

Using EM38 Soil Surveys and EC_a-directed Soil Sampling with ArcGIS post-processing to Determine Temporal Changes in Soil Salinity in Forage Fields under Long Term Irrigation with Saline Drainage Water

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ABSTRACT

Saline waters are increasingly used for irrigation due to a declining irrigation water supply in California. Reliable-field specific data on salinity levels within and near the root zone is critical to the long-term management of forage production with saline water. This project aims to compare EM38 soil survey data collected in 2017 and 2021 at the San Joaquin River Improvement Project (SJRIP), a 6,500-acre saline water reuse facility in western Fresno County, to determine spatial-temporal changes in soil salinity at the field scale. Four fields sown to ‘Jose’ tall wheatgrass were selected (10-6, 13-1, 13-2, and 13-6). The EM38 sensor was walked along 20 to 25 transects per field (~30 meters apart) after which 12 soil sampling locations for ground-truthing were generated using the ESAP-RSSD software. Soil samples taken in 30 cm increments to a depth of 120 cm were analyzed for gravimetric water content, saturation percentage, pH, and soil salinity (EC_e). ESAP-Calibrate software was used to convert the EC_a (apparent electrical conductivity) data from the sensor to EC_e for all survey points and the change detection function in ArcGIS was then used to compare soil salinity in 2017 and 2021. In field 10-6 soil with good natural drainage, soil salinity averaged over the field did not change appreciably from 2017 to 2021, although the western half increased in salinity while the middle portion decreased. In field 13-1 which had minimal irrigation in summer 2021, approximately 75 % of the field fell into the 20 – 24 dS/m class in 2021, as compared to 2017 when a similar percentage of the field was in the 16 – 20 dS/m class. Spatial-temporal patterns in soil salinity can inform irrigation management under saline conditions.

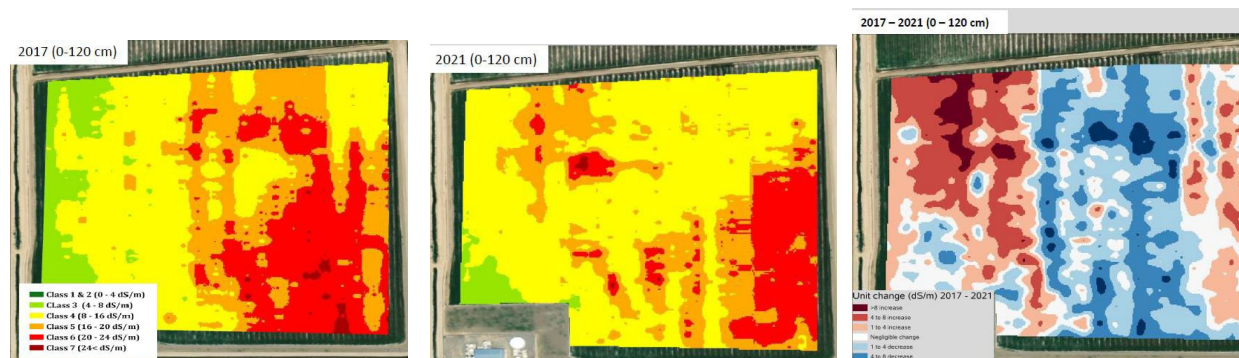


Figure 1: spatial map for field 10-6 in 2017 (left) and in 2021 (right) and unit change map (right)

