Agricultural and Resource Policy Report

Colorado State University Cooperative Extension

Department of Agricultural and Resource Economics, Fort Collins, CO 80523-1172 January 2003-APR 03-01

Estimated Economic Impact of Well Depletions By the Groundwater Appropriators of the South Platte (GASP)

James Pritchett and Stephan Weiler1

Water shortages created by a sustained drought impose economic losses on many groups including municipalities, manufacturers and agriculture. During a drought, irrigated agriculture suffers production losses that range from simple yield reduction to outright crop failure because of reduced water supplies. Crop losses hurt Colorado counties directly due to lost revenues, and indirectly according to lost wages and reduced purchases of goods and services.

Economic losses from a drought are not shared proportionately. Rather, Colorado allocates surface water according to a prior appropriation doctrine in which users with the earliest water right are allocated water first. As a result, junior water right holders typically suffer greater drought losses relative to senior water right holders. A water court system typically oversees administration of the prior appropriations doctrine.

Tributary groundwater users who pump from wells were made part of the prior appropriation doctrine in 1969; and must purchase or lease surface water rights to replace depletions that their out-of-priority pumping creates. In the early 1970s, producers organized groups to purchase or lease water rights for replacement of their out-of-priority depletions. As an example, the Central Colorado Water Conservancy District maintains a $50 million portfolio of permanent water rights for replacement. Another organization, the Groundwater Appropriators of the South Platte, primarily leases temporary water rights as a replacement plan. Until recently, Colorado's Division of Water Resources oversaw the replacement plans of these tributary groundwater users.

A recent water court ruling has shifted the oversight of water replacement plans from the Division of Water Resources to the water court system. Consequently, groundwater users will need to file replacement plans with their respective water courts. Groundwater users

1 Authors are an Assistant Professor in the Department of Agricultural and Resource Economics and an Associate Professor in the Department of Economics, respectively at Colorado State University, Ft. Collins, CO, 80523-1172. Contact: James.Pritchett@ColoState.edu T:970-491-5496; F:970-491-2067.

who do not already have permanent rights will likely be required to purchase expensive water rights or forced to shut down their wells (Jackson).

The purpose of this study is to estimate the economic impact of one augmentation group, the Groundwater Appropriators of the South Platte (GASP), whose members may not be able to pump groundwater in 2003 due to the recent water court ruling. Economic effects quantified in this study include the direct contribution of GASP-member lands to the economies of the five primary counties in which GASP resides, as well as the indirect effects that GASP lands have on the five primary counties' businesses and households.

Groundwater Appropriators of the South Platte (GASP)

GASP handles the depletion replacement plan for approximately 3,500 wells in five primary counties: Adams, Logan, Morgan, Sedgwick and Weld. These wells provide water to roughly 180,000 acres -- 25% of the irrigated acres in the five counties. Corn is grown on a majority of GASP irrigated lands (50%) followed by alfalfa hay (33%), while sugar beets (4%), small grains (7%) and vegetables (7%) comprise the remainder (Garcia).

The analysis focuses on the economic contribution of GASP irrigated lands for Adams, Logan, Morgan, Sedgwick and Weld counties. It is an economic snapshot of the direct and indirect effects that GASP lands have on the five counties. Because it is a snapshot, the economic contribution reported in this study is likely to be greater than the losses that might occur from a GASP well shutdown. As an example, the analysis assumes no cropping alternatives exist for GASP lands when, in truth, dryland crops may be grown mitigating losses from the well shutdown. Furthermore, it's assumed that surface water rights are not available in sufficient quantity to grow irrigated crops on all of the GASP lands if groundwater pumping is disallowed (Garcia). Lastly, the estimated economic activity is not solely attributed to water; rather, other inputs such as land also contribute to the economic activity of the five counties documented in this study.

On a final note, the economic contribution of GASP wells is but one part of society's stake in water use for the South Platte River Basin. If groundwater wells pump without replacement, junior and senior surface water right holders will certainly be harmed, as will the counties in which they operate. Water right holders include both other irrigating farmers and municipalities, and their losses may outweigh the losses of a GASP well shutdown. Thus, the report does not suggest the highest or best use of water resources in the South Platte River Basin.

Economic Effects of Irrigated Lands Covered by GASP Replacement Plans

Economic contributions can be placed in two categories: direct effects and indirect effects. Direct effects are revenues from the sale of corn, alfalfa hay, vegetables, and other crops. Table 1 shows the direct effects by sector, which total more than $79 million.

Table 1. Direct Contribution of GASP Lands to the Five Counties

Crop Category	Annual Contributed Revenues
Food Grains	$2,242,093
Feed Grains	$33,117,324
Alfalfa Hay	$25,076,684
Vegetable	$14,465,524
Sugar Beets	$4,504,767
Total Effect	$79,406,392

As indicated in Table 1, feed grains (e.g., corn) and alfalfa hay are the greatest contributors to the GASP lands in five counties totaling $58 million. Vegetables and sugar beets also provide significant revenues in spite of being grown on fewer acres. Of course, these contributions are revenues to producers and do not reflect the profits that producers receive.

