Effects of Phosphorus Application and Cover Cropping on Soil Aggregate Stability

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Introduction

- Soil aggregation is the clumping of multiple particles, forming one individual piece of soil.
- Aggregate stability is important, effecting water and nutrient retention, as well as preventing erosion.
- The aggregate samples came from the KAW or Kansas Agricultural Watershed.
- The goal of the KAW is to learn more affordable and sustainable methods, promoting flexible crop and nutrient management plans.
- Using the Slakes application, aggregate stability can be measured.
- Slakes Index has three groupings of stable, moderate, and unstable soil.
- The smaller the number, the more stable the aggregate.
- Stable: 0-3
- Moderate: 3-7
- Unstable: 7 and Above

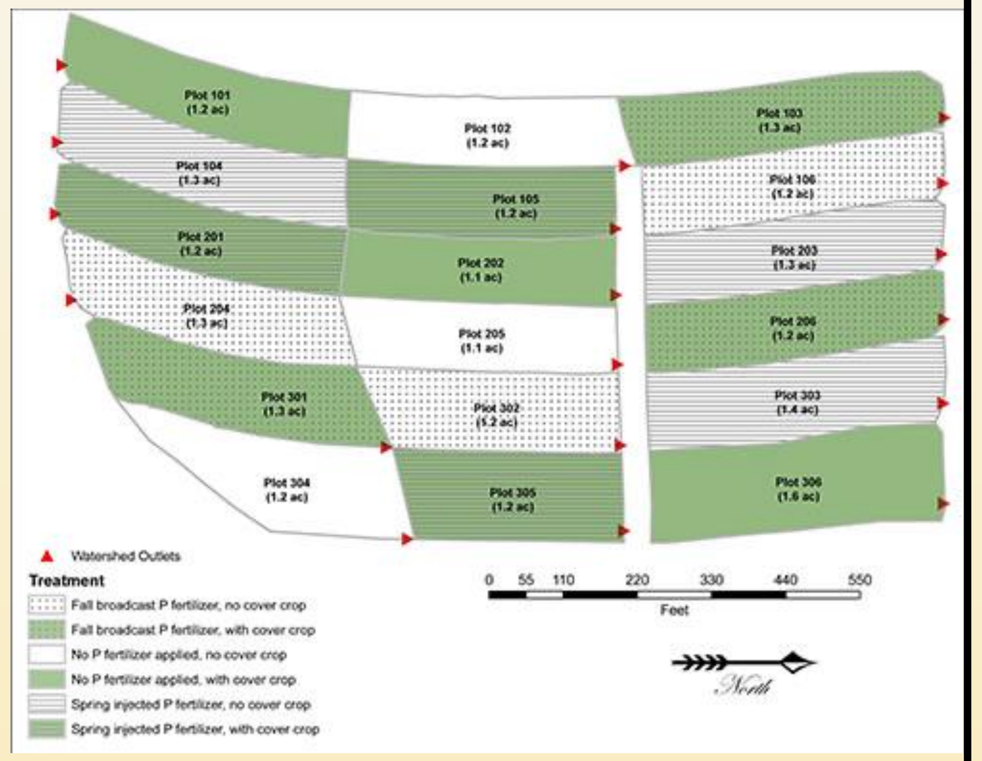


Figure 1: The KAW field plotted out with each treatment type.

Methods

- Three samples from 18 different plots are taken of the topsoil (0-5 cm) and subsoil (5-10 cm).
- The Slakes application on a phone or tablet with a camera is held by a stabilizing device, camera aiming at a well-lit area.
- Three aggregates per sample are then placed in a petri dish in the well-lit area.
- Water is added to the petri dish.
- A timer of 10 minutes is started on the Slakes app.
- After the timer runs out, a number pops up and that value is the Slakes Index.
- The SI were statistically analyzed with an analysis of variance in SAS, and means were separated at .05.

