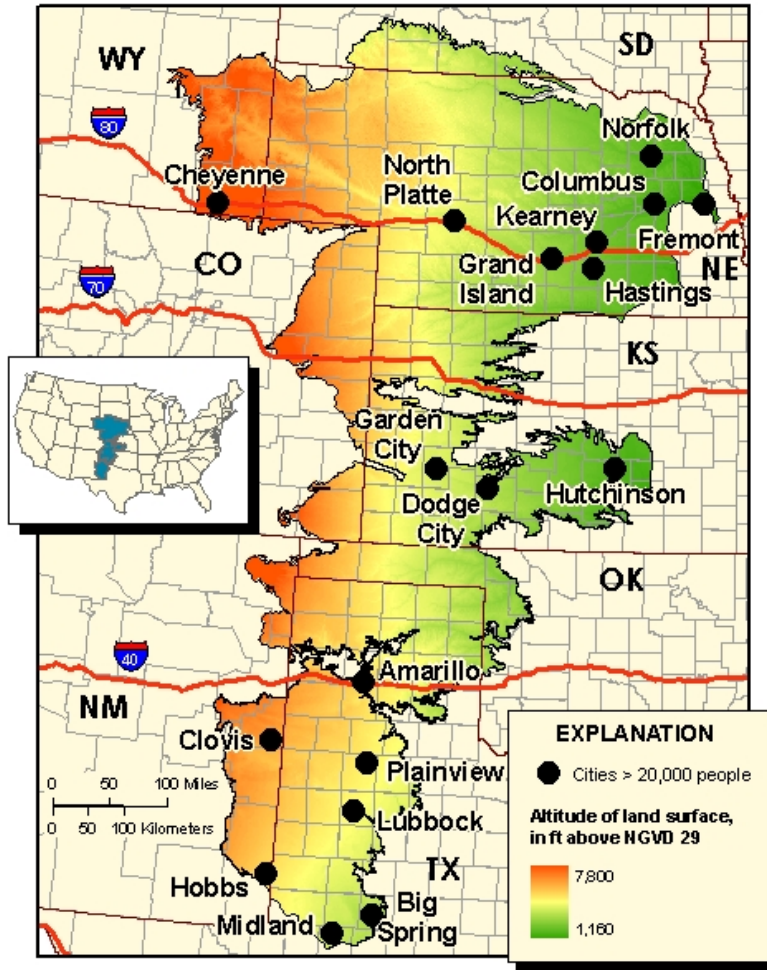


REAP ports

Groundwater Irrigation and Water Withdrawals: The Ogallala Aquifer Initiative



This report is a product from the Strategic Planning and Accountability
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Cover: Location of the Ogallala High Plains Aquifer showing the aquifer boundary, major cities and roads, and altitude of land surface by the US Geological Survey.

Groundwater Irrigation and Water Withdrawals: The Ogallala Aquifer Initiative

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Summary

Groundwater supplied irrigation is an important component of the agricultural sector in the counties in the eight States that overlay the Ogallala High Plains Aquifer. Crop sales from groundwater supplied lands accounted for more than \$7 billion in 2007, about 60 percent of the crop sales in the eight-State region and more than 10 percent of national irrigated crop sales. Irrigated farms in the region produce primarily grain crops. Roughly half the region's farms with irrigation, groundwater-irrigated acres, and groundwater-based sales are located in Nebraska.

Technical and financial assistance provided through several NRCS conservation programs, including the Ogallala Aquifer Initiative (OAI), support the sustainability of irrigated agriculture in the Ogallala Aquifer Region. These programs provide opportunities for reducing the quantity of groundwater withdrawn and the energy required for irrigation. From 2009 to 2012—the implementation period of the 2008 Farm Bill—the NRCS provided assistance for conservation systems that reduced the quantity of water withdrawn from the aquifer by an estimated 1.5 million acre-feet and reduced energy needs by almost 33 million gallons of diesel equivalent. More than 60 percent of the reduced withdrawals were attributable to NRCS practices that converted from irrigated to nonirrigated land uses, about 33 percent to practices that improved irrigation technology, and about 4 percent of the reduced withdrawals from improving irrigation water management with existing technology on existing acres.

As expected, Nebraska accounted for the greatest reduction in water withdrawals, expected since it accounts for the greatest acreage and withdraws the most water for irrigation from the aquifer. Surprisingly, Oklahoma had the second greatest reduction in water withdrawals and the greatest reduction in withdrawals when compared to the total quantity withdrawn for irrigation. Oklahoma reduced withdrawals by more than 30 percent when compared to published USGS estimates of irrigation withdrawals. One additional State exceeded 5 percent (Colorado), and all other States were less than 2 percent.

