

Regional Economic Impacts of Reduced Irrigated Acres: Colorado's Arkansas River Basin

A large center pivot irrigation system is shown in a field. The system consists of a long metal pipe supported by a series of metal trusses and wheels, extending from the foreground into the distance. The field is divided into sections of brown, tilled soil and green, growing crops. The sky is clear and blue.

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The Presentation's Path

- The Arkansas Basin
 - Economic baseline
 - Composition of the agricultural sector
 - Forecast of water supply and demand
- Economic impact analysis
 - General Overview
 - IMPLAN
 - Results

Arkansas Basin

- Colorado's largest river basin in (27% of State's land area), comprised of all or parts of 16 counties in the southeast corner of the state
- The basin's population has increased 28% since 1990 (from 662,400 to 849,124) and is expected to grow by another 55% by the year 2030

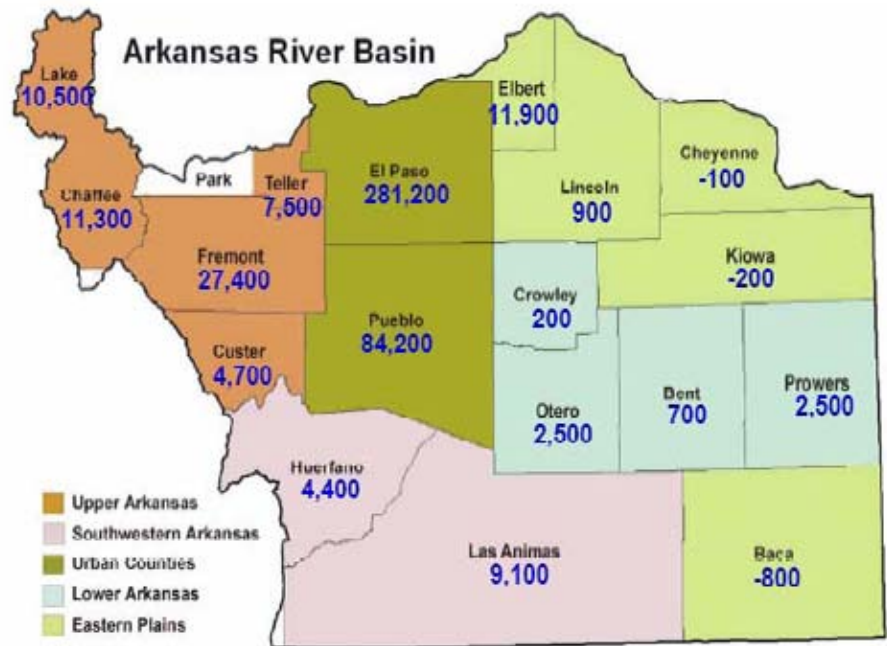


Figure 3 Arkansas Subbasins and Changes in County Populations 2000 to 2030



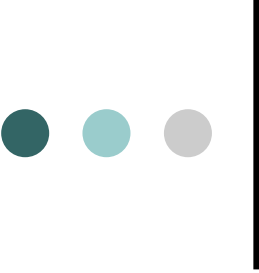
Stakeholder Questions

- How important is irrigated agriculture to the Arkansas basin economy, both directly and indirectly?
- Which economic sectors suffer the most as irrigated acres dry-up?



Economic Demographics of the Arkansas Basin

| Industry | <i>Value of Sales (million \$)</i> | <i>Percentage of Total</i> |
|--|------------------------------------|----------------------------|
| Total | \$45,189 | 100 % |
| <i>Government and non-NAICs</i> | \$7,970 | 17.6 % |
| <i>Manufacturing</i> | \$7,151 | 15.8 % |
| <i>Construction</i> | \$3,857 | 8.5 % |
| <i>Information</i> | \$2,957 | 6.5 % |
| <i>Retail trade</i> | \$2,865 | 6.3 % |
| <i>Finance and insurance</i> | \$2,813 | 6.2 % |
| <i>Other services</i> | \$2,690 | 6.0 % |
| <i>Health and social services</i> | \$2,686 | 5.9 % |
| <i>Scientific and Technical Services</i> | \$2,527 | 5.6 % |
| <i>Real Estate and Rental</i> | \$2,222 | 4.9 % |



