

DYNAMIC SOIL PROPERTIES IN THE LOWER RIO GRANDE VALLEY: UNDERSTANDING RESPONSES OF INFILTRATION RATE, BULK DENSITY, AGGREGATE STABILITY TO DIFFERENT TILLAGE PRACTICES.

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INTRODUCTION

- ❖ Dynamic soil properties (DSPs) are indicators of soil health and function that change over short time-scales due to changes in environmental conditions or management practices.
- ❖ Conservation tillage is a management practice that reduces soil disturbance and has been shown to improve soil health, as measured by DSPs.
- ❖ This study, part of a national NRCS project on DSPs and soil health, investigates the impact of tillage practices in Hidalgo sandy clay loam, a soil series that spans more than 250,000 acres in south Texas.
- ❖ We measure dynamic soil physical properties including wet aggregate stability, infiltration, and bulk density in unirrigated agricultural fields in Hidalgo and Willacy counties with a history of strip tillage, intermittent strip tillage, and conventional tillage.
- ❖ A minimally disturbed natural site is also included as a reference point.
- ❖ Local lab results will be compared to results from the NRCS Kellogg Soil Survey Laboratory to help standardize laboratory procedures and increase accuracy for future soil tests in our region.
- ❖ Improved local DSP testing capacity and better data on conservation tillage's impacts on soil health will support efforts to expand conservation agriculture practices in the Lower Rio Grande Valley.

SAMPLE COLLECTION, PROCESSING, LAB TESTING AND FIELD WORK



Cornell Infiltrometer test



Slakes App test

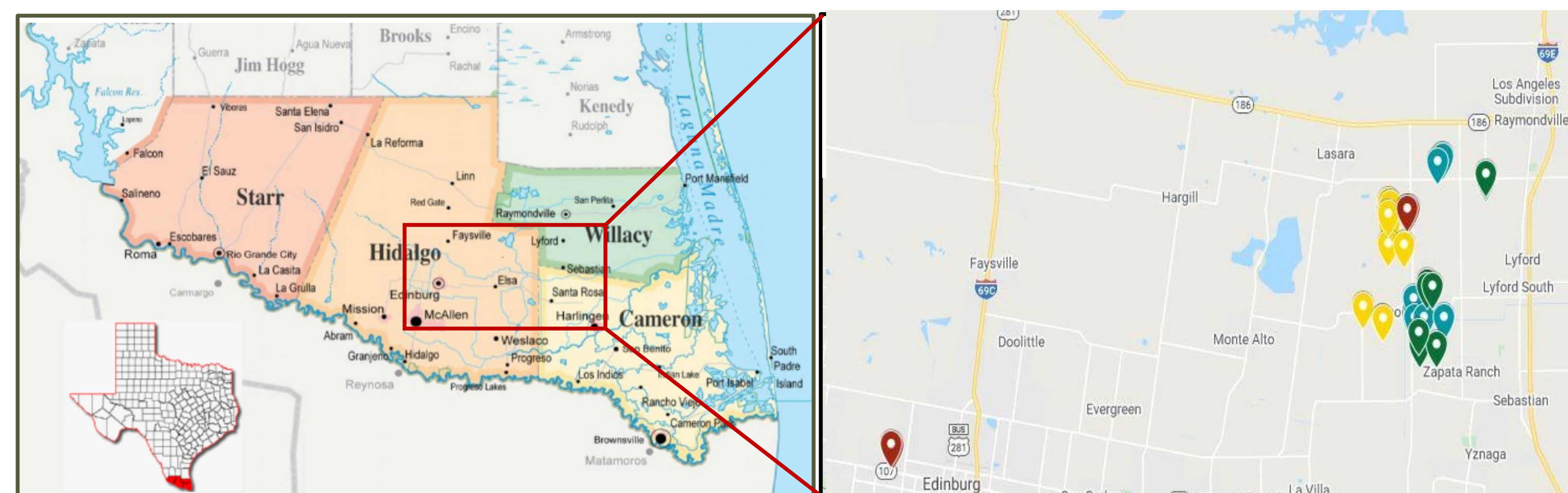


Samples collection



Saturo Infiltrometer test

STUDY AREA & SITE SELECTION



- Benchmark soil - **Hidalgo sandy clay loam**
- 11 sites selected using soil classifications from USDA Web Soil Survey
 - 3 conventional tilled fields
 - 3 strip tilled fields
 - 3 intermittent tilled fields
 - 2 ecological reference
- For each site, three sampling locations were chosen
 - 2 one-meter-deep cores with Edelman probe
 - 5 additional surface cores (first 10 cm)
 - Cores combined for a composite sample separated by horizon
 - Field assessment includes:
 - NRCS field metrics
 - Infiltration using single ring, Saturo, and Cornell infiltrometers
- 11 fields x 3 sampling locations x 6 horizons = **198 total soil samples**
 - Each sample tested by UTRGV and the NRCS Kellogg Soil Survey Laboratory (KSSL) for lab testing listed at right