The OAI practice implementations accounted for more than one-quarter of the reduced water withdrawals, 434,000 acre-feet, and reduced energy needs by 9.0 million gallons of diesel-equivalent. OAI accounted for as little as 3 percent of the reduced withdrawals from NRCS programs in Kansas to as much as 99 percent of the reductions in New Mexico. The OAI-funded practices in the large withdrawal States of Texas and Nebraska accounted for 36 and 24 percent of the reduced withdrawals, respectively. The conservation practices funded by the OAI were similar to those funded by all programs. However, the relative contribution of conversion to grasslands increased and contribution of conversion to nonirrigated cropland decreased relative to the practices funded by other programs. The OAI supported 47 percent of the reduced water withdrawals accomplished by conversion to grasslands, about 30 percent of improved technology, and 23 percent of reduced water withdrawals from improving irrigation water management.

Ogallala Groundwater Irrigation

Agricultural producers that rely on the Ogallala Aquifer and reside in the 215 counties that lie above the aquifer are much more dependent on grain production than irrigated producers nationally. Nationally, almost 80 percent of irrigated crop revenue comes from nongrain crops (vegetables, orchards, cotton, and horticulture). In the Ogallala counties region, that value is reversed with about 80 percent of the irrigated crop sales value coming from grain sales (corn, soybeans, and wheat).

In general, grain sales produce less revenue per acre than nongrain sales. The Ogallala counties produce about 11 percent of the Nation's irrigated crop sales from about 25 percent of the Nation's irrigated acres. Approximately 11 percent of the Nation's irrigated farms are in this region.

The Ogallala counties included in this analysis (see methods) were grouped by State, and table 1 reports several of the key findings. Table 1 includes the groundwater share of irrigation withdrawals for the Ogallala counties in each State. This value reflects the dependence of the irrigated agriculture on groundwater and, thus, relative importance of groundwater management. Irrigation in the Ogallala counties relies on groundwater for more than 99 percent of the irrigation withdrawals in Texas, but only 41 percent in South Dakota. The region relies on groundwater for about 88 percent of the water withdrawn for irrigation; more than 30 percent of the Nation's groundwater withdrawals for irrigation occur in this 215 county region.

Crop sales from irrigation in the Ogallala region totaled more than \$7.2 billion from irrigation on more than 14 million groundwater supplied acres in 2007, accounting for more than 60 percent of the regions crop sales and irrigated area. Nearly half the irrigated area and resulting sales were in Nebraska. In Nebraska, groundwater-based crop sales and acres irrigated accounted for more than 83 percent of the total crop sales and acres irrigated from all water sources (table 1). The importance of groundwater-based irrigation and crop sales relative to State totals was highest in Nebraska and Kansas and lower where many of the State's crops are grown outside the Ogallala area, such as South Dakota and Texas.

The Ogallala region contains about 32,000 farms, about 40 percent of the farms in the eight States, and more than 10 percent of the total farms in the Nation.

Table 1 Groundwater-based agriculture in the 215 counties over the Ogallala Aquifer

State	Groundwater irrigation withdrawals		Irrigated crop sales from groundwater		Irrigated acres from groundwater		Irrigated farms (all water sources)	
	taf	Share of withdrawals	Million \$	Share of State	Million acres	Share of State	Thousand farms	Share of State
NE	7,960	86.6	3,543.8	83.71	7.17	83.75	16.05	93.68
TX	5,601	99.3	1,851.7	3.76	3.54	0.71	6.02	30.51
CO	1,395	63.1	418.8	30.30	0.75	26.21	3.36	21.29
KS	2,845	97.0	1,289.4	87.71	2.44	88.43	4.56	76.50
WY	411	40.9	22.7	12.31	0.12	7.66	1.04	17.92
NM	514	85.6	82.8	16.93	0.21	25.88	0.76	7.43
OK	272	87.1	94.2	24.57	0.23	42.55	0.55	18.11
SD	22	41.3	2.8	.13	0.01	2.53	0.10	6.39
Total Ogallala	19,000	87.9	7,222.6	61.64	14.40	64.02	32.42	40.94
Share of National Total		31.7 %		11.0%		25.4%		10.8%

Reduced Water Withdrawals

Technical and financial assistance provided through NRCS conservation programs support the sustainability of irrigated agriculture in the Ogallala Aquifer Region by reducing the quantity of groundwater withdrawn. The geologic and climatic conditions of the Ogallala Aquifer should not be applied to other locations. Recharge in other aquifers allows for extended aquifer life. However, due to the nature of the Ogallala aquifer, water not withdrawn in one year remains available for use in future years, and the aquifer life is extended. And, due to the semi-arid nature of the regional climate, recharge is not a large-scale option for aquifer life extension.

From 2009 to 2012 to the implementation period of the 2008 Farm Bill, NRCS programs reduced the quantity of water withdrawn from the aquifer by 1.5 million acre-feet from the application of a suite of structural and management practices. This withdrawal reduction represents the sum over all NRCS programs, across seven of the eight Ogallala States, considering five common water conservation practices. While the absolute quantity of water not withdrawn is significant, at more than 1.5 million acre-feet over the period, the quantity represents about 2 percent of the total groundwater irrigation withdrawals from the aquifer over the same period. (In Oklahoma the quantity was significantly greater at about 30 percent of the irrigation withdrawals.) At the agricultural sales level from the 2007 Census of Agriculture, an extension of aquifer life of 2 percent would transfer into sales today of about \$140 million. The actual value may be greater because the extension of aquifer life occurs in the future when water will likely be more limiting with greater value. (The method used to estimate the reduced withdrawals is described in the Methods section.)

