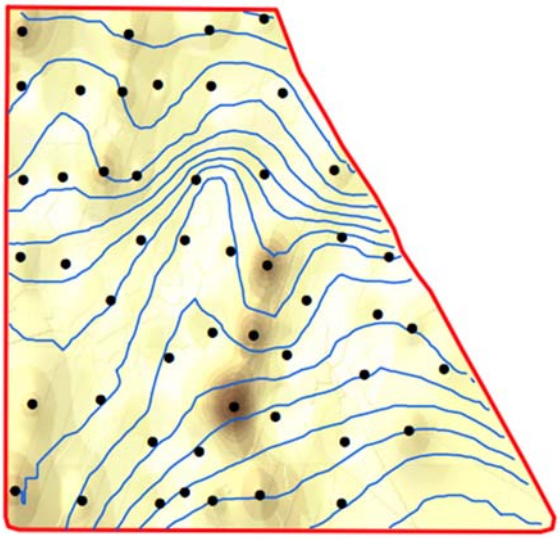
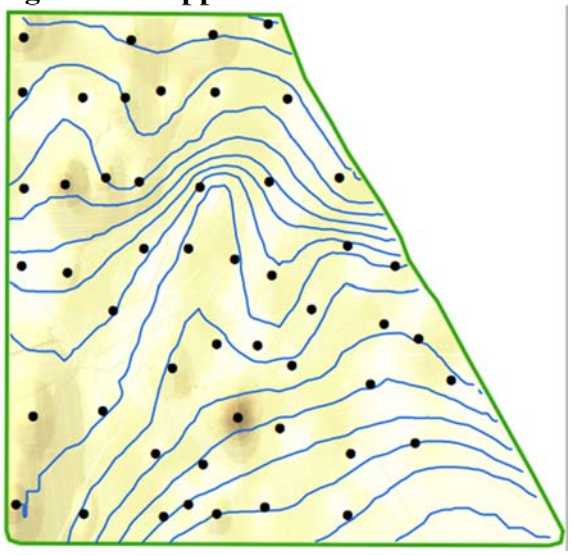
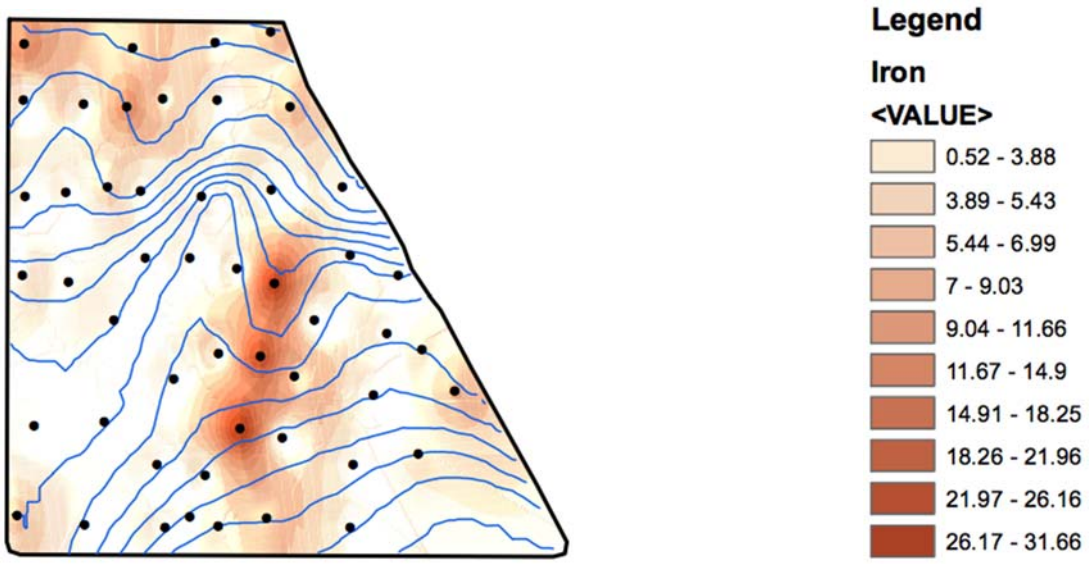


Figure 15. Copper at 3 feet.