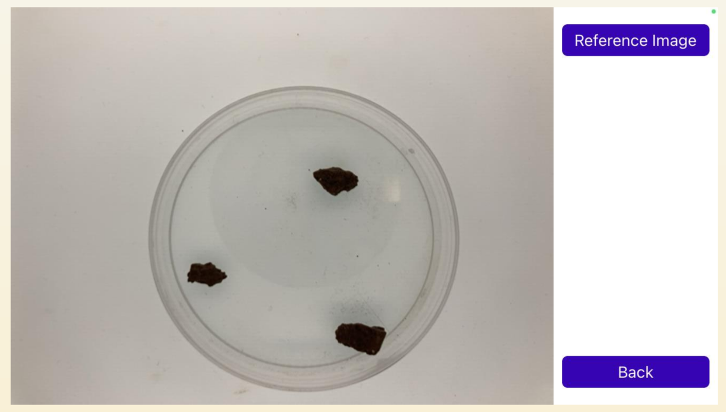


Figure 2: Screen shot of the Slakes app, with the camera pointed at three dry soil aggregates placed in a petri dish.

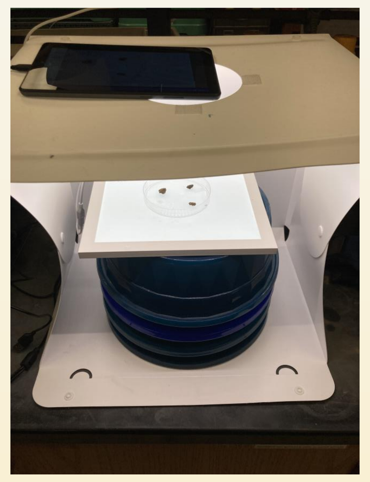


Figure: 3: Water is added to the petri dish, set up in well lit area.

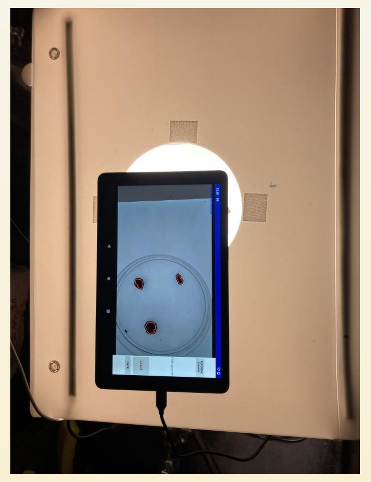


Figure 4: Birds-eye-view of the Slakes app photo booth.

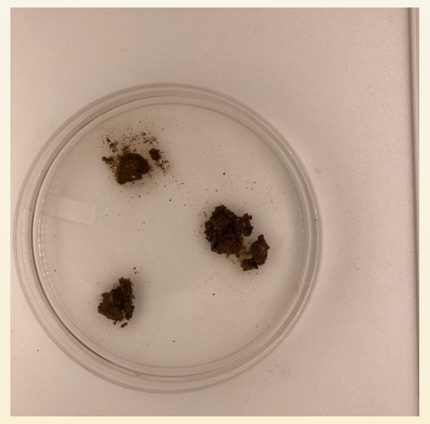


Figure 5: Three aggregates after they have been soaking in water.