Economic Demographics of the *East Arkansas Basin*

| Industry | <i>Value of Sales (million \$)</i> | <i>Percentage of Total</i> |
|---|--|--------------------------------|
| Total | \$2,001.26 | 100 % |
| <i>Cattle Ranching and Farming</i> | \$371.38 | 18.6 % |
| <i>State and Local Government</i> | \$215.58 | 10.8 % |
| <i>Irrigated Crops</i> | \$119.34 | 6.0 % |
| <i>Owner-Occupied Dwellings</i> | \$108.92 | 5.4 % |
| <i>Monetary Authorities and Depository Credit</i> | \$89.10 | 4.5 % |
| <i>Wholesale Trade</i> | \$57.61 | 2.9 % |
| <i>Physicians, Dentists, etc.</i> | \$48.06 | 2.4 % |
| <i>Other Animal Food Manufacturing</i> | \$47.99 | 2.4 % |
| <i>Food Services and Drinking Places</i> | \$41.91 | 2.1 % |
| <i>Real Estate</i> | \$33.54 | 1.7 % |



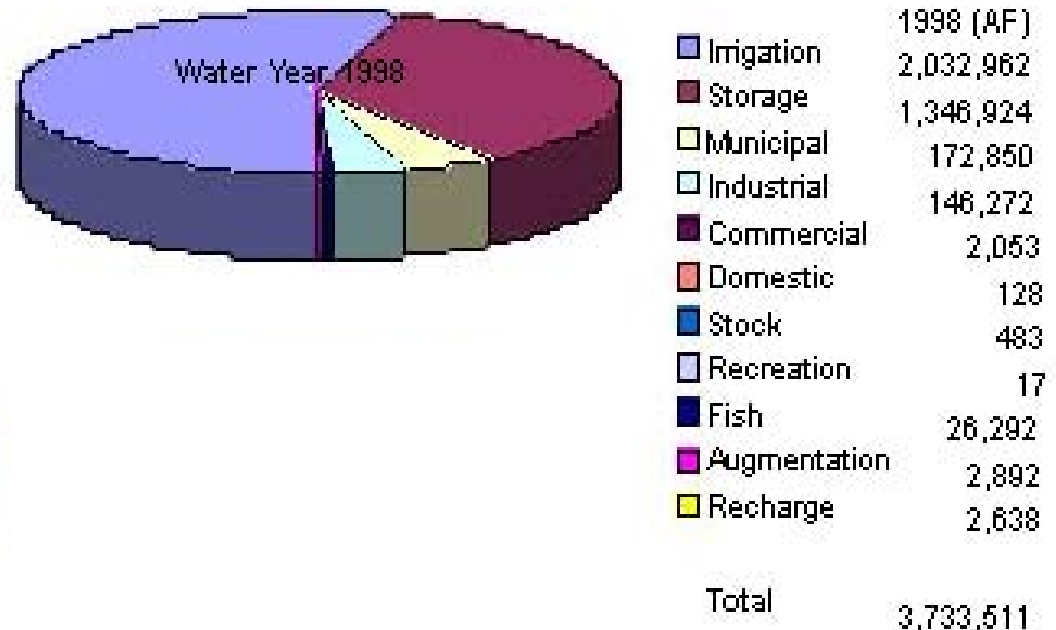
Value of Sales by Irrigated Crop for East Arkansas Basin

| Crops | <i>Total Production</i> | <i>Value of Sales (million \$)</i> | <i>Percent of Total</i> |
|---------------------------|-------------------------|--|-----------------------------|
| Total | | \$119.34 | 100 % |
| <i>Hay (TON)</i> | <i>645,825</i> | <i>\$64.58</i> | <i>54.1%</i> |
| <i>Sorghum Grain (BU)</i> | <i>8,007,500</i> | <i>\$26.41</i> | <i>22.1 %</i> |
| <i>Corn Grain (BU)</i> | <i>6,811,200</i> | <i>\$14.64</i> | <i>12.3 %</i> |
| <i>All Wheat (BU)</i> | <i>1,927,800</i> | <i>\$5.30</i> | <i>4.4 %</i> |
| <i>Corn Silage (TON)</i> | <i>184,500</i> | <i>\$4.06</i> | <i>3.4 %</i> |
| <i>Soybeans (BU)</i> | <i>393,330</i> | <i>\$2.89</i> | <i>2.4 %</i> |

Water Use in the Arkansas Basin

- Agriculture is the major surface water user (2 million AF per year used to irrigate 235,141 acres)
- Groundwater also used for irrigation, livestock, municipal and domestic uses
- Surface and groundwater in the basin are closely interrelated, resulting in conjunctive water use practices

Surface Water Diversions in Acre-feet by Use



Source: [Colorado Division of Water Resources, Division 2 Annual Reports](#)



Projections of Reduced Irrigated Cropland in Arkansas Basin

| <u>Source</u> | <u>Reduction in Irrigated Acres</u> |
|-------------------------------|--|
| Transfers | 17,000-59,000 |
| Urbanization (development) | 2,300-4,500 |
| Other Reasons | 4,000-8,000 |
| Total | 23,000-72,000 (10-31% of total irrigated acres in East Arkansas Basin) |



How to Measure the Economic Effects?

