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Economic Analysis of Groundwater Curtailment in Colorado's Republican River Basin

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- An agreement between the states of Colorado, Nebraska, and Kansas, related to the Republican River Compact, requires that 25,000 acres in Colorado's South Fork Focus Zone be removed from irrigated production by 2030. Failure to comply with this requirement could result in the curtailment of all groundwater irrigation across the Republican River Basin in Colorado.
- Agriculture, including irrigated crop production (primarily corn and alfalfa), is critical to the economy in the region, representing more than 25% of total revenue and almost 20% of employment.
- This study examines four different land-use scenarios to describe future economic impacts, should groundwater irrigation be curtailed.

Colorado's Republican River Basin

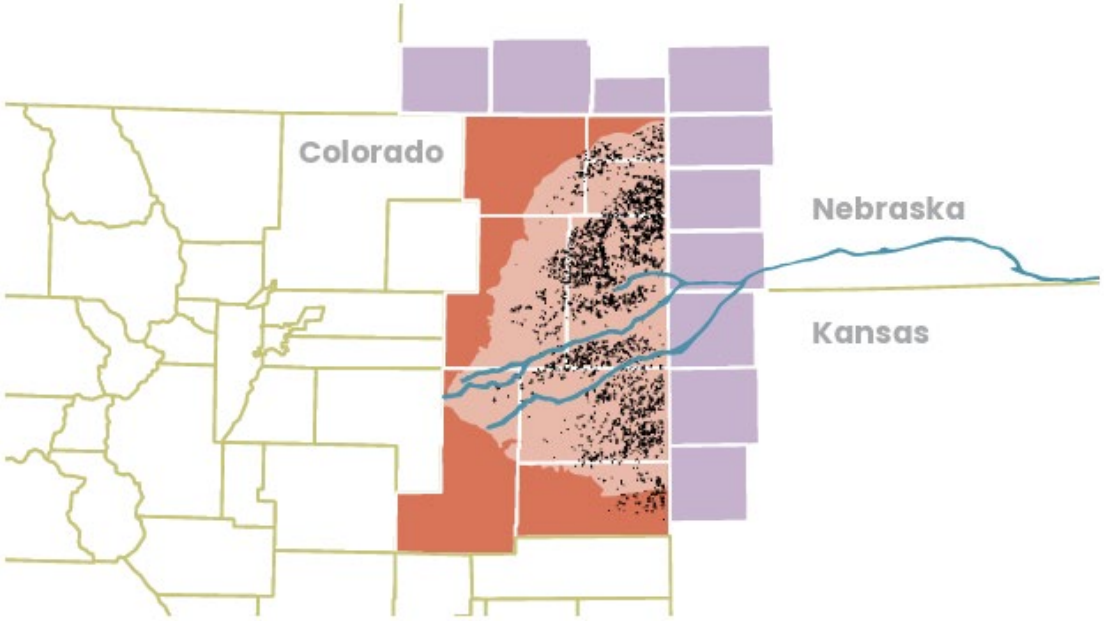

Figure 1: Map of Republican River Water Conservation District boundary (light orange), counties in study area (Orange), neighboring counties in Kansas and Nebraska (purple), and irrigation wells (black dots).

Colorado's Republican River Basin (the Basin) is a key agricultural region reliant on groundwater irrigation. Groundwater use in the Basin is influenced by the Republican River Compact, an agreement between Colorado, Nebraska, and Kansas. To remain in compliance with the Compact, Colorado has agreed to remove 25,000 acres of irrigated land from production in a part of the Republican Basin known as the South Fork Focus Zone by 2030. Failure to achieve the 25,000-acre requirement could result in the curtailment of all groundwater use in the Basin, which would have significant economic repercussions. Without irrigation from groundwater sources, agricultural production in the Basin would transition primarily to lower-value dryland crops and grazing, reducing revenue for agricultural producers and generating cascading effects on input supplies, local businesses, and regional economies.

Calculating the Economic Impact

Using data from the IMPLAN modeling tool, Colorado's Decision Support Systems, University crop-enterprise budgets, and the USDA's Cropland Data Layer, this study evaluates the primary and secondary economic impacts of groundwater curtailment on the eight counties in Colorado's Republican River Basin, as well as the spillover economic impacts on adjacent regions in Colorado, Kansas, and Nebraska. The analysis estimates change in revenue from economic output, employment, and state and local government revenue from alternative land-use scenarios ranging from complete conversion to non-irrigated pasture to a mix of dryland crop production and grazing. All scenarios assume lower productivity of grazing land due to lost forage on irrigated corn fields. There remains some uncertainty as to whether groundwater wells operated by concentrated animal feeding operations would also be impacted. Given the reliance on local irrigated corn and silage for animal feed, however, these operations would experience some negative impacts regardless. Scenario 4 accounts for this by reducing the demand for non-grazing livestock sectors in addition to irrigated cropping sectors. The four curtailment scenarios analyzed are detailed in Figure 2.

Scenario 1: All groundwater-irrigated land in study area converted to grazing.

Scenario 2: Conversion of irrigated acres to dryland crop production and grazing based on the current land use share of non-irrigated acres in the study area.

