Water Market Insider
WestWater Research LLC
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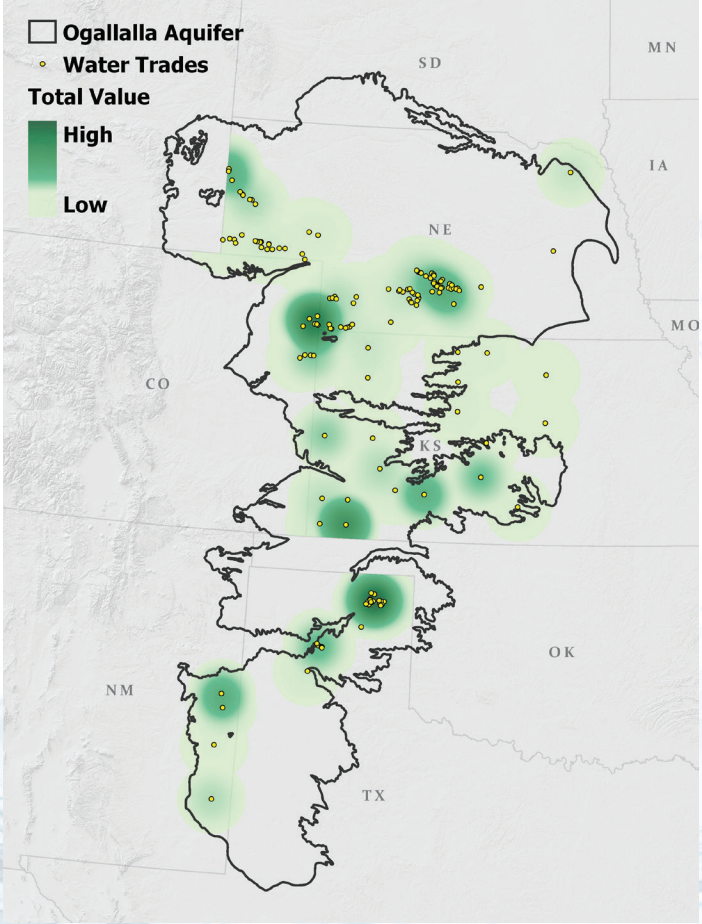
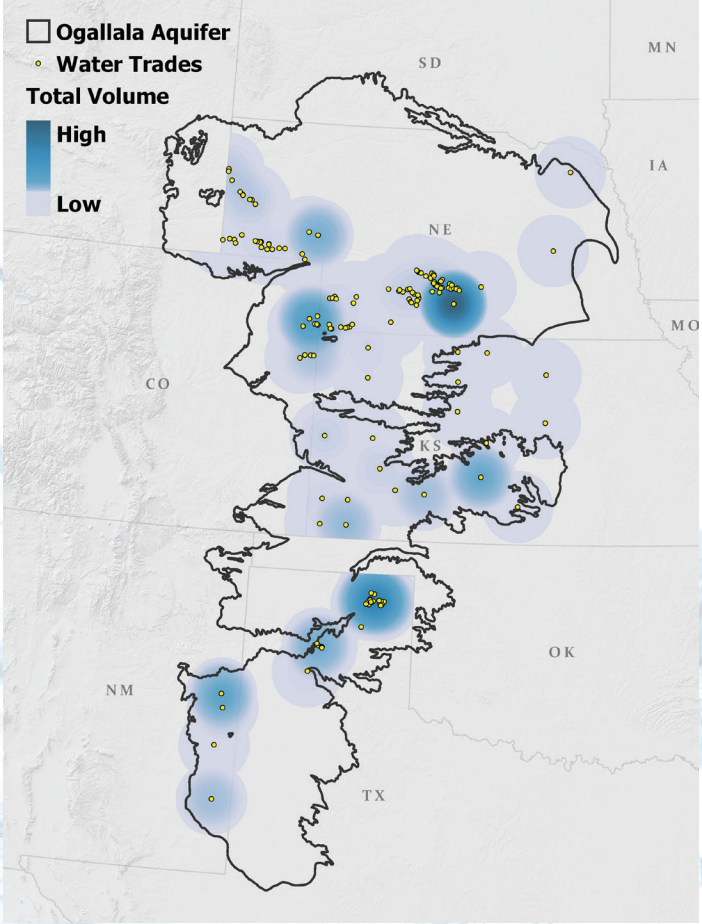
Water Markets in the Ogallala

A Finite Resource

The Ogallala Aquifer is one of the largest groundwater basins in the United States, underlying eight states and supplying over 30% of the groundwater used for irrigation in the entire United States. Roughly $7 billion worth of crops are grown each year with groundwater supplied by the aquifer. The Ogallala Aquifer is quite stratified, both in terms of groundwater available and in how states are managing the resource.