Alternative lenses may be used to view the reduced water withdrawals.

- **NRCS programs**—several programs were used to fund practices that reduced water withdrawals over the 2008 Farm Bill implementation period of 2009 to 2012. The Ogallala Aquifer Initiative

(OAI), a targeted component of the Environmental Quality Incentives Program (EQIP), provided funding for 29 percent of water reductions. The OAI has specific goals to reduce aquifer water use, improve water quality and enhance the economic viability of croplands and rangelands in the region. The practices funded through General EQIP delivered the greatest reduction in water withdrawals—accounted for 52 percent of the water reductions. And practices implemented through the Agricultural Water Enhancement Program (AWEP) accounted for 17 percent and other programs with about 2 percent of water withdrawal reductions (fig. 1, panel a).

- **State distribution**—seven of the eight States over the Ogallala aquifer funded practices considered in this analysis that reduced water withdrawals. (South Dakota did not fund any of the practices considered in the counties over the aquifer.) As expected, Nebraska accounted for the greatest reduction in water withdrawals (391,500 acre-feet), since it accounts for the greatest acreages and withdraw the most water (fig. 1, panel b). Kansas, another State with significant irrigated area (2.4 million acres (see table 1)), ranked fifth in terms of reduced water withdrawn with 170,000 acre-feet. Among the States with less than 1 million irrigated acres in the Ogallala area, Oklahoma (329,000 acre-feet) and Colorado (250,000) each accounted for significant water reductions with Oklahoma having the second highest water reduction in the region. When reductions in withdrawals are compared to the total quantity withdrawn for irrigation, Oklahoma reduced withdrawals by 30 percent, the greatest share, followed by Colorado with 5 percent. However, the reduction in water withdrawn in Oklahoma was accomplished by converting about 23 percent of the groundwater-supplied irrigated land to nonirrigated pasture, a permanent conversion.
- **Practice distribution**—more than half (62 percent) of the reduced withdrawals were attributable to NRCS Conservation Practice Standards (CPS) Codes 328 and 528, practices that convert irrigated land to nonirrigated cropland or pastureland. (New Mexico used CPS 645 to achieve the same objective.) CPS Codes 441 and 442 to convert irrigation technology to more efficient sprinkler and drip systems accounted for about 33 percent of reduced withdrawals (fig. 1, panel b). Irrigation water management (CPS Code 449) improved water management with existing technology on existing acres contributed more than 4 percent of reduced water withdrawals. CPS Codes 328 and 449 were considered management practices, and the reduced water withdrawals were included for no more than a 3-year contract period, even though the goal of the practice is to prompt a permanent change in behavior. (If the practice was implemented in 2012, only one year of effect was included in the Farm Bill period of 2009 to 2012.) CPS Codes 441 and 442 were considered technology-based practices, and the water reductions were considered permanent and cumulative over the 2009 to 2012 period. CSP Code 528, conversion to grasslands, was treated as a technology practice in this analysis. (See the Methods section for more information on the practices introduced here.)
- **Ogallala Aquifer Initiative**—the OAI practice implementations, funded through the EQIP Program, accounted for more than 434,000 acre-feet of reduced the water withdrawals, almost 29 percent of total reductions from all programs. By State, the OAI supported the greatest reduction in withdrawals in Oklahoma (160,000 acre-feet) and Texas (108,000 acre-feet). It accounted for as little as 3 percent of the reduced water withdrawals for all NRCS programs (Kansas) to as much as 99 percent of the reductions (New Mexico). The OAI-funded practices in the large withdrawal States of Texas and Nebraska accounted for 36 and 24 percent of the reduced withdrawals, respectively. The relative water reductions imply that the OAI plays a

greater role in the water conservation efforts in New Mexico (99 percent) and Oklahoma (49 percent) than Kansas (3 percent) and Colorado (6 percent) (fig. 1, panel d).

The NRCS CPSs funded by the OAI were similar in that the conservation practices funded to reduced withdrawals were the same under the OAI as with the General EQIP, AWEF, and other programs. Conversion to nonirrigated alternatives both grassland (CPS Code 528, 47 percent) and nonirrigated crop production (CPS Code 328, 15 percent) accounted for 62 percent of the water reductions. Conversion to grassland was a greater share of the reduced water withdrawals in the OAI in large part due to use in New Mexico and Oklahoma where 94 percent and 84 percent of the water reduction was attributable to this one practice. Technology adjustment (CPS Codes 441 and 442) provided about 30 percent of the reduced water withdrawals followed by improvements in irrigation management at 23 percent (CPS Code 449) (fig. 1, panel e). However, the relative contribution of grassland conversion and irrigation management were greater with the OAI when compared to the other programs and less for conversion to nonirrigated cropland and technology adjustments.

