Groundwater levels across parts of western Kansas have been declining at unsustainable rates due to pumping for agricultural irrigation despite strategies designed to decrease total water use from the underlying aquifer (e.g., efficient irrigation, drought-resistant cultivars). Thus, water management across this agricultural landscape is more complex than targeting a simple water budget. Instead, both qualitative (e.g., management boundaries) and quantitative (e.g., crop prices) factors drive agricultural water applications, and these factors frequently change through time. This study uses a boosted regression tree machine-learning technique to simultaneously analyze categorical and numerical data against annual irrigation pumping to determine the relative influence of each driver (i.e., factor) on groundwater pumping across both space and time. Specifically, over 40 key variables relating to (1) management/policy, (2) hydrology, (3) climate, (4) land/agriculture, and (5) economics categories are tested against irrigation use from 2006-2016 across approximately 19,000 groundwater wells. Study results showed variables from all five categories of data were among the top drivers to irrigation, and the greatest influence came from the following variables: irrigated acres per well, landscape features such as saturated thickness and soil permeability, spring and summer precipitation, and the annual market value of crops grown per acre. Variables that had little influence included regional management boundaries and irrigation technology (i.e., center-pivot). The results of this study can further be used to target the factors that statistically lead to the greatest volumes of groundwater pumping to develop robust management strategies designed to achieve the water conservation goals of the region. Lastly, the methods used here can be replicated for other large-scale studies across the country, particularly in regions seeking to better understand irrigation use in a changing agricultural landscape.

This seminar can be viewed live via this link: Susan Lamb. Viewers of the live stream may now ask questions by clicking on the message icon at the bottom. Questions will be read at the end during the question and answer portion. In addition, all seminars are archived for viewing on our SWSD Seminar Page.