Since pre-development (1950), the Aquifer has seen about 270 million acre-feet of overdraft, which represents a 9% decline in total groundwater storage. In some states, state regulation is sparse and new well permits are still being issued despite notable drawdown in groundwater levels. In other states, water agencies have taken proactive approaches by placing moratoriums on new well permits, limiting pumping, and retiring irrigated lands. Physical and institutional water scarcity are often catalysts for water market development, and so WestWater spent time this summer examining water trades in the Ogallala Aquifer in Colorado, Kansas, Nebraska, New Mexico, and Texas. Research was also conducted in Oklahoma, but no water trading activity was found.



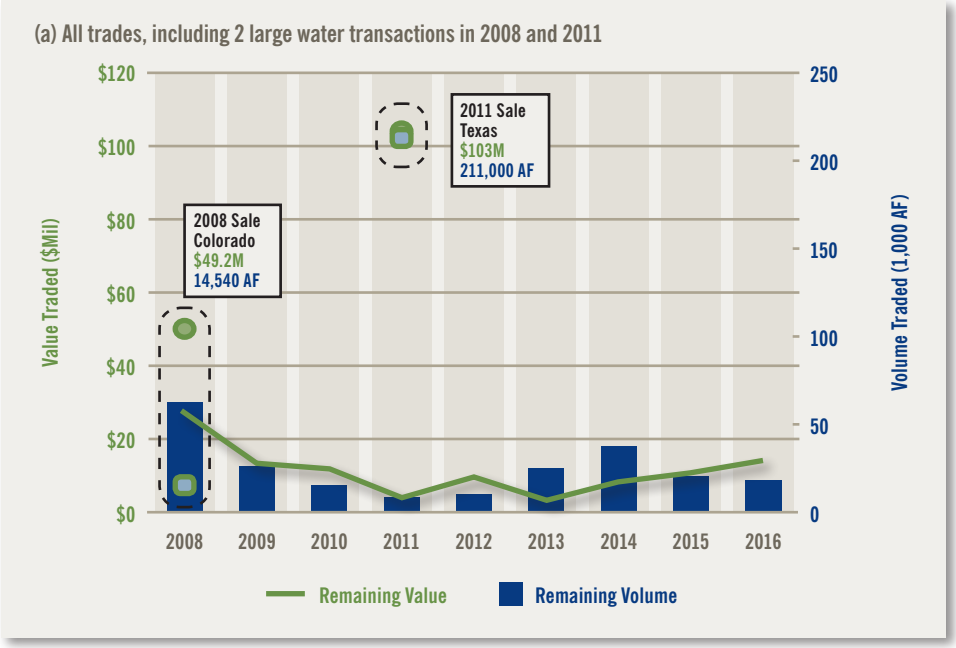


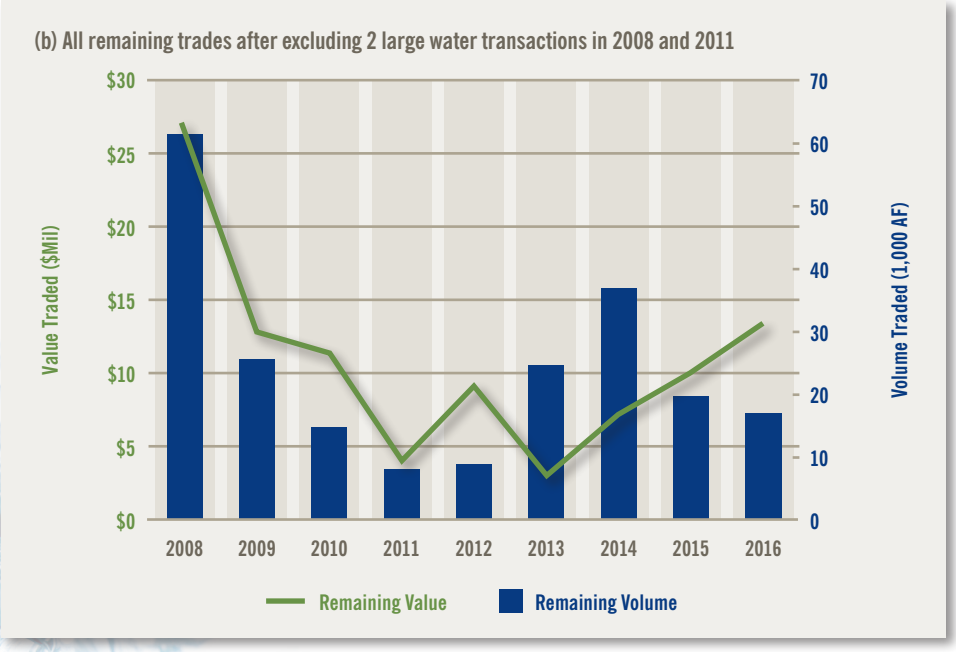
Regional Rundown

Water trading activity in the Ogallala Aquifer region remains limited, with only 270 total water trades found over the period 2008-2016. This period saw an estimated 441,900 acre-feet of water rights change hands through sales and leases, corresponding to an average of 49,100 acre-feet of annual trading volume. This compares with total groundwater use of roughly 19 million acre-feet per year across 14 million acres served by groundwater. Total value traded over this time period was approximately $250 million, or $27 million per year. By comparison, water rights trading across the rest of the Western U.S. is estimated to be approximately 1.8 million acre-feet per year, with a corresponding annual average value of $385 million. The Ogallala Aquifer region as a whole represents 3% of volume and 7% of value compared to water market activity across the Western U.S. Figure 1a provides a summary of water transaction activity over the last decade. The sporadic trading activity in the region means that single large transactions can skew data trends and averages. For the Ogallala Aquifer region, two large water trades in 2008 and 2011 make up about half of the total volume and value traded over the recent period. These two trades are summarized in the sidebar. Removing these two trades, Figure 1b shows that water market activity in the Ogallala has dropped since 2008, with a temporary increase around 2014.

Water transactions in the Ogallala region are typically driven by the decisions of a local water authority addressing one of the following two issues:

Figure 1: Annual Water Trading Activity in the Ogallala Aquifer, 2008-2016