- **Reduced water withdrawals**—the total reduced water withdrawals previously described are based on per acre water reductions and the number of acres enrolled in each practice. Each of these factors are discussed below:
 - **Per acre water reductions**—panel f in figure 1 describes the average regional per acre water reductions by practice type for the OAI and all other programs (primarily General EQIP and AWEF). Panel f shows the greatest per acre water withdrawal reduction associated with conversion to grasslands, followed by conversion to dry cropland and improved irrigation technology. The smallest per acre water reduction was recorded by irrigation management improvements. Panel f also shows the applications of the practices with the OAI were all greater and, in the case of conversion to grasslands, about 4 inches per acre greater than those in other programs.
 - **Acres in practices**—Panel a in figure 2 describes the acres enrolled by practice type for all NRCS programs, which totaled more than 1.087 million acres. Both Colorado and Texas enrolled more than 300,000 acres in the water reduction practices considered. The practice type with the largest number of acres was technology improvement, followed by improved management, conversion to nonirrigated crop production, and conversion to grassland. The regional enrollment by practice type corresponds with the impact on current production activities, with technology improvement having the least impact on current production and conversion to grasslands the most impact. The greatest number of acres enrolled in a practice type by State includes more than 235,000 acres of technology improvement in Texas, more than 193,000 acres of management improvement in Colorado, almost 91,000 acres converted to nonirrigated crops in Kansas, and more than 51,000 acres converted to grassland in Oklahoma. (Note that a single acre could be enrolled in both technology and management improvements, thus the acreage totals do not translate into unique acres.)

An alternative view of the acres enrolled in by practice type is found in panel b of figure 2, where the irrigated acres reported in the 2007 Census of Agriculture for the area over the Ogallala Aquifer are compared to the acres enrolled in NRCS water application reducing practices from 2009 to 2012. Over that period, the NRCS enrolled about 7.5

percent of the irrigated area in practices that reduce water withdrawals. (Note there will be some double counting of acres enrolled in technology and management improvement practices.) By State, both Colorado and Oklahoma enrolled large shares of the available irrigated area in a water reducing practice with more than 40 and 30 percent of the irrigated area enrolled, respectively. Colorado enrolled more than 25 percent of the area in improved management while Oklahoma converted more than 20 percent of the area to grassland. (The Oklahoma combination of the large acreage converted to grassland plus the highest water reduction per acre for this practice translates into significant water withdrawal reductions of about 30 percent of the 2005 average irrigation withdrawals.)

Acres enrolled in the OAI are shown by State in panel c, figure 2. More than 248,000 acres were enrolled in the OAI with more than 104,000 acres in Texas, mostly in technology improvement practices. The importance of the OAI program to practices by State is shown in panel d, figure 2. The OAI funded 97 percent of all acres enrolled in water reduction practices in New Mexico, 56 percent in Oklahoma, and 34 percent in Texas over the 2009 to 2012 period. The OAI was used to fund 100 percent of acres in management improvements and conversion to grassland in New Mexico and conversion to nonirrigated cropland and conversion to grassland in Wyoming. In Oklahoma, the OAI was the funding source for 70 percent of the acres enrolled in conversion to nonirrigated cropland, about 60 percent of acres in technology improvement practices, about 55 percent of the acres enrolled in conversion to grassland, and 40 percent of the acres enrolled in management improvements.

- **Additional practices**—the reduced water withdrawals described previously and reported in figures 1 and 2 considered the water conservation potential from only five NRCS CPSs. There are additional practices that can reduce water withdrawals depending on the circumstances and location. These additional practices may not have the same water reduction potential across the entire Ogallala Region and may not have the same level of documented water savings. Additional practices that Texas considered were pipeline replacement (CPS Code 430) as an independent practice without replacing the irrigation application system and conservation tillage (CPS Codes 329 and 345). Reduced withdrawals with pipeline replacement are attributable to loss reductions from replacing aging concrete pipelines, a practice common in Texas. Conservation tillage reduces the irrigation requirements by retaining more natural precipitation. Texas has documentation from the ARS research facility in Bushland, Texas, on the water conserving potential of conservation tillage in the area.

Considering the additional practices only in Texas increased the reduced water withdrawals in the region by about 4.4 percent to 1.576 million acre-feet. The additional practices increased the water reductions in Texas to more than 365,000 acre-feet, more than a 20 percent increase. All practices were funded through General EQIP and AWEP (fig. 3, panel a.)

The distribution of reduced water withdrawals by practice is presented in figure 3, panel b, with the additional practices summed for presentation purposes. None of the additional practices were funded by the OAI.

The additional practices in Texas are a reminder that other practices can reduce the demand for water resources, and they may be locally significant. While other States also have additional

practices that should be considered, like the Texas example, these practices are not likely to dramatically change the total water applied in the region. The five base practices considered in this study represent most of the potential for reduced water withdrawals.

