



Introduction

Groundwater levels across parts of the High Plains Aquifer have been declining at unsustainable rates due to agricultural irrigation use. Despite management strategies designed to decrease total groundwater use from the underlying aquifer, declines in groundwater levels are still observed throughout the region. This study seeks to use boosted regression trees to evaluate the impact of physical and socio-political factors on pumping to identify the predominant drivers to irrigation water use across western Kansas.



<u>Purpose</u>: Identify the predominant drivers to irrigation water use across western Kansas



Irrigation Decision-Making and Groundwater Use Outcomes in Western Kansas Susan E. Lamb¹, Samuel J. Smidt¹

¹Soil and Water Sciences Department | University of Florida, Gainesville, FL

Methods & Results

Boosted Regression Trees (BRTs)

What is a Boosted Regression Tree model?

- Developed from statistical and machine learning techniques
- Is both an explanatory and predictive model

- "Boosting" adaptively and sequentially fits the decision trees

- Advantages: Handles both categorical and continuous data • Variable relationships do not have to be linear • Method handles interactions between predictors varables



Disadvantages:

• There are no reported P values, thus other parameters must be used for selecting the best model settings

UF Water Institute Symposium, February 2020

Applications

Predicting Irrigation Use Under Climate Scenarios RCP 4.5 and 8.5



Conclusion

Boosted Regression Trees (BRTs) are an effective tool to identify irrigation drivers and their influence on past and future irrigation water use.

Earlty predictors of groundwater pumping for irrigation include precipitation and water use policy. Continued research will apply BRT techniques across a range of time scales and management boundaries.

References & Acknowledgements

GIS Data Sources:

HPA Water Level, K: USGS HPA Border: USGS Well Density: WIMAS Soil Permeability: USGS Precipitation: PRISM, OSU

Climate Data: MACA, Climatology Lab GMDs: KS Dept of Agriculture Urban Areas: U.S. Census Bureau Kansas Border: U.S. Census Bureau CONUS Border: U.S. Census Bureau ST, WTE: developed by EMK Haacker

Code adapted from: Elith, J., Leathwick, J. R. and Hastie, T. (2008), A working guide to boosted regression trees.

A special thanks to the Land and Water Lab, and the Soil and Water Sciences Department, University of Florida/IFAS, Gainesville, Florida.





and and Water Lab University of Florida landandwaterlab.org