Scenario 3: A predictive model of land conversion based on outcomes and characteristics of land enrolled in EQIP in the basin.

Scenario 4: The land use changes from Scenario 3 with the addition of a 50% reduction in demand for non-grazing livestock sectors as a result of livestock operations leaving the area.

Figure 2: Land use Scenarios used in the analysis

Study Outcomes

The analysis finds that groundwater curtailment could reduce annual revenues in the study area by between $656 million and $1.5 billion, depending on land use changes and impacts to feedlots – a decrease of up to 16.1% in the value of economic output. The reduction in economic output is associated with a decrease in employment of between 2,591 and 5,263 jobs, representing a 6.9% to 13.9% decrease. The decreases in revenue and employment are concentrated in Yuma and Kit Carson counties, which lie fully within the Republican River Basin. The economic declines are associated with

significant reductions in household income and state/local government revenue and lead to diminished economic outcomes in Colorado counties that lie outside the Republican River Basin and in bordering counties in Kansas and Nebraska. Lost state/local government revenue is estimated to be between $48 and $97 million depending on the scenario. Economic impacts to these surrounding counties that lie outside the Republican River basin range from $100 and $293 million.

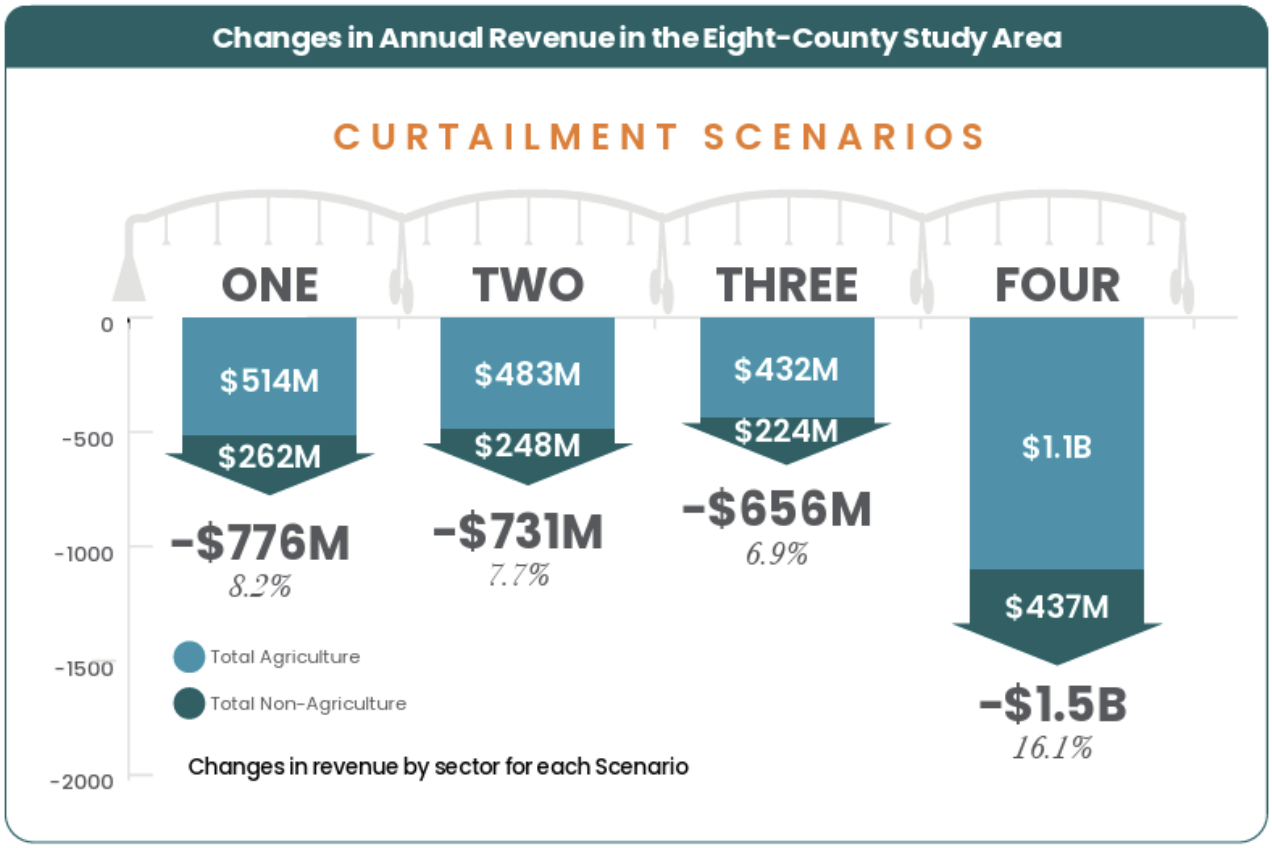

Figure 3: Changes in Annual Revenue in Eight-County Study Area

Conclusions

Achieving compliance with the 2030 land retirement requirement will avoid the negative economic consequences of basin-wide groundwater curtailment. This report underscores the cost of basin-wide curtailment on the State of Colorado and neighboring areas in Kansas and Nebraska. The findings can also inform policymakers and stakeholders about the economic implications of alternative land use scenarios.

The full report for this study can be found on the Colorado Water Center website: https://watercenter.colostate.edu/reports/