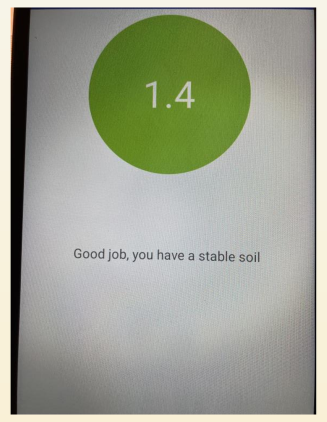
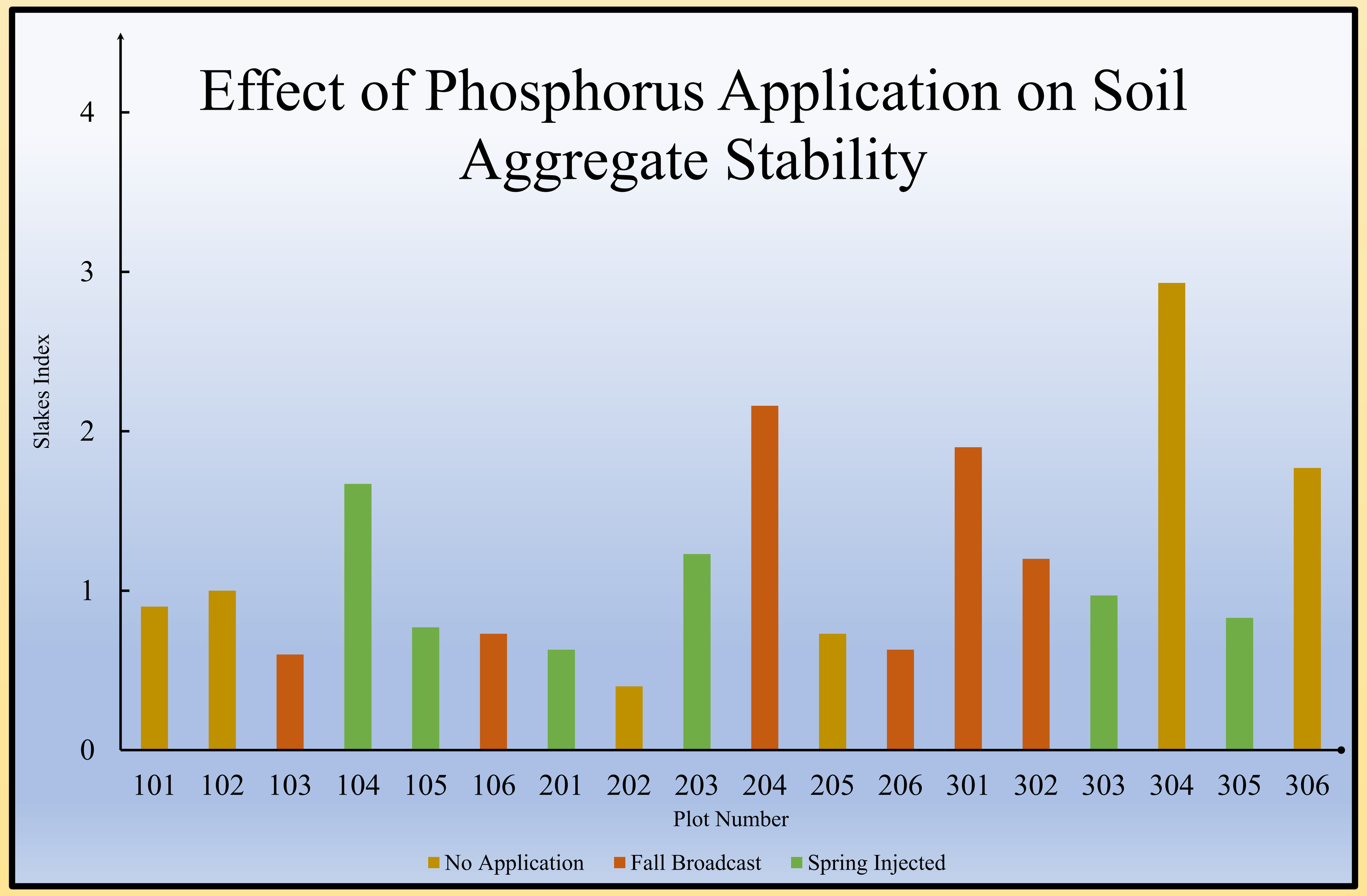


