Colorado

Authors: Reagan Waskom (Colorado State University) & John Stulp (Water Policy Advisor for Governor Hickenlooper)

Introduction

The Ogallala aquifer underlies nearly 14% of Colorado, stretching across the Eastern Plains from the northern border with Nebraska to the southern border with Oklahoma. Management of Colorado groundwater in designated basins has progressed from unregulated pumping (prior to 1957), to regulated pumping based upon a principle of maximum utilization (1957 to 1965), to integration within a modified prior appropriation doctrine (1965) that effectively limited the amount of water available for appropriation. The Ogallala aquifer in Colorado is managed with the understanding that it is in an over-appropriated condition, and that as water levels decline and wells' ability to pump declines, use of the water will decline as physical availability and economics dictate.

Policy

Colorado generally manages groundwater use in the Ogallala to limit the depletion of the resource to a 25% depletion in 100 years. This limitation has been in place for many years and is enforced through the well permitting system. The biggest recent push to manage groundwater use in Colorado has come from obligations related to the Republican River Compact, signed by Colorado, Nebraska, and Kansas in 1942. To meet obligations of a 2002 settlement approved by the U.S. Supreme Court, the Colorado State Legislature created the Republican River Water Conservation District (RRWCD) in 2004. The RRWCD is an independent, self-governed entity with 15 Board of Director members appointed by the Commissioners of local counties, Boards of ground water management districts, and the Colorado Ground Water Commission (CGWC). The RRWCD promotes conservation through voluntary participation. A major project has been the voluntary retirement of irrigated acres under incentive payments provided through Federal initiatives that are enhanced with RRWCD payments. The RRWCD's geographic extent covers much of the Northern High Plains Designated Basin. To help manage water supplies in the area the Division of Water Resources promulgated metering rules for groundwater uses in 2008.

The main mechanisms for ensuring compact compliance have been: RRWCD fallowing programs to reduce consumption, State Engineer curtailment of post-compact surface water rights, and RRWCD's operation of an augmentation pipeline, completed in 2012, which delivers pumped groundwater into the North Fork of the Republican River, near the Nebraska border. The water source for the pipeline came from the purchase and transfer of appropriations from 53 existing irrigation wells in eastern Yuma County. Along with other junior surface water rights, Bonny Reservoir, with a post-compact water right on the South Fork of the Republican River, was required to pass all inflows and was finally drained in September 2011. The fallowing programs (over 49,500 acres), curtailment of junior water rights, and the augmentation pipeline help Colorado comply with the Compact.

The CGWC has enforcement authority to manage groundwater resources within the State's Designated Ground Water Basins. Two Designated Basins within Colorado, the Northern High Plains, and the Southern High Plains contain Ogallala aquifer water. Well permits, required for all groundwater users in the region, are issued and adjudicated by the CGWC. Totalizing flow meters or alternative measurement methods approved by the State Engineer and submission of pumping data to the State are required for high capacity wells in much of the Northern High Plains Designated Basin. Some high capacity wells in the Southern

High Plains Designated Basin, typically those wells that have undergone a change in water right, must be metered and submit pumping data to the State.

There are eight local Ground Water Management Districts (GWMD) within the Northern High Plains Designated Basin, and one local Ground Water Management District within the Southern High Plains Designated Basin. Each GWMD has the authority to implement rules and regulations related to groundwater use to supplement the rules provided by the CGWC. Although the individual GWMDs have taken responsibility for monitoring and enforcing rules related to new well development and well spacing, they have done little to implement mandatory groundwater conservation policies within their borders (Best, 2014). A few years ago, concern over decreasing groundwater levels in the Ogallala aquifer spurred several farmers from the Northern High Plains Basin to form the Water Preservation Partnership (WPP). In 2017, the WPP drafted a resolution stipulating a 25% reduction in groundwater pumping in GWMDs by 2025. Outreach and discussions related to the proposed resolution are currently ongoing.

Science and Data

Ogallala-related research underway at Colorado State University (CSU) and at USDA's Limited Research Irrigation Farm is currently focused on:

1) Increasing adoption of more efficient irrigation technologies

2) Increasing use of more precise

irrigation scheduling methods and tools

3) Shifting toward more water efficient crop varieties and crops

4) Improving water conservation through soil and residue management

5) Shifting more marginally productive irrigated lands to dryland management

6) Using modeling to support producers and GWMDs as they evaluate the potential impact on the aquifer of different management scenarios (producer practice and policy-related)

Scientists are working on:

1) Identifying plant traits, mechanisms, and agronomic practices that increase productivity per unit of water used by the crop

2) Improving irrigation scheduling efficiency by developing accurate methods to quantify evapotranspiration (ET) in agricultural systems under limited water availability, including the use of remote sensing

3) Creating Water Production Functions (WPF, yield per ET) for crops produced with limited water

Recent research from CSU involving the use of a novel hydroeconomic modeling framework to evaluate groundwater conservation-oriented policies led to heterogeneous impacts projected for producers in the Northern High Plains and Southern High Plains Designated Basins, in part because well capacity and soil type are not uniform across the region. This study highlighted the importance of including the role of well capacity in groundwater models in order to avoid coming to misleading conclusions about the magnitude and distribution of groundwater use and policy impacts over time.

Producer Practice

At the individual farm level, water use efficiency has improved over the past several decades as farmers implement advanced irrigation management and technologies. Partnering with USDA's Natural Resources Conservation Service (NRCS), the RRWCD seeks to voluntarily enroll 1,280 acres in the Republican River Ogallala Aquifer Initiative Program (OAI), offering a total of $50,000 for soil moisture monitoring systems, for converting sprinkler systems to underground

drip systems or modifying a conventional sprinkler to a mobile drip system. RRWCD is also encouraging Republican River Basin producers in Colorado to enroll in a voluntary Agricultural Water Enhancement Program (AWEP) that provides incentives and cost-sharing to participants who elect to remove irrigation water from enrolled acres permanently. Producers can also participate in the Republican River Conservation Reserve Enhancement Program (CREP), a program through the Farm Services Agency (FSA) in which a water right is permanently retired and the land must be put into a grass habitat for 15 years, treated much like CRP ground. The land may be used for grazing or dryland production after the 15-year period has ended. To qualify for the program, the land enrolled in the program must have been irrigated during the year just prior to enrollment, irrigated during four of the six previous years, and be able to legally and physically irrigate the next year.

Moving Forward

The state is in the process of implementing rules requiring that all wells within the Republican River Basin (i.e. the Northern High Plains Designated Basin) replace their depletions to reduce stream impacts for purposes of assisting Colorado in meeting the requirements of the Republican River Interstate Compact. These rules could have an effect that well owners/users may decide to reduce the amount of acres irrigated.