NRCS practices reduce the quantity of water withdrawn from the Ogallala Aquifer as measured by the impact of individual practices on crop water applications. This analysis considered five major practice types used in seven of eight States that overlie the Ogallala Aquifer. Additional practices were considered in Texas and were found to be significant to the local area but not to the regional withdrawal reduction. Other practices may be locally significant to reduced water withdrawals depending on local farming practices.

The practices that reduce water withdrawals were funded largely by the General EQIP program, but the OAI did fund almost 23 percent of the acres and 29 percent of the water withdrawal reduction. CPSs funded by the OAI provided greater water withdrawal reductions per acre. The OAI funded a disproportionately large share of the reduced water from converting irrigated land to grasslands, which was the most effective practice type on a per acre basis. While converting irrigated land to grassland does significantly reduce the water withdrawal (from current level to zero), there is an economic impact in that grassland-based agriculture is much less economically intense with less profit potential per acre. This practice potentially impacts land values and local agriculturally related businesses.

Reduced Energy Use

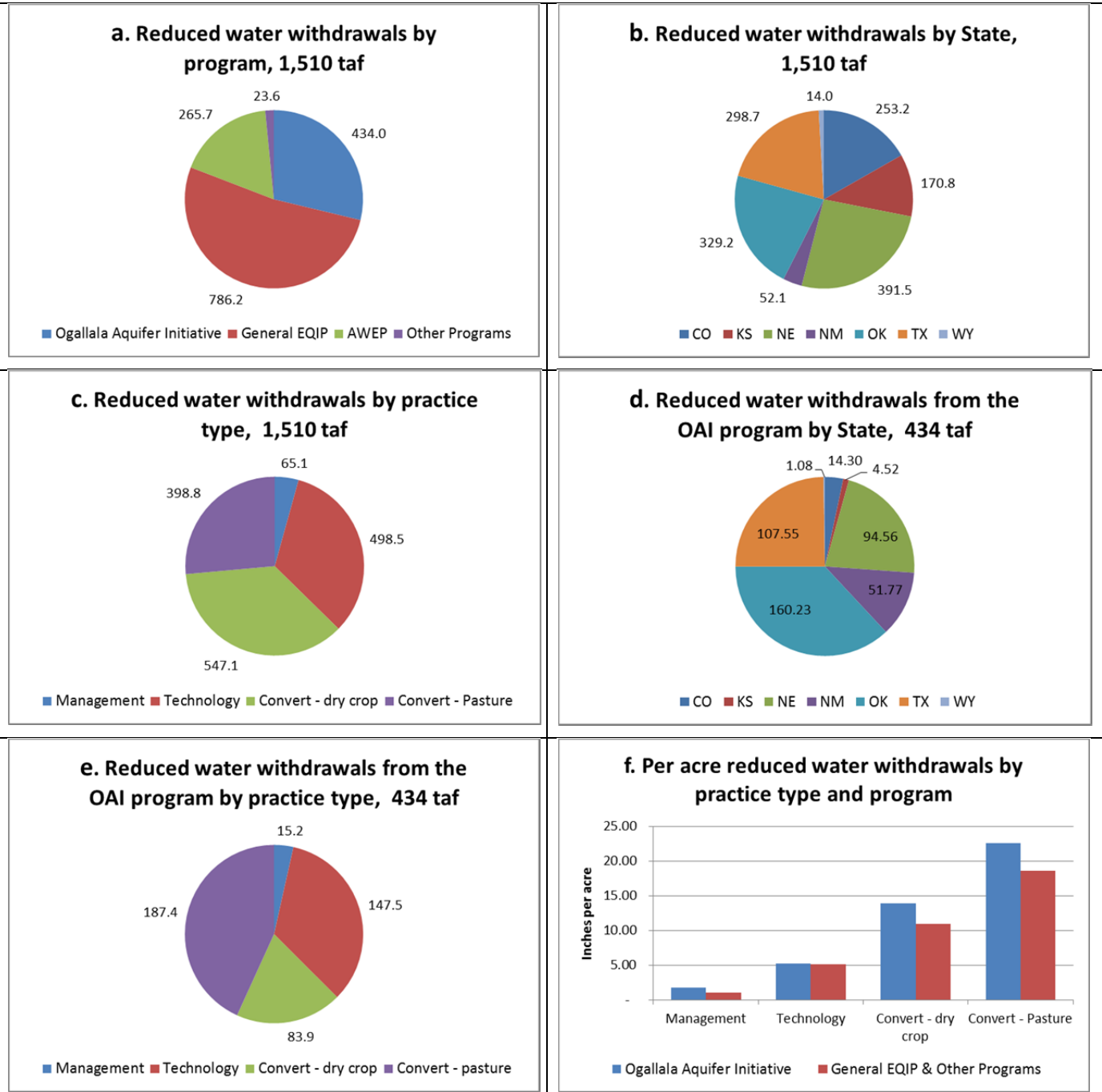
In addition to reducing the quantity of groundwater withdrawn, the technical and financial assistance provided through NRCS conservation programs supports the sustainability of irrigated agriculture in the Ogallala Aquifer Region by reducing the energy needed to pump irrigation water. Based on the contracts obligated for conservation activities from 2009 to 2012—the implementation period of the 2008 Farm Bill—NRCS programs reduced the quantity of energy needed to withdraw and pressurize water by more than 32 million gallons of diesel equivalent (more than 4.6 trillion BTUs) from the application of a suite of structural and management practices. This energy savings represents the sum over all NRCS programs, across seven of the eight Ogallala States, considering five common water conservation practices. While the absolute quantity of energy savings is significant, the quantity represents only about 1 percent of the total diesel consumption on U.S. farms reported in 2002. However, at a diesel price of \$3 per gallon, the savings amount to an estimated \$96 million in reduced fuel cost for the sector. The actual value will be different because of different fuel sources and fuel cost per BTU.