Regulatory Requirement. A local groundwater management authority, often representing hundreds of groundwater users, acquires water rights to fulfill a regulatory requirement, such as Nebraska's state policy goal to achieve sustainable levels of groundwater pumping or Colorado's interstate compact obligations and local groundwater management policies. These types of water acquisitions are initiated by the adoption and/or enforcement of the regulatory requirement, and are often funded using publicly generated money such as taxes, levies, and government bonds. This market driver has been seen in Eastern Colorado and Nebraska.

Municipal Supply Shortages. A local municipal water utility is experiencing a water supply shortage, resulting from either demand growth on limited existing supplies or a reduction in available supply from historic sources. Examples include the permanent sales completed by the City of Amarillo (TX) and several 10-year leases entered into by EPCOR (NM). These water acquisitions are funded through water rates paid by customers served by the water utility. This market driver has been seen in Eastern New Mexico, western Kansas, and the Texas Panhandle.

State by State Rundown

Each state overlying the Ogallala has a unique water market. Texas represents 50% of the total value traded across the region and 64% of the trading volume; while Nebraska represents close of half of the total number of transactions, but only 8% of the value and 18% of the volume (see Table 1). These variations result primarily from different transaction terms (sales vs. leases), and also buyer price perspectives. Figure 2 provides a map of water trading hotspots around the Ogallala Aquifer region, based on total trading values and volumes. Local market drivers (as described previously) have led to water transactions in the Texas panhandle, northeast Colorado, and southern Nebraska as the most active water market areas of the Ogallala. The overlying states have experienced different trading trends over the last decade (see Figure 3). Texas and Colorado saw the most active levels of trading from 2008 to 2011, with more limited activity in recent years. In contrast, Nebraska, Kansas, and New Mexico have all seen increases in water trading volumes since 2011/2012, although annual volumes remain relatively small with Nebraska seeing.

Colorado

- There have only been 11 water trades over the last decade, with the Republican River Water Conservancy District as the primary buyer. The District has acquired water rights to supplement streamflows in the Republican River in order to meet interstate compact obligations with Kansas and Nebraska, and also to permanently retire water uses in the basin.
- All water trades have been permanent sales, with an average unit price of approximately $1,800 per acre-foot of transferred water. This represents the highest average price across the region, and corresponds with expected agricultural returns from corn.