Agricultural sales create ripples that indirectly affect other businesses in the five counties. These indirect effects belong to sectors related to irrigated agriculture including agricultural services such as crop consultants, wholesalers of irrigation equipment, feedlots that purchase feed ingredients, and similar businesses. The indirect effect of GASP irrigated production on businesses in the five counties is estimated at more than $50 million, and the sectors primarily impacted by GASP lands are listed in Table 2.

Table 2. Indirect Effect of GASP Lands on Selected Sectors

Sector	Yearly Revenue Contribution
Wholesale Trade	$8,183,487
Real Estate Services	$6,309,673
Agricultural Services	$3,778,129
Petroleum Refining	$2,875,815
Transport & Warehouse	$2,814,412
Facility Maintenance	$2,045,865
Livestock	$1,054,424
Farm Machinery & Equip.	$1,034,262
Ag Fertilizers & Chemicals	$1,032,221
Household Spending	$10,840,100
Total Indirect Effects	$51,526,378

*Some sectors experiencing indirect effects have been omitted for brevity, so the individual sectors in Table 2 do not sum to the total.

The indirect effects listed in Table 2 represent the additional economic value generated by irrigated production of lands under the GASP depletion replacement plans. The wholesale trade experiences significant impacts (more than $8 million), while the agricultural services sector receives more than $3.7 million in revenues. The livestock, farm machinery and agricultural fertilizer/chemical sectors each garner indirect effects greater than $1 million.

GASP lands also induce additional economic activity in the five counties via household spending on goods and services purchased from retailers, grocery stores, restaurants, gas stations, and so on, which are attributed to income and salaries derived from irrigated agricultural production. The induced economic effect generated by GASP irrigated lands is estimated as $10,840,100 and is listed near the bottom of Table 2.

An estimate of the total economic contribution of irrigated crops from GASP wells can be derived as the sum of its direct and indirect effects. The total contribution is estimated at $130,932,770; that is, the economic contribution of irrigated agricultural production covered by GASP replacement plans is estimated at nearly $131 million.

What's Missing?

Persistent drought creates economic hardship for water users in the South Platte River Basin. These economic losses are not borne equally among groundwater irrigators, surface water irrigators, and municipalities. While this analysis considers the economic contribution of groundwater wells whose depletions fall under GASP, the potential losses to other stakeholders have not been considered. Additional insights can be gained by considering impacts to these stakeholders.

Surface water irrigators will sustain economic losses if GASP wells are allowed to pump without adequate replacement. Their losses are similar to those of groundwater users in effect (i.e. decreased yields or total crop failure), but it is uncertain if the total economic loss of surface water irrigators would be greater than or less than groundwater irrigators. The extent to which their losses are comparable to groundwater users depends on the crop composition for the area (i.e., do senior surface irrigators produce the same crops as the junior groundwater irrigators), the timing of the water shortage, and the severity of the shortage.

Municipalities with junior water rights may be asked to bypass water into the South Platte River during a drought to cover the needs of more senior surface water users, and will certainly have to release relatively more if groundwater users pump without adequate replacement. Municipal governments often respond to water shortages by restricting use and by leasing additional water rights. Water rights are currently at prices ranging between $300 and $400 per acre-foot, and an acre-foot will provide two average households with enough water for one year. The GASP wells pump between 250,000 and 300,000 acre-feet of water each year.

Summary and Conclusions

This study estimates the total economic contribution for Adams, Logan, Morgan, Sedgwick, and Weld Counties of irrigated lands whose depletion replacement plan is covered by the Groundwater Appropriators of the South Platte (GASP). The contribution is estimated at $130,932,770, and the total effect may be decomposed into the direct effects of agricultural sales ($79,406,392) and the indirect effects on sectors related to agricultural production ($51,526,378). The economic contribution is an overstatement of the losses that occur if GASP wells are unable to pump by assuming that no other crops may be grown in lieu of irrigated crops. Finally, the economic activity in this study cannot be solely attributed to water because other inputs are also used generate the $130 million value.

Care must be taken when interpreting these results. The tool used to generate the estimates of the impacts is called a "multiplier." A multiplier is a term referring to the total amount of economic activity or the impact generated by a dollar of export sales. Multipliers are imperfect measures of economic impacts and changes in social welfare; however, they do generate estimates from which policy discussions can take place. In isolation, multipliers do not indicate the opportunity cost of using a scarce resource like water in a particular activity; in other words, they do not indicate the highest and best use.

References

Garcia, Luis. Associate Director, Colorado Agricultural Experiment Station. Personal Communication. Jan. 9, 2003.

Jackson, B. "State's well operation may depend on new legislation." Greeley Tribune. January 8, 2003. Internet URL http://www.greeeleytrib.com.