- **NRCS programs**—several programs were used to fund practices that reduced energy needs over the 2008 Farm Bill implementation period of 2009-2012. The Ogallala Aquifer Initiative provided about 27 percent of energy savings (about the same share as water reductions) and other programs (General EQIP, AWEP, and others) delivered about 73 percent of the energy savings (fig. 4, panel a).
- **State distribution**—seven of the eight States over the Ogallala aquifer funded practices considered in this analysis that reduced energy use. (South Dakota did not fund any of the practices considered in the counties over the aquifer.) As expected, Oklahoma (8.7 Mgal diesel equivalent) and Nebraska (6.7 Mgal) accounted for the greatest energy savings; expected since

they accounted for the greatest water reductions (fig. 1, panel b). (Mgal represents 1 million gallons of diesel equivalent estimated at 139,000 BTUs per gallon.)

- **Ogallala Aquifer Initiative**—the OAI practice implementations, funded through EQIP, accounted for more than a quarter of the energy savings, about 9.0 Mgal diesel equivalent (fig. 4, panel a). By State, the OAI supported the greatest energy savings in Oklahoma (about 4.2 Mgal, almost half the total energy reduction with OAI) and Texas (about 2.1 Mgal).

Figure 1. Estimates of reduced irrigation withdrawals from NRCS programs by program, State, and practice during the 2008 Farm Bill Period (2009–2012), Ogallala High Plains Aquifer, cumulative totals in thousand acre-feet



taf = thousand acre-feet
 1 acre-foot = 325, 851 gallons

Figure 2. Acres enrolled in irrigation withdrawal reducing practices by program type and State during the 2008 Farm Bill Period (2009–2012), Ogallala High Plains Aquifer, cumulative totals in acres