Sample sorting



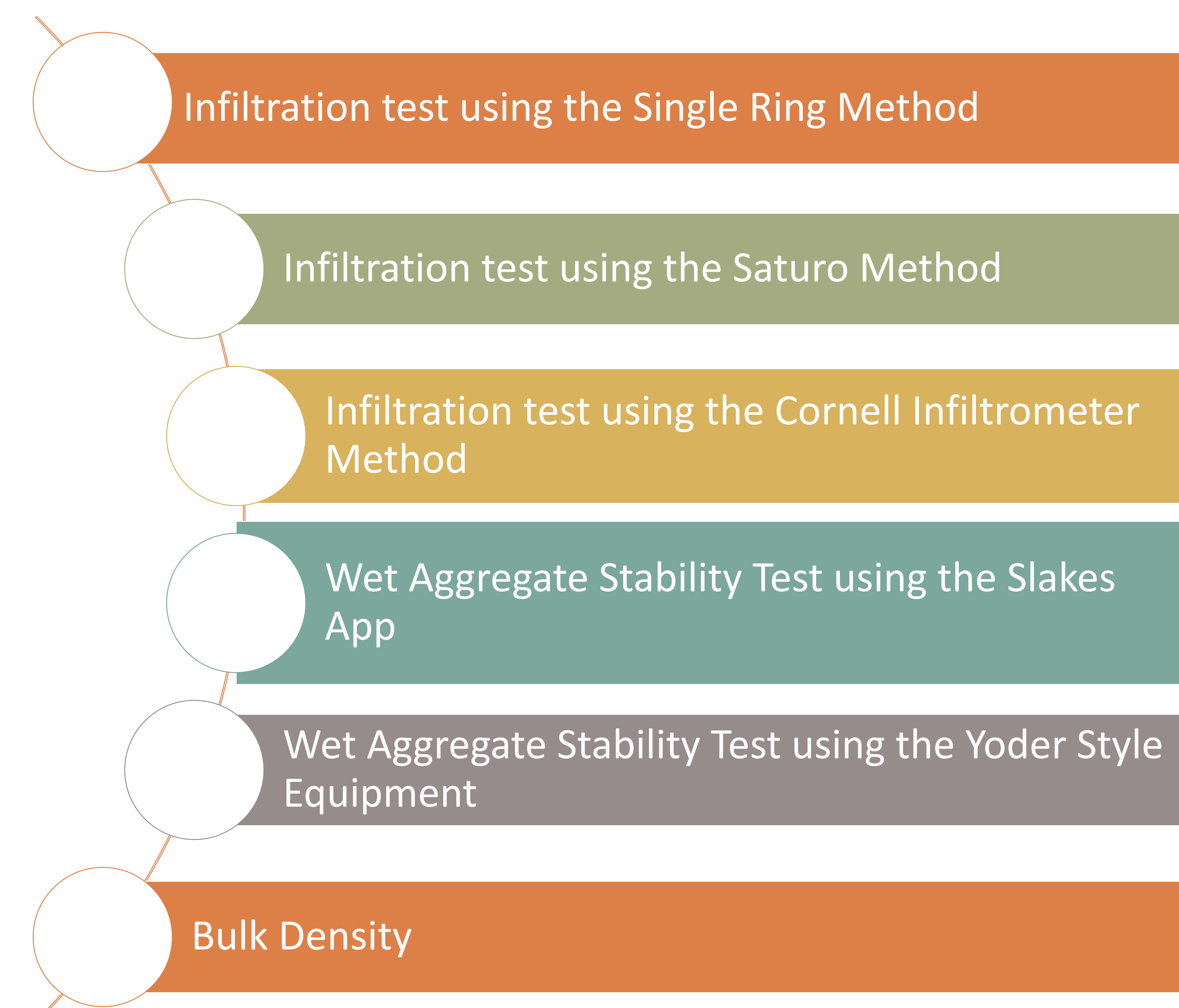
Cornell Infiltrometer test



Saturo Infiltrometer test



Processed Samples



- ❖ All samples were processed prior to the wet aggregate stability test using the slakes App, Yoder Style equipment and for conducting the bulk density test.
- ❖ Infiltration tests using the Single ring, Saturo and Cornell infiltrometer method were implemented.

REFERENCES

1. Jemai, I., Aissa, N. B., Guirat, S. B., Ben-Hammouda, M., & Gallali, T. 2013. Impact of three and seven years of no-tillage on the soil water storage, in the plant root zone, under a dry subhumid Tunisian climate. *Soil and Tillage Research*, 126, 26-33. doi:10.1016/j.still.2012.07.008
2. USDA. Soil Health Definitions. Accessed Nov 9, 2020. file:///C:/Users/luzb1/Downloads/HealthySoil_FS.pdf

PRIOR RESEARCH AND PRELIMINARY RESULTS

Prior research shows higher soil organic matter and water retention for fields under conservation tillage, especially for the top 30 cm of soil [1]. Over time, improved dynamic soil properties as a result of conservation practices like strip tillage ideally can help reduce costs and improve returns for farmers [2]. Our preliminary results for bulk density show a significant impact by tillage practice, but not by depth. Aggregate stability, however, seems to be impacted by both tillage and depth. Continued analysis will also compare correlations among the multiple methods for measuring infiltration and aggregate stability. We expect the fields with reduced soil disturbance (strip tillage and intermittent tillage) to compare favorably to those with higher soil disturbance (conventional tillage) for all measured dynamic soil physical properties.

ACKNOWLEDGEMENTS

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