IRON (DTPA Extractable; mg/kg)

Figure 16. Iron at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 5 mg/kg.

Figure 17. Iron at 2 feet.

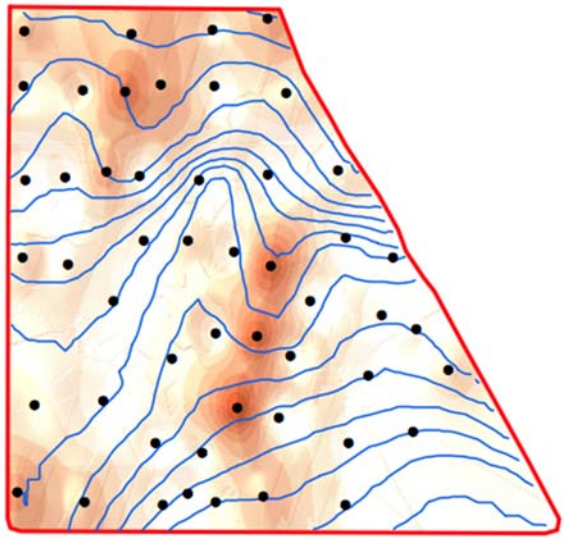
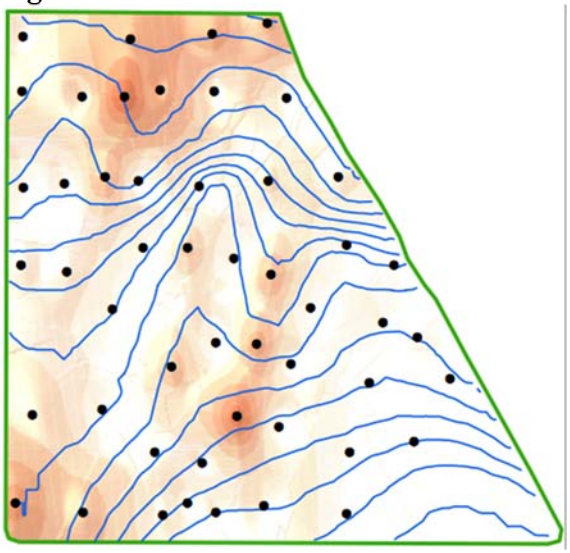
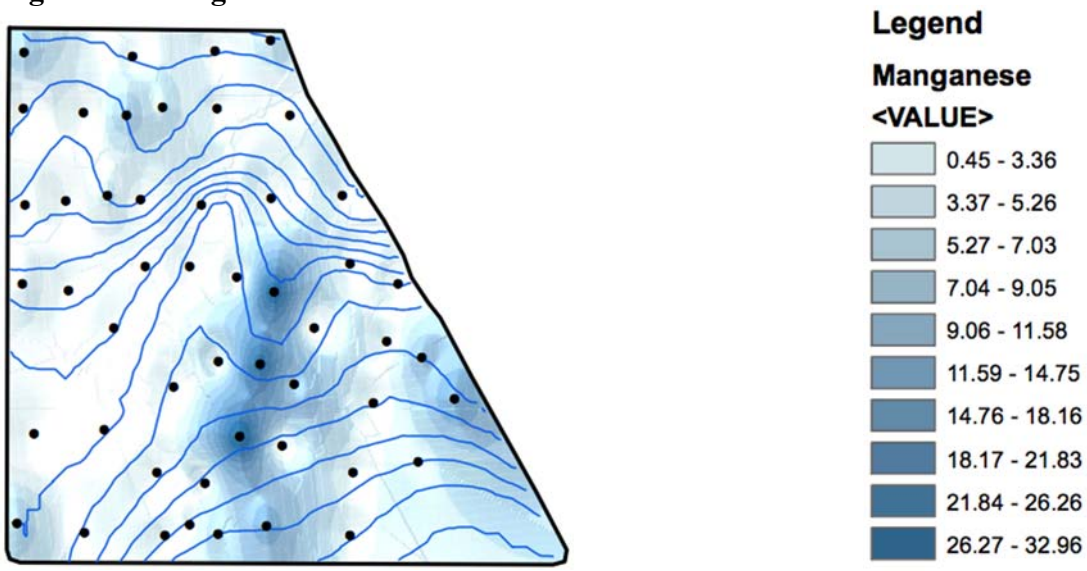