- **Economic impact analysis** examines the effects of such a change on an entire economy
- The total loss to the economy is more than just the value of lost sales
- Whenever one sector reduces production, the impact ripples through the other sectors of the economy, reducing demand for *their* output too, and reducing employment and income in the region.



Input-Output Models

- **I-O Models** describe commodity flows from producers to intermediate and final consumers
- I-O models measure 3 types of effects:
 - Direct (lost sales)
 - Indirect (support industry losses)
 - Induced (lost wages and reduced household spending)
- **IMPLAN**



Limitations of Current Study

- Instantaneous (not dynamic)
- Impacts are for small changes
- Local vs. global effects (size and diversity of study area important in determining effects of impact)
- Distributional effects (people with different levels of income, education, etc. likely to be affected differently)



Impact Components

| Estimated Acres Lost | Direct Impact (million \$) | Indirect Impact (million \$) | Induced Impact (million \$) | Total Impact (million \$) |
|----------------------|----------------------------|------------------------------|-----------------------------|---------------------------|
| 47,500 | - \$13.80 | - \$5.46 | - \$1.07 | - \$20.33 |



Impact Relative to Total Output and Agricultural Output

| Total Impact (million \$) | Impact as % of Total Output | Impact as % of Agriculture | Impact as % of Irrigated Crop Sales | Economic Activity per Irrigated Acre |
|---------------------------|-----------------------------|----------------------------|-------------------------------------|--------------------------------------|
| - \$20.33 | 1.0% | 3.2% | 13.9% | \$428 |



Impact by Sector (million \$)

| <u>Sector</u> | <u>Direct</u> | <u>Indirect</u> | <u>Induced</u> | <u>Total</u> |
|--------------------------------------|---------------|-----------------|----------------|--------------|
| Irrigated Crops | - \$13.80 | - \$3.33 | - \$1.84 | - \$17.13 |
| Ag & Forestry Support | 0 | - \$0.58 | 0 | - \$0.58 |
| Wholesale Trade | 0 | - \$0.22 | - \$0.04 | - \$0.26 |
| Cattle Ranching & Farming | 0 | - \$0.22 | - \$0.01 | - \$0.23 |
| Owner-Occupied Dwellings | 0 | 0 | - \$0.19 | - \$0.19 |



For More Information

- Fact sheets can be found at:

<http://dare.agsci.colostate.edu/csusagecon/extension/pubstools.htm>

- Full report can be found at:

<http://cwrri.colostate.edu/pubs/series/completionreport/crlist.htm>



Questions?
Comments?

Thank
you!



What about forward linkages (Dairy and Livestock Farmers)?

- Colorado is a grain-deficit state, meaning that we already import grain (mainly for dairies and feedlots), so a reduction in irrigated acres will likely not have a huge effect on livestock farmers.
- Will likely be some increased costs but these will not be of great magnitude, especially at the margin, which is what most production decisions are concerned with.
- 1990 study of economic impact of agriculture-to-urban water transfers in the Arkansas River Basin.
 - no evidence that the phase-outs of feed grains, hay, and irrigated pasture held back the expansion of feedlots
 - no significant forward linkages during study period
- Texas Panhandle: has experienced a reduction in irrigated acreage in recent past, yet more cattle production there than ever before.



What about forward linkages (Dairy and Livestock Farmers)?

- Fears of dairy and livestock farmers in eastern Colorado, though quite valid, may be somewhat overstated.
- However, these are merely examples of what has occurred in the past; future impacts may be somewhat different due to different study area and time frame.
- Thus, further study on these specific industries would be beneficial and is encouraged.



Future Research

- Econometric study of economy tipping points
- Producer survey
 - Which irrigated crops most likely to be dried up?
 - What will be done on lost acres (fallow, graze, dryland farming)?