Analyzing Land Use Effects on Recharge through Playas to the High Plains Aquifer

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Background

Playas are ephemeral wetlands where recharge rates to the HPA are one to two orders of magnitude higher than the interplaya.1 Recharge through playas is increasingly important as groundwater levels in the HPA have dropped 15.2 – 30.5 m (50 – 100 ft.) in Groundwater Management District 1 (GMD1) in Western KS since the 1950s.2 However, playas have experienced severe degradation due to farming which may compromise the magnitude of recharge though playas.3, 4

Research Question

• Which characteristics of playas including land use result in the greatest recharge to the HPA?
• It is hypothesized that natural playas recharge water to the HPA at higher rates than playas with modified land uses due to changes in soil structure and sedimentation.

Methods

This Poster
• Core and groundwater sampling to determine recharge rates
• Geospatial Analysis using ArcGIS to determine playa characteristics in the selected study sites over time

Related Analyses
• Ecological Surveys to determine playa impairment
• Shallow core collection to determine sedimentation rates
• Yield map geospatial analysis to determine the cost-benefit of farming through playas
• Hydrologic models to extend field recharge measurements to other playas

Results

• The study sites selected represent a range in playa characteristics across GMD1 including area, land use, and depth to water.
• The most common land uses within playas in GMD1 are fallow, winter wheat, corn, sorghum, and grassland. The selected study sites represent GMD1.
• Playa characteristics in GMD1 including area, saturated thickness, and mean wet frequency have some variations compared to probable playas across the HPA.

Future Work

• For the next year, deep core will be collected in additional playas varying in size and land use.
• Compiling recharge, sedimentation, biological diversity, and land use will determine the characteristics of playas most critical for recharging the HPA.

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References