

LOCAL GROUNDWATER MANAGEMENT DISTRICTS AND KANSAS STATE AGENCIES SHARE AUTHORITY AND RESPONSIBILITY FOR TRANSITION TO LONG TERM MANAGEMENT OF THE HIGH PLAINS AQUIFER

Thomas L. Huntzinger¹

ABSTRACT

Kansas faces complex challenges in managing the Ogallala-High Plains aquifer for the future. This aquifer, one of the largest in the world, is critical to a sustainable economy for Kansas and the other seven states that rely on it. Kansas withdraws between 3 and 4.5 million acre feet annually from this source for irrigation of corn, sorghum, and alfalfa that supports some of the largest livestock feeding and meat packing industries in the world. Overall declines of the aquifer, which occurred in about one generation of family farmers, threatens an economy that is projected to no longer be possible in 50 to 100 years in many areas and less than 25 years in some areas².

Established rates of withdrawal exceed natural recharge by such large amounts that very large decreases in use must be considered to achieve any measurable decrease in depletion. An urgent need to begin a transition to a less water intensive economy has motivated organizations representing local water users and state agencies to cooperate in a proactive management strategy. Under this strategy, three local ground water management districts have been given the responsibility for developing a protocol for more intensive management. The protocol includes defining hydrologic sub-units, determining priority sub-areas to focus implementation activities, and setting goals for extending the life of the aquifer to protect the economy. Local Groundwater Management Districts and state agencies are working cooperatively to ensure that regulatory authorities of the Division of Water Resources and the policies of the state support local efforts through the State Water Plan developed by the Kansas Water Office.

KANSAS FACES COMPLEX MANAGEMENT CHALLENGES

A Declining Aquifer

The Ogallala-High Plains aquifer, one of the largest in the world, is critical to a sustainable economy for Kansas and the other seven states that rely on it. Kansas withdraws between 3 and 4.5 million acre feet annually from this source for irrigation of corn, sorghum, and alfalfa that supports some of the largest livestock

¹ Water Appropriation Program Manager, Kansas Department of Agriculture, 109 SW 9th Street, 2nd Floor, Topeka, KS 66612

² Schloss, 2000 and McGuire, 2003

feeding and meat packing industries in the world. Typical overall declines of the aquifer vary from 30 to 60 percent of the original saturated thickness which threatens an economy that is projected to no longer be possible in 50 to 100 years in many areas and less than 25 years in some areas. Concerns for the future of this region are compounded by the fact these declines have occurred in about one generation of family farmers³.

Groundwater Management Districts and State Agencies Share Water Management Responsibility

Kansas has a well established organizational and administrative structure for water management. It includes responsibilities for local Groundwater Management Districts, state water management, and state planning agencies defined by statute (see Table 1).

Three Groundwater Management Districts cover the Ogallala-High Plains aquifer in western Kansas as shown in Figure 2. The boundaries are set by the users within the District, subject to approval by the Chief Engineer. Each district has an elected board of directors that represents the water users within the boundary of the district. The board of directors establishes water management policies for the district that will provide the most economic benefits from water use and protect the water supply. A manager directs the daily operations of the district, which provides technical assistance to water users, represents the users on issues before the state, and implements the policies of the board of directors. The districts have the authority to assess fees upon the water users for operational expenses and state law sets the limits. The district board of directors has the authority to recommend rules and regulations to the state's Chief Engineer, and enforce rules and regulations adopted by the Chief Engineer for the district. Policies of the board must not conflict with state law⁴.

The Kansas Department of Agriculture, Division of Water Resources, is the water management agency for the state. Responsibilities authorized by state law include appropriation of water, which includes permits for all beneficial uses except household and farmstead domestic uses, water use reporting, and compliance enforcement. The Chief Engineer, who is the director of the Division of Water Resources, has the authority to adopt rules and regulations needed to administer the water laws in the state. The Chief Engineer also adopts rules and regulations recommended by the Groundwater Management Districts unless they conflict with state law or state rules and regulations⁵.

³ Schloss, 2000 and McGuire, 2003

⁴ Kansas Statutes Annotated, K.S.A. 82a-1020 et. seq.

⁵ Kansas Statutes Annotated, K.S.A. 82a-701 et. seq.