Figure 18. Iron at 3 feet.



MANGANESE (DTPA Extractable; mg/kg)

Figure 19. Manganese at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 1 mg/kg.

Figure 20. Manganese at 2 feet.

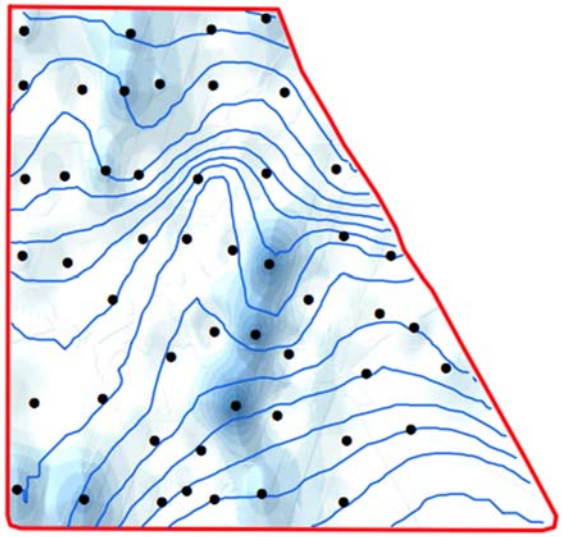
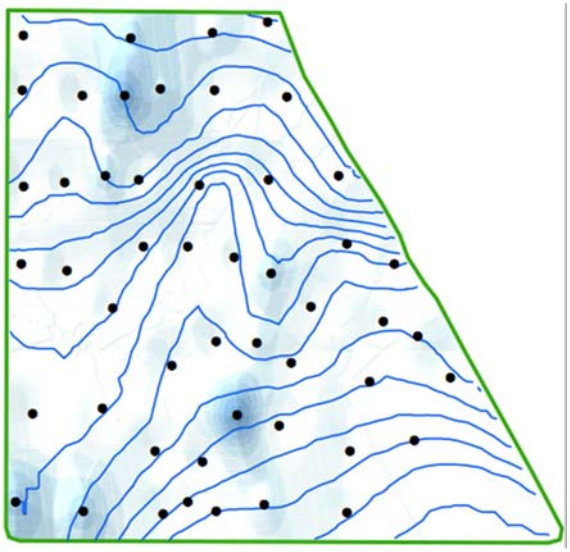
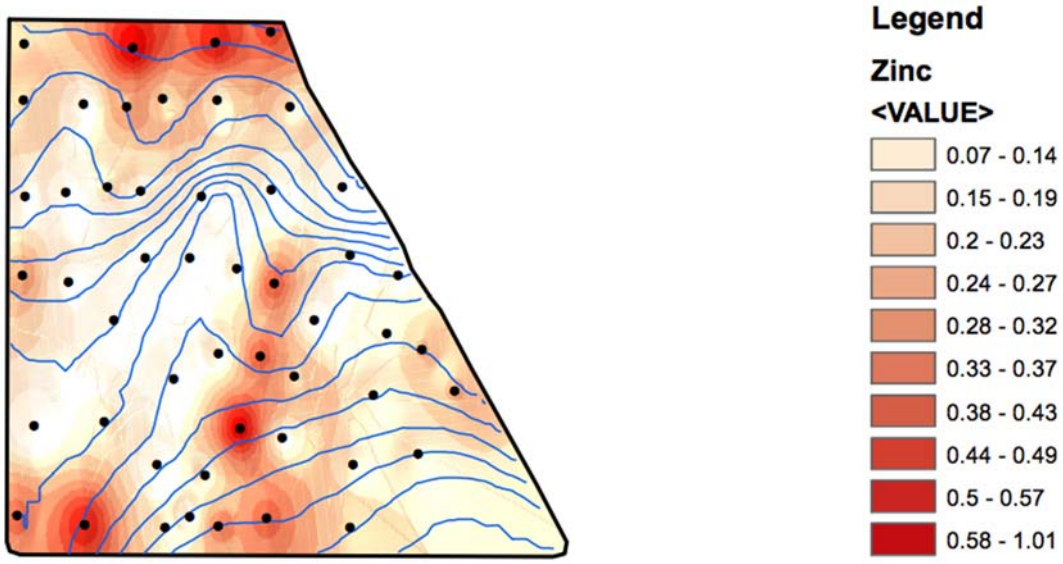