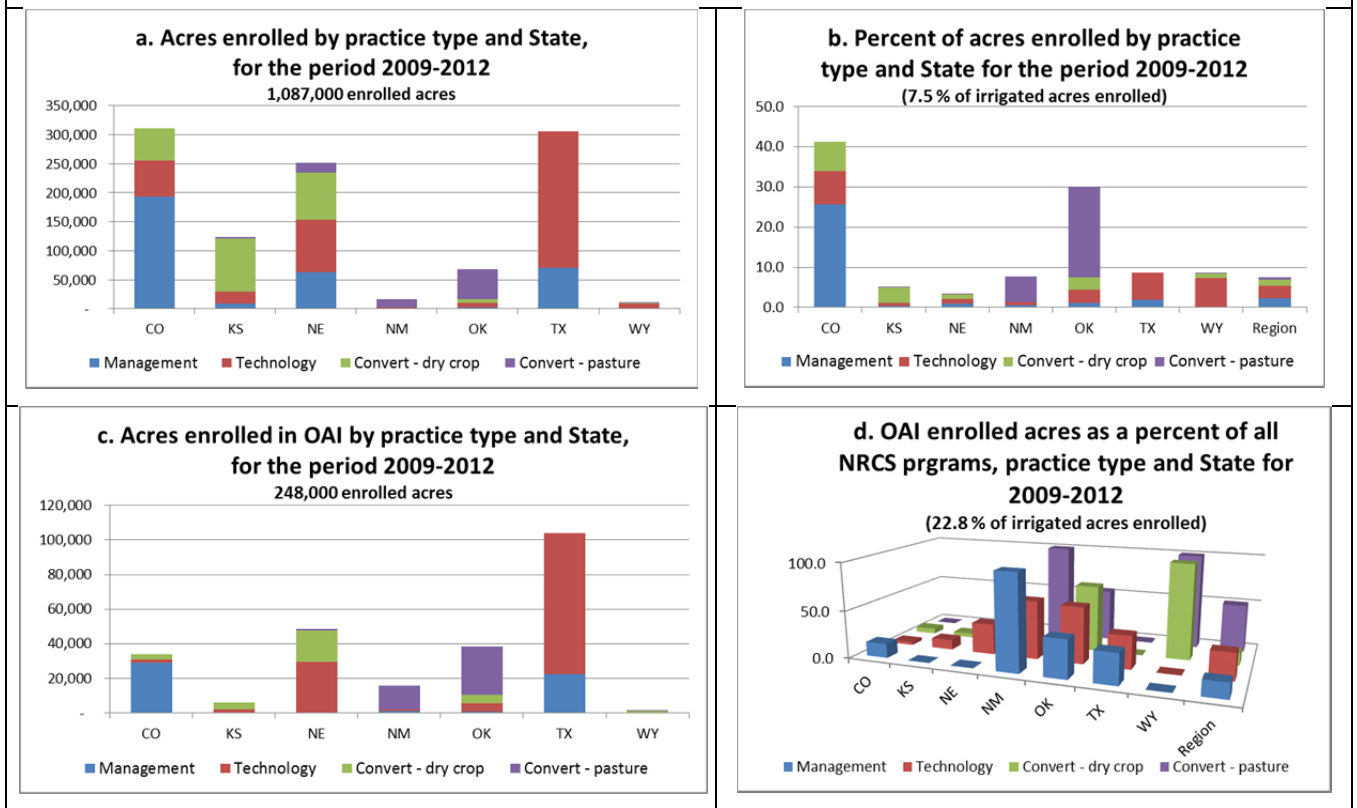
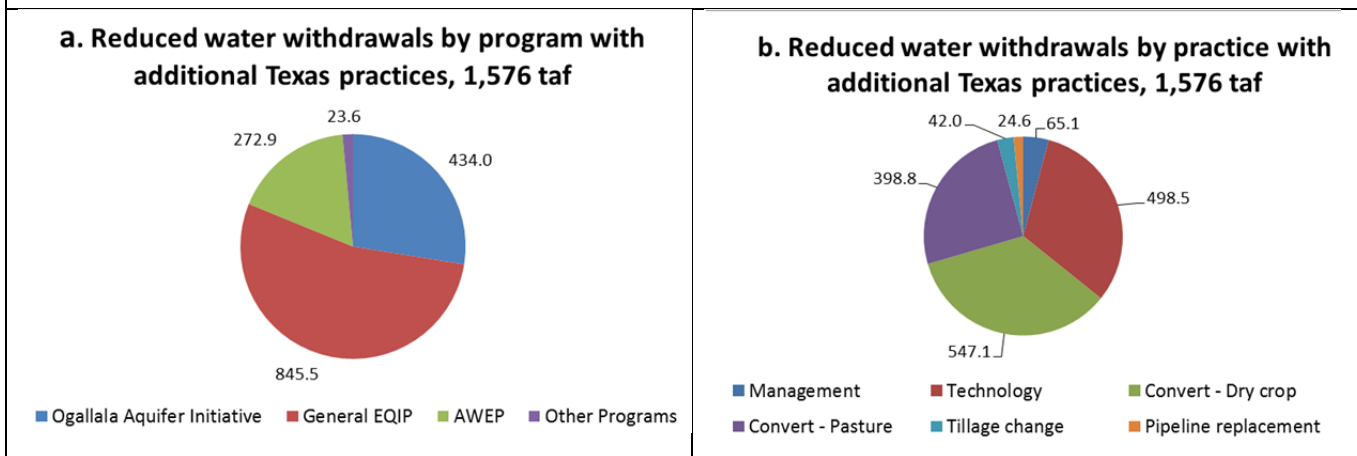


Figure 3. Estimates of reduced irrigation withdrawals from NRCS programs by program, State and practice during the 2008 Farm Bill Period (2009–2012) with additional Texas practices, Ogallala High Plains Aquifer, cumulative totals in thousand Acre-feet

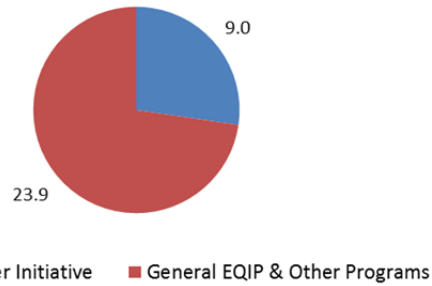


taf = million acre-feet

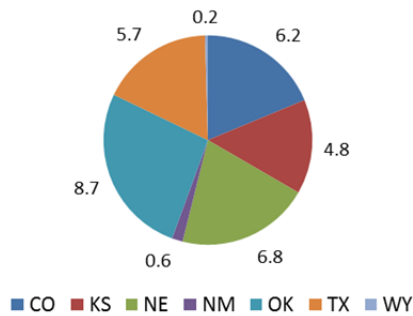
one acre-foot = 325, 851 gallons

Figure 4. Estimates of energy savings from reduced irrigation withdrawals from NRCS programs by program, State and practice during the 2008 Farm Bill Period (2009–2012), Ogallala High Plains Aquifer, cumulative totals in Mgal diesel equivalent

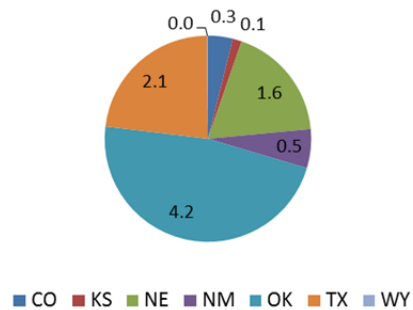
**a. Energy savings from reduced water pumpage, for the OAI and all programs
32.8 Mgal diesel**



**b. Energy savings from reduced water pumpage, by State for all programs,
32.8 Mgal diesel**



**c. Energy savings from reduced water pumpage, by State for the OAI program,
9.0 Mgal diesel**



one gallon of diesel = 139,000 btu

Methods—Crop Sales and Water Withdrawn for Irrigation

This analysis used the information from 215 of the 237 counties that overlay the Ogallala Aquifer (fig. 5). The counties excluded from the sales analysis are those that visually contain little land with access to the Aquifer. They were excluded to avoid incorrectly attributing water withdrawals and sales to lands likely not supplied by the Ogallala Aquifer.