Kansas

- Two water markets were identified: (1) a lease market operated as an electronic exchange through the Central Kansas Water Bank Association, and (2) a sales market made up of isolated water acquisitions to meet new municipal and industrial demands.
- The lease market has been active since 2014 with only 14 leases totaling 2,084 acre-feet. Recent lease rates have been in the range of $70 to $100 per acre-foot.
- The sales market was estimated based on water right transfer records, which show acquisitions by the municipal sector and companies in the food and energy industries (including dairies, feedlots, and biogas plants). Water right sale prices were assumed to track with farm returns for growing corn, with prices ranging from $1,500 per acre-foot in 2008 to $3,000 per acre-foot in 2014. A total of 70 potential sales were identified over the past decade, with a corresponding trading volume of 22,490 acre-feet.

Nebraska

- All water trades identified in Nebraska were tied to activities of the Natural Resource Districts (NRDs), which were established by the state to manage local groundwater and other natural resources. The NRDs have been acquiring water rights through sales and leases to provide for

Table 1: Water Market Activity Totals by State (2008-2016)

State	Number		Value		Volume (AF)	
Texas	26	10%	$125,989,059	50%	280,870	64%
Nebraska	127	47%	$19,025,693	8%	80,364	18%
Kansas	84	31%	$29,290,459	12%	24,576	6%
Colorado	11	4%	$68,006,283	27%	37,690	9%
New Mexico	22	8%	$8,022,530	3%	18,444	4%
Total	270		$250,334,024		441,944	

Figure 3: Annual Water Trading Volumes by State, 2008-2016

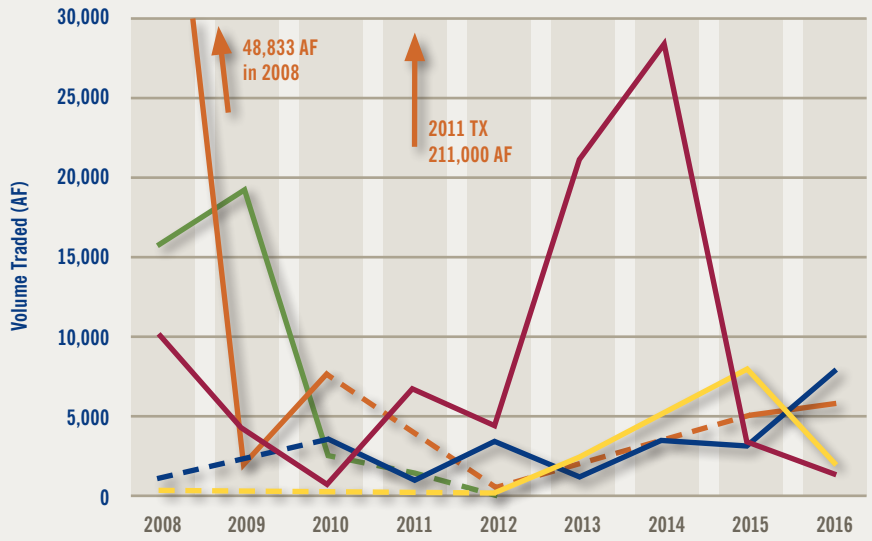


Figure Notes: Dashed lines represent interpolated values between points of known trading volumes for each state. Data does not include the 3 large water trades referenced in Figure 1.

enhanced instream flows and to reduce groundwater pumping, with a goal of eventually reaching sustainable groundwater use within the NRD boundary.

- There are a total of 23 NRDs in Nebraska, and 6 of them have made water acquisitions over the past decade. The Central Platte NRD has been the most active in terms of number of trades (40%) but with a limited trading volume (2%). The Tri-Basin NRD has traded roughly 83% of the volume, followed by the North Platte NRD with 12%.
- About 80% of the 127 identified water transactions over the past decade have been permanent sales, and most (85%) of the total trading value has come from sales. The sales are typically small volume transactions, such that over 90% of the trading volume has been through lease agreements.