Figure 21. Manganese at 3 feet.



ZINC (DTPA Extractable; mg/kg)

Figure 22. Zinc at 1 foot.



NOTE: For context, the sufficiency level for dryland small grain production is 1 mg/kg.

Figure 23. Zinc at 2 feet.

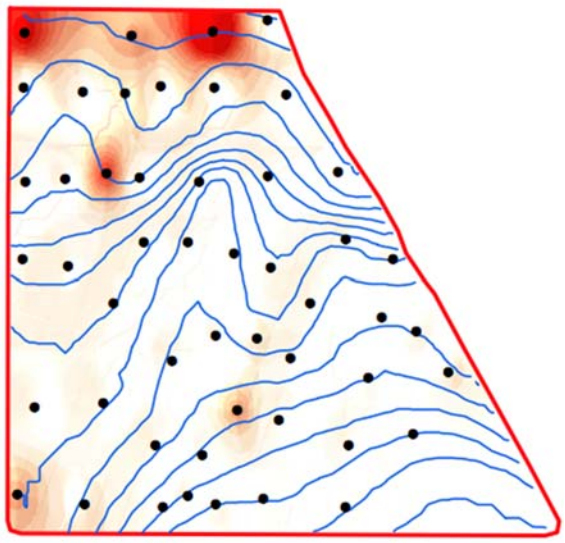
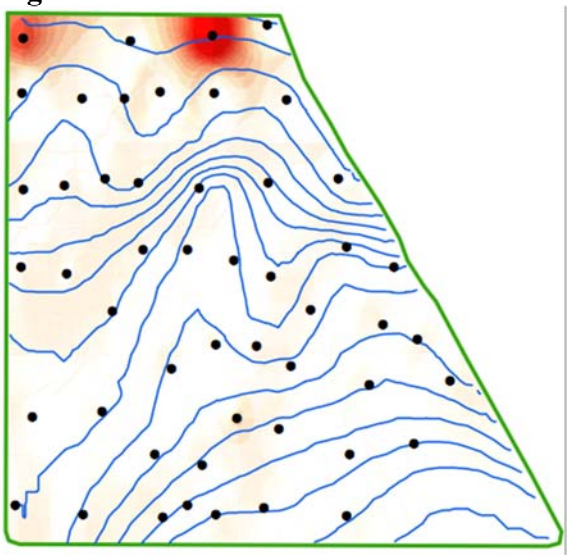
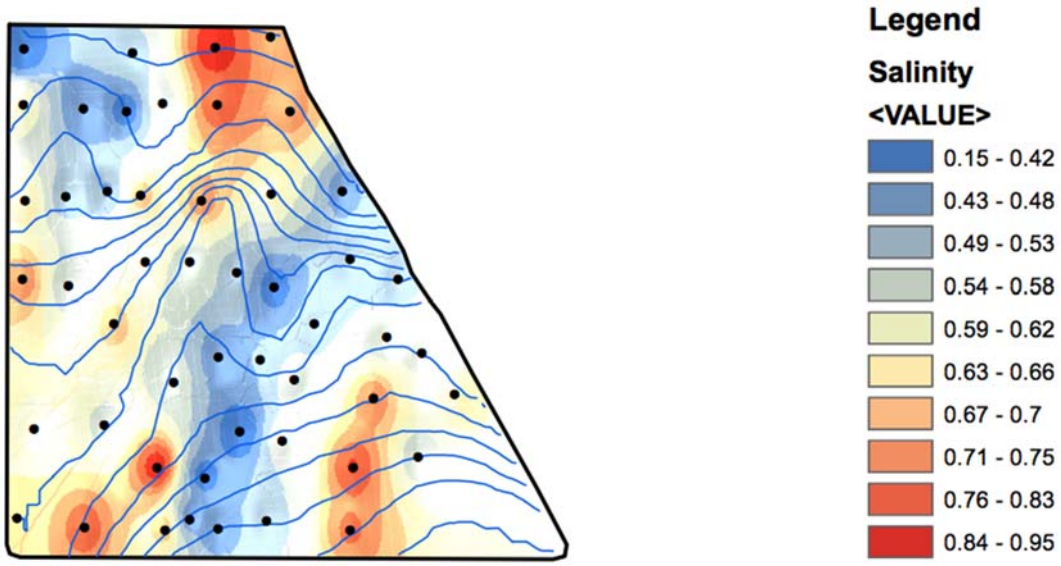