The crop sales attributable to irrigation in the 215 included counties were estimated from an analysis of the farm responses to the 2007 Census of Agriculture. The crop sales reported to the National Agricultural Statistics Service by farm operators was examined at the crop level and the portion of sales from irrigated lands determined. Irrigated sales by crop were then summed to the county and then State level for the included Ogallala counties. The share of the water supply provided by groundwater was used to adjust the irrigated sales and acres estimated from the Census of Agriculture. (Irrigation, even in the Ogallala counties, may withdraw irrigation water from surface sources. The data behind the U.S. Geological Survey's 2005 report on Estimated Use of Water in the United States reports the county-level irrigation withdrawals for ground and surface water and was used here to determine groundwater's share of the water supply.)

Irrigated acres adjusted for water source and the number of farms with irrigated land were also estimated and reported in table 1 (and compared to the State and national totals) based on the 2007 Census of Agriculture. (Note that the number of farms was not adjusted for water source because many farms will utilize both sources of water where they are available and adjusting the number of farms would result in a significant undercount.)

Methods—NRCS Efforts to Reduce Irrigation Withdrawals:

This summary report relied on the findings of the Ogallala Analysis Team led by Brad Soncksen, Nebraska, and assisted by Jerry Walker, Water Management Engineer, CNTSC. The team was comprised of NRCS staff in each of the eight Ogallala States who made State-level estimates of water reductions using a core methodology. This team compiled the reduced water needs by year, State, program, and practice. The core methodology for estimating the reduced water applications are detailed in reports developed for Nebraska and Texas and is not repeated here.

The five practices considered were:

1. CPS Code 328—*Conservation Crop Rotation* was used in this context to substitute nonirrigated crops for irrigated crops, but the practice has many other applications depending on the resource being addressed.
2. CPS Code 441—*Irrigation System, Microirrigation* was used to convert irrigation application systems to the most efficient drip-type irrigation systems.
3. CPS Code 442—*Irrigation System, Sprinkler* was used to convert irrigation application systems to a more efficient sprinkler irrigation system.
4. CPS Code 449—*Irrigation Water Management* was used to improve the human element of the irrigation process, by knowing when to turn the irrigation technology on and off, water can be applied more effectively and efficiently.
5. CPS Code 528—*Prescribed Grazing* was used in this context to substitute grasslands for irrigated crops, but the practice has many other applications depending on the resource being addressed.

The State-level estimates used a “contract” period approach for making estimates of water withdrawal reductions. The estimates presented here are for the Farm Bill period, 2009 to 2012, and water withdrawal reductions were estimated at 1,510,000 acre-feet, with additional reductions occurring after 2012.

- For CPS Codes 441 and 442, irrigation application technology improvements, water reductions were estimated only for the year of NRCS contract implementation. This summary report assumed that the technology change would continue over the Farm Bill period and computed cumulative water reductions over the period.
- For CPS Code 528, conversion to grassland, this summary analysis converted the water reductions to those expected over the Farm Bill period. In addition, since the conversion to grassland was assumed to last at least the Farm Bill period, the water reductions were cumulative.
- For CPS Code 328, conversion to nonirrigated cropland, the contract period was 3 years and State-level water reductions were totaled for that period. However, since at the end of the period there is no assurance irrigation did not resume, the water reductions were not cumulative over the Farm Bill period.
- For CPS Code 449, improved irrigation water management, the contract period was 3 years and State-level water reductions were totaled for that period. However, since at the end of the period there is no assurance that the improved irrigation management practices continued, the water reductions were not cumulative over the Farm Bill period.

The cumulative effect of selected practices resulted in the “contract period” sum of 583,000 acre-feet of water reductions increasing to a total over the Farm Bill period 1,510,000 acre-feet.

Methods—NRCS Efforts to Reduce Irrigation Energy Requirements

This summary report relied on the methods of the same Ogallala Analysis Team that estimated reduced water needs. Basically reduced water needs converts to reduced energy requirements since pumping and pressurizing water from underground aquifers requires energy. Each acre-foot reduction in water required or reduction in pressure of the application technology translates to reduced energy needs and producer cost savings. The energy savings presented in this summary report are based on the reduced water withdrawals for the Farm Bill period and represent the sum of energy savings over that period. Please refer to the Ogallala Analysis Team reports for Nebraska and Texas and for details of the energy “savings” estimation procedure.