Table 1. Structure and Functions of Water Management Organizations in Kansas

<p>Western Kansas Groundwater Management District No. 1 Southwest Kansas Groundwater Management District No. 3 Northwest Kansas Groundwater District No. 4</p> <p>A local entity authorized by state statute to manage ground water resources within its defined boundaries in Kansas. It is directed by a Board of Directors and a District Manager hired by the board. The board is elected by the water users within the district (one vote per user). It has authority to assess fees on irrigated land and water, recommend rules and regulations to the state's Chief Engineer, and enforce rules and regulations adopted by the Chief Engineer for the district.</p>
<p>Kansas Department of Agriculture, Division of Water Resources</p> <p>A division of a state agency directed by statute to administer the Kansas Water Appropriation Act. This division is under the direction of the Chief Engineer with statutory authority to issue permits to put water to beneficial use, quantify and certify water rights, and enforce compliance with the terms, conditions, and limitations of water rights.</p>
<p>Kansas Water Office</p> <p>A state office with statutory authority to prepare and maintain a state water plan, to coordinate with state agencies and local organizations in the water planning process, and to acquire and market reservoir storage. The office is under a Director appointed by the Governor and serves as the executive to the Kansas Water Authority. The Director manages the water plan funds generated by water protection fees collected for water planning and management projects approved by the Kansas Water Authority.</p>
<p>State Conservation Commission</p> <p>A state office with authority to administer cost share programs for water management and structural projects that support improved conservation practices in the state. Administers the distribution of cost share funds for the Federal Environmental Quality Incentives Program (EQIP), flood and other water control structures, and state water conservation programs. Administers the activities of the county conservation districts throughout the state.</p>
<p>Kansas Water Authority</p> <p>An appointed board of representatives of all water interests in the state including appointments by the leadership of the state Legislature. Recommends water planning and management initiatives and policies to the Governor and the Legislature. Heads of state water agencies are non-voting members of the Authority. The Governor appoints the Chairman of the Authority.</p>

Water planning is the responsibility of the Kansas Water Office under the direction of the Kansas Water Authority. The Kansas Water Office coordinates with Groundwater Management Districts, state water agencies, and local

organizations to prepare and maintain the state water plan. The plan, once approved by the Kansas Water Authority, is submitted to the Governor and Legislature as a recommendation for water policy in the state. Members of the Water Authority represent all water interests in the state, including members appointed by the State Legislature, major water users, Groundwater Management Districts, and heads of state agencies. The Governor appoints the chairman of the Authority and also the Director of the Water Office⁶. Other state agencies also share responsibilities for water resources as listed in Table 1.

MEETING THE CHALLENGES OF MANAGING THE OGALLALA-HIGH PLAINS AQUIFER

Planning for the future

An Advisory Committee was convened by the Director of the Kansas Water Office to prepare recommendations for addressing the depletion of the Ogallala Aquifer. The Committee members were all water users or representatives of water users and all from areas within the Ogallala-High Plains Aquifer boundaries. The chairman of the Committee was an irrigation farmer and former President of the Board of Directors of Southwest Kansas Groundwater Management District No. 3. The Committee was provided two support staff that were not members, one from the Kansas Water Office and the other from the Division of Water Resources. Key recommendations and principles from the report prepared by the Committee were:

1. Management strategies should be focused on decreasing the depletion of and extending the life of the aquifer, not a commitment to lower the levels of water use required to stop the depletion.
2. The strategy should be an incentive based approach that would encourage water conservation and less intensive water uses and impose specific water management options through state regulation when incentives are not successful.
3. Retain and exercise all the existing regulatory authorities of the Chief Engineer to enforce compliance with the existing annual diversion limits on each water right or permit.
4. Economic impacts of water management options must be considered.
5. The variability of the saturated thickness and other aquifer characteristics must be reflected in the management strategy through determination of hydrologic subunits.
6. Each Groundwater Management District was required to prepare a Water Management Protocol to address the depletion and extend the life of the aquifer within their boundaries. The Division of Water Resources was

⁶ Kansas Statutes Annotated, K.S.A. 74-2601 et. seq.

required to prepare a protocol for those fringe areas of the Ogallala-High Plains aquifer outside the Groundwater Management District boundaries.