Figure 24. Zinc at 3 feet.



SALINITY (Saturated Paste Extractable; dS/m)

Figure 25. Salinity at 1 foot.



NOTE: For context, the upper acceptable level for dryland small grain production is 3 dS/m.

Figure 26. Salinity at 2 feet.

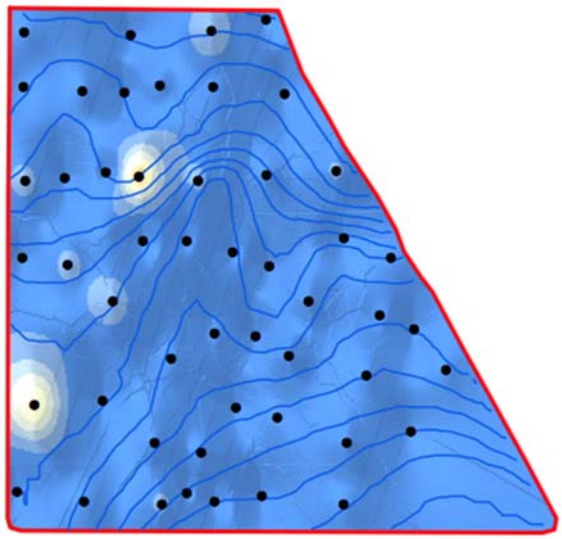
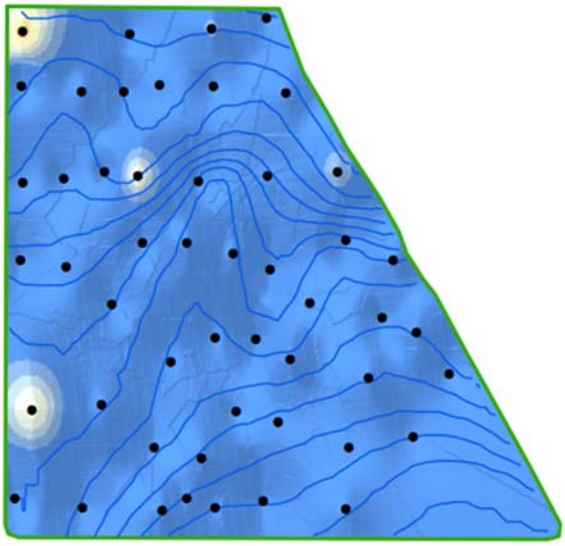
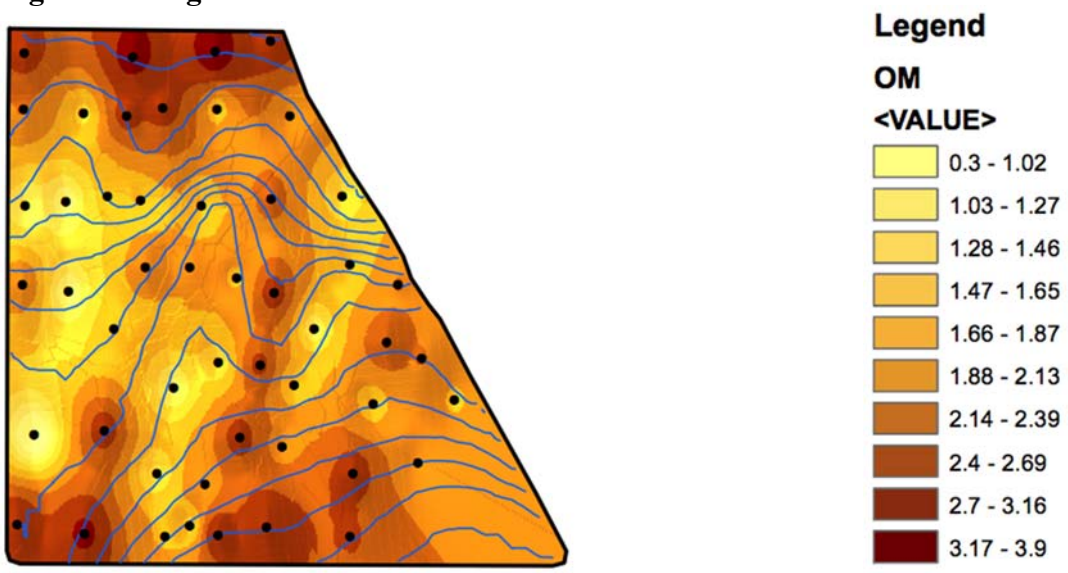