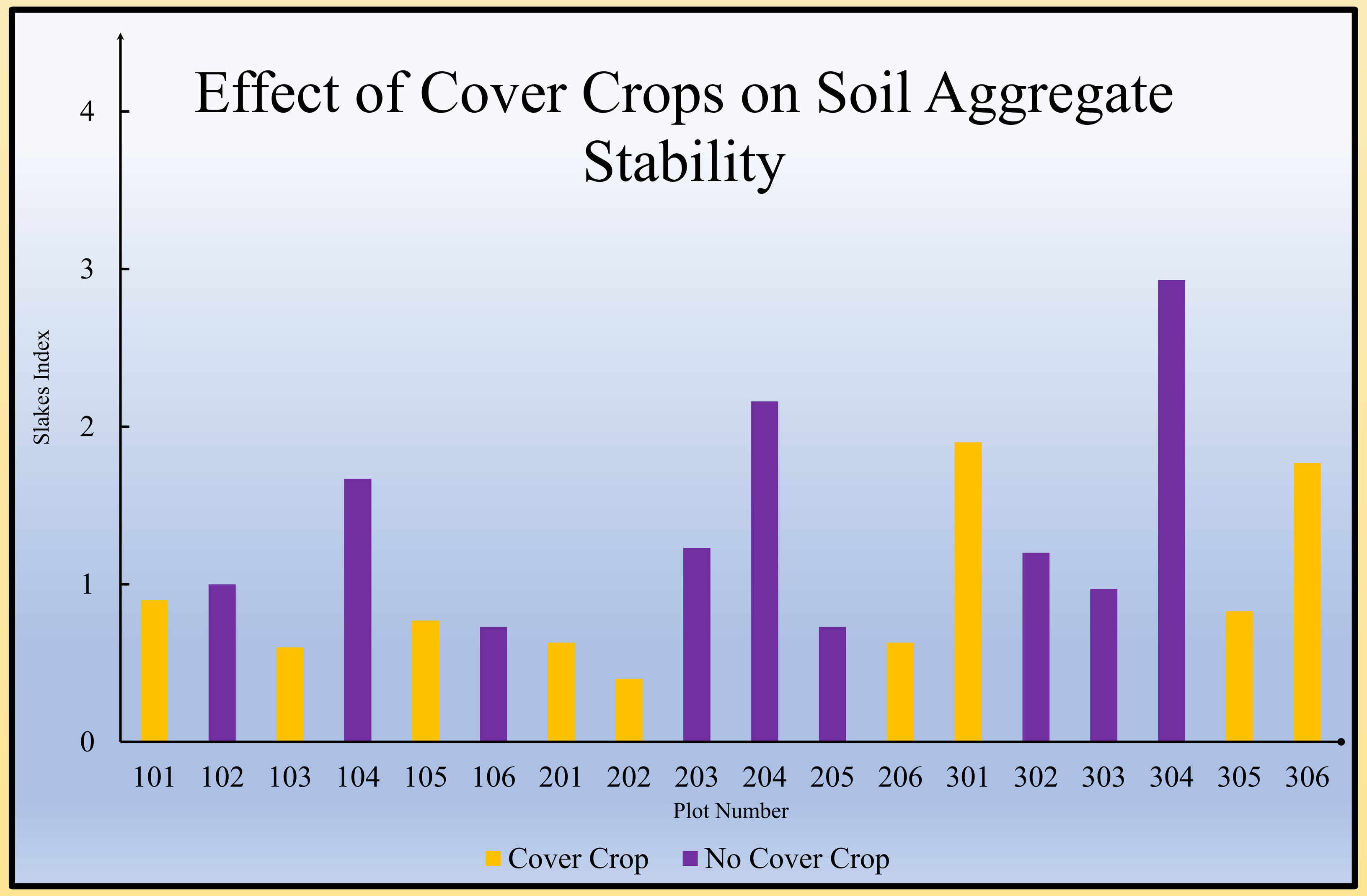
Figure 6: The Slakes app producing value of sample's Slakes Index.

Results

- All though appearing to have large variation, all measurements fell into the "stable" category, between 0-3 on the Slakes Index.



Graph 1: This graph shows the Slakes Index relative to the three phosphorus applications; fall broadcast, spring injection, and none.



Graph 2: This graph shows the Slakes Index of each plot, relative to cover crops or no cover crops.

Discussion

- We observe no statistical difference between cover and no cover for Slakes SI.
- We observe no statistical difference between P application methods for Slakes SI.
- We observe no interaction between the two factors

Conclusion

- The effects on the soil were positive, but no measurable differences were found between the treatments.
- Other conservation methods are applied to the KAW fields, such as no-till, and perhaps that explains why there was not much variation in aggregate stability.

References

- Flynn, Bagnall, D. K., & Morgan, C. L. (2020). Evaluation of SLAKES, a smartphone application for quantifying aggregate stability, in high-clay soils. *Soil Science Society of America Journal*, *84*(2), 345–353. https://doi.org/10.1002/saj2.20012
- Fajardo, Mario, et al. "Soil Slaking Assessment Using Image Recognition." *Soil and Tillage Research*, vol. 163, 3 June 2016, pp. 119–129., https://doi.org/10.1016/j.still.2016.05.018.

Acknowledgments

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