The Advisory Committee report was submitted to the Kansas Water Authority that approved it as part of the Kansas Water Plan⁷.

Enhanced water management protocols

Protocols prepared by the Groundwater Management Districts include general methods for defining aquifer subunits that reflect the variability in aquifer characteristics and a commitment to setting priorities of high, medium or low for each subunit. Enhanced water management would not be immediately necessary in the low priority areas. Enhanced water management goals will be set by each district for each high priority and some medium priority subunits. Protocols are included in the District Management Program by the District Boards, and are submitted to the Chief Engineer for review to ensure that it does not conflict with state law and rules and regulations. A public hearing is held before approval by the Board.

A fundamental factual concept used in defining subunits and setting priorities is the projected usable lifetime of the aquifer. The Kansas Geological Survey published an initial analysis of projected usable lifetime that computed the time required for a projection of the past rate of decline in the water table to deplete the current saturated thickness down to a threshold considered to be a minimum required to support marginal irrigation practices. The geographic distribution of these computations reflects the variability in aquifer characteristics combined with the variability in current decline rates⁸. Expressing the results in time periods describes the future impacts of current pumping in terms understood by all water users and it gives a relative sense of urgency in defining priority subunits. Water level data used in the analysis was primarily annual mid-winter measurements made on hundreds of wells over the past thirty years. Analysis of the data was done at approximately square mile resolution with results provided at about the township level (every 36 square miles). The results were refined to use a threshold well yield or pumping rate rather than a threshold saturated thickness so the value is more directly related to the practical limits for traditional large-scale irrigation in the area. The Kansas Geological Survey established the relationship between well yield and saturated thickness for various values of aquifer hydraulic conductivity and well density found in the aquifer⁹.

A map of the projected usable lifetime of the aquifer in Southwest Kansas Groundwater Management District No. 3 with a threshold of 400 gallons per

⁷ Ogallala Aquifer Management Advisory Committee, 2001

⁸ Schloss, 2000

⁹ Hecox, 2002

minute is shown in Figure 3. The 400 gallons a minute threshold is one considered to be a minimum well yield adequate for large scale irrigation of corn using the most common irrigation technology which is center pivots. The map shows some areas with a useful lifetime of more than 100 years and others less than 25 years. However, there are some areas where the aquifer has never been adequate for large-scale irrigation so there are a few wells even though the projected lifetimes are relatively short. It would not be appropriate to define these marginal subunits of the aquifer as high priority even though they have short projected lifetimes. Final decisions made by the Groundwater Management District will consider subunit boundaries based on the areas defined by the contours on the map.

GOALS AND SOLUTIONS

The goals and solutions for the priority subunits follow the Advisory Committee recommendations in the water plan. Administrative processes to address the water management challenges in the recommendations must be available to Groundwater Management Districts and the State.

Challenges in the Application of Prior Appropriation

Kansas's water law applies the prior appropriation doctrine to ground and surface water¹⁰. Since 1978, the law requires a permit approved by the Chief Engineer for any beneficial use except household and farmstead domestic use. Permit approval was based on an allowable depletion rate or safe yield set by the Groundwater Management Districts or the State outside of District boundaries. Safe yield is defined as authorized annual withdrawals equal to average annual natural recharge. Water development exceeded safe yield in many areas of the Ogallala-High Plains Aquifer before 1978 and continued thereafter under allowable depletion criteria for a number of years. Therefore many areas are over appropriated to the extent that annual quantity authorized for diversion far exceeds safe yield. A substantial decrease in annual water use is needed in many areas to make any noticeable decrease in the water level declines.

Stream base flow is fed by outflows from the regional aquifer in the fringe areas near the boundary. Gradients in the water table of the Ogallala-High Plains Aquifer determine the amount of base flow directly to the stream and to the alluvium. Pumping near the boundary decreases the gradient, decreasing or curtailing flows depending on the pumping water levels. Kansas water law acknowledges that groundwater rights are protected when pumpage from junior water rights decrease base flows beyond a reasonable limit. New groundwater permits have been denied in some instances where the additional pumping is expected to impair existing surface water rights on streams fed by the aquifer.

¹⁰ Kansas Statutes Annotated, K.S.A. 82a-701 et. seq.