Figure 27. Salinity at 3 feet.



ORGANIC MATTER (Loss on Ignition; %)

Figure 28. Organic Matter at 1 foot.



NOTE: For context, there are no limits associated with organic matter content, but lower values in the surface soil layer are generally evidence of topsoil erosion. Subsurface layers are typically low in organic matter in the arid/semi-arid western U.S.

Figure 29. Organic Matter at 2 feet.

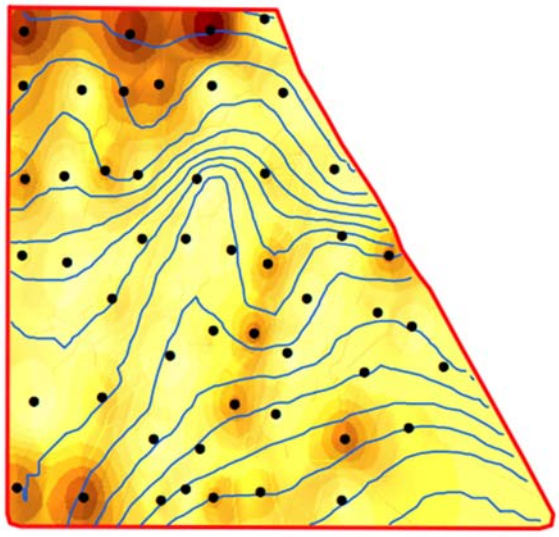
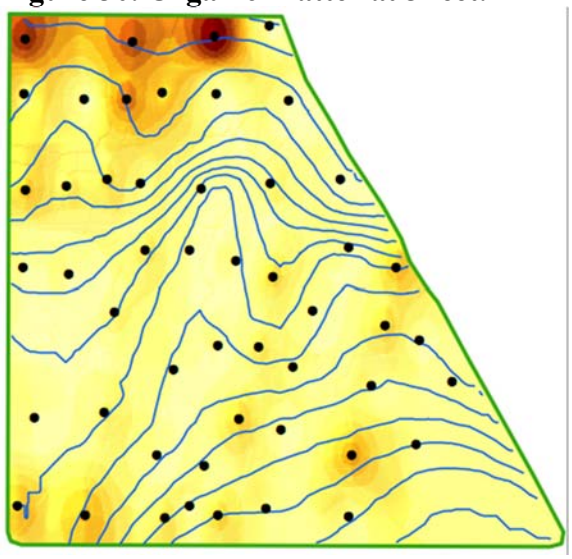
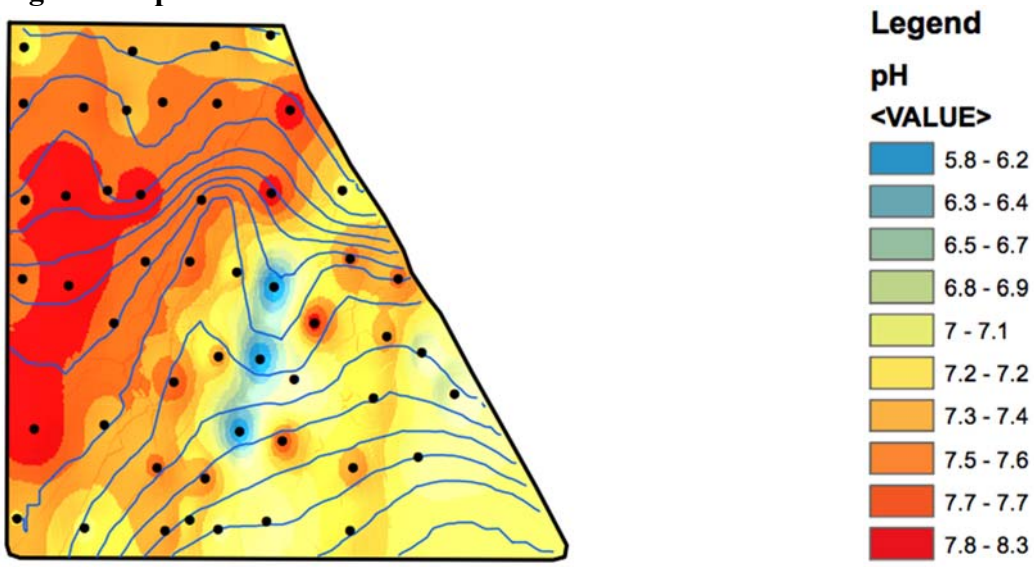


Figure 30. Organic Matter at 3 feet.



pH (Saturated Paste)

Figure 31. pH at 1 foot.



NOTE: For context, the normal pH range for crop production is 6.1 to 8.4.

Figure 32. pH at 2 feet.

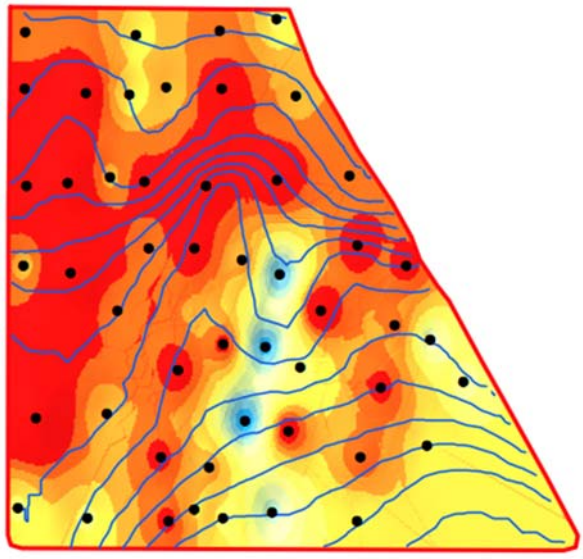


Figure 33. pH at 3 feet.