New Mexico

- A small slice of Eastern New Mexico overlies the Ogallala Aquifer, and partly as a result, New Mexico showed the smallest trading volumes and value of the five states included in the research.
- Two separate water markets were identified in Eastern New Mexico. In Curry County, the Edmonton Power Corp. (EPCOR) acquired New Mexico American water company in 2012 and provides municipal water supply to the City of Clovis and other towns in the region. Groundwater drawdown has forced EPCOR to acquire new supplies, in the form of 10-year water leases from irrigation wells. Beyond this timeframe, EPCOR and other municipal water systems in the area are hopeful that the Eastern New Mexico Water Utility Authority will be successful in funding the construction of a regional water system served from Ute Reservoir. EPCOR has entered into 8 leases since 2013 for close to 10,000 acre-feet of total supply. In Lea County, oil and gas activity in the Permian Basin has prompted water right transfers to develop water

Interesting Transactions

Canadian River Municipal Water Authority (Texas)

Constructed in 1965 by the BOR as part of the Canadian River Project, Lake Meredith was once an expansive Reservoir, originally supplying an estimated 103,000 acre-feet of municipal water to Texas' panhandle cities. Located approximately 30 miles north of Amarillo, Lake Meredith's water yields have dropped significantly over the following 4 decades, and by 2012 no water was delivered to municipalities from the lake at all. In light of this shortage, the Canadian River Municipal Water Authority (CRMWA) embarked on a campaign to purchase extensive amounts of groundwater rights. From about 2007-2001, CRMWA purchased 423,100 acres for groundwater production at a price of $179 million. The bulk of the acreage came from a single deal signed with Mesa Water, for 211,000 acres at $103 million. Presently, CRMWA owns over 444,000 acres for groundwater production; comprising nearly half of Roberts County, parts of Hutchinson, Gray, Wheeler, Carson, Hemphill and Lipscomb counties, and claims to be the largest water right holder in the state. The city of Amarillo, a member of CRMWA, has also been adding to their water rights portfolio significantly in the last decade. Their largest acquisition was a secondary purchase associated the CRMWA/Mesa Water deal, in which Amarillo agreed to pay approximately $17 million for the ownership of over 34,000 acres of groundwater rights, which abutted their existing ownership in neighboring Ochiltree County.

Republican River Water Conservation District (Colorado)

In 2004, the Republican River Water Conservation District (RRWCD) was created by the Colorado General Assembly to maintain the state's obligations under the Republican River Compact by sustaining the surface water of the Republican River as well as the Ogallala aquifer. The District's administrative boundary encompasses the majority of the Northern High Plains designated basin. The RRWCD collects water use fees that fund the District's operations, including permanent acquisitions of irrigated land and water rights. In 2008, the District purchased almost 15,000 acre-feet of groundwater rights for just over $49 million to supply a stream augmentation project, which supplements flows into the Republican River to meet interstate compact obligations. For that project, the RRWCD received a $60 million loan from the Colorado Water Conservation Board, which paid for both the pipeline construction costs as well as the water rights which had historically irrigated 10,000 acres of land. Fifteen wells are authorized to pump 62 consolidated water right permits. The pipeline was fully operational in 2014, and has pumped approximately 11,000 acre-feet each year. As of 2017, groundwater levels in the wellfield are holding steady. The pipeline operates from fall to spring, and draws from saturated thickness of over 200 feet.

supplies for fracking activities. Trades and trading volume are about split between leases and sales. A total trading volume of 3,700 acre-feet was identified in Lea County.

Texas

- Texas saw the most water market activity over the past decade, in terms of both volume and value. As discussed, this dominance results from one large transaction in 2011 which transferred 211,000 acre-feet at a cost of $103 million to a regional municipal water provider. Beyond this one large trade, 25 other permanent acquisitions by the City of Amarillo were identified totaling about $23 million for 69,800 acre-feet. Water market activity in the Texas Panhandle has been driven by municipalities seeking additional water sources.

WestWater would like to thank Lacey Moore for her dedicated research efforts to compile this information during her 2017 summer internship with us. Lacey is currently working on her graduate degree in Agricultural and Resource Economics at Colorado State University.

Stationary Markets

Across the region, continued overdraft of the Ogallala Aquifer has not prompted significant water market activity, at least over the last 10 years. Trading activity remains low across most of the area due to a lack of new water demands to drive the market. The two market drivers noted previously, addressing regulatory requirements and municipal demand growth, are expected to continue to be the dominant influences on water trading over the next decade. Both Nebraska and Colorado could continue to see water trading to address state and local water policy objectives, but likely at levels similar to what has been seen over the past decade. Water market activity in Kansas, the Texas Panhandle, and Eastern New Mexico has been driven by municipal and industrial demands looking for new and alternate sources of water supply. Trading volumes are anticipated to remain small in the near-term, as several buyers have built up their water portfolios in recent years, but are likely to increase into the future as municipal and industrial demands continue to grow and seek supplies in a water-limited region.