Ensure this is accurate, extensive edits: The Hoxie area in Sheridan County of northwest Kansas is an example of the extent of over appropriation in some areas that have a short usable lifetime (see Figure 3). This area near Hoxie has about 30 irrigation wells within a circle of 2 miles in radius around a well that has reported substantial yield declines that dip below 400 gallons per minute. The reported water use in this area exceeds the estimated annual natural recharge by about 30 times¹¹. Most of the irrigated crop production is corn that is sold to a beef cattle feeding operation within the 2-mile radius circle. A computation of the projected usable lifetime for this area to reach a threshold of 400 gallons a minute is less than 25 years at current pumping rates and some wells have already reached this threshold. It is apparent that a substantial decrease in pumping must occur in order to decrease the declines and extend the life of the aquifer.

Kansas's law is based on prior appropriation and would require the wells with the most junior rights to cease pumping until the most senior rights can be protected from depletion. If safe yield were a goal for this aquifer subunit, the reported use for the two wells with the most senior rights would exceed the estimated safe yield. There are about 12 wells with water rights senior to those supplying the feedlot, which is the primary market for crops produced. Even though some water users have expressed their concerns, no senior water right owner has filed a formal impairment complaint at this time.

Intensive Groundwater Use Control Areas

Kansas state law gives Groundwater Management Districts the authority to recommend to the Chief Engineer that an intensive groundwater use control area be designated¹². Under this authority the state may impose such regulatory provisions as necessary to protect the public interest in the water supply where groundwater levels have declined excessively. These provisions allow the Chief Engineer to depart from the prior appropriation doctrine as may be necessary in these specially designated areas. A decision to use this authority has not been made by any Groundwater Management District included in the Hoxie area.

Incentive Programs

The primary incentive programs are some form of financial compensation for decreasing irrigated acres or some other means of decreasing water use. In each case the decision to participate is the water user's choice.

The Environmental Quality Incentives Program (EQIP) is a voluntary federal conservation program that promotes agricultural production and environmental quality. Farmers may receive financial and technical assistance to install or

¹¹ Huntzinger, 2003

¹² Kansas Statutes Annotated, K.S.A. 82a-1020 et. seq.

implement structural and management conservation practices on eligible agricultural land. Local and state entities develop an evaluation process for defining high priority applicants to meet local and national objectives. Groundwater Management Districts participate in the evaluation process to ensure that applications are approved that will significantly decrease water use. The Natural Resources Conservation Service administers the federal program. Groundwater Management Districts and the State priorities are directed to using this federal program in assisting farmers in the transition from irrigation to dryland agriculture.

Another federal program is the Conservation Reserve program, which provides annual per acre payments to landowners for taking land out of crop production by planting it to a natural vegetation cover. The federal program is administered by the U.S. Department of Agriculture, Farm Services Agency. Participating farmers enroll in the program for 10 to 15 years. Farmers that would typically use the EQIP program, but are irrigating land that is not suitable for dryland farming, would be encouraged to use this program.

Groundwater Management Districts and state agencies have been working with the state's congressional representatives to get provisions included in the Farm Security and Rural Investment Act that would encourage water conservation. Payments and other benefits related to the current federal law provide loans and price support payments to farmers that are based on crop acreage and crop yields which tend to encourage large applications of irrigation water to increase yields. Discussions with legislators are directed at new provisions that would base program payments and other benefits on the costs of transition from irrigation to dryland, not on crop yields in the Ogallala-High Plains where the aquifer is depleting.

Kansas state law has provisions for the state to acquire water rights from owners to conserve water. Regulations are being written at this time to set criteria for the amount of compensation to be paid to a water right owner. Water right owners would be required to permanently retire their water rights upon receipt of payment under this state program. State funding for the program to date has been small.

A local foundation has been created in northwest Kansas to raise funds for buying water rights that would be permanently retired to conserve water. Northwest Kansas Groundwater Management District No. 4 is administering the foundation.

Kansas's water law requires that water be put to beneficial use under all water rights. Those rights that have not had water use for more than 5 consecutive years without justifiable cause are abandoned and dismissed. Kansas's rules and regulations provide specific due and sufficient causes for non-use that will not

result in abandonment¹³. All programs that result in curtailment of water use for a specified period of time must be considered by the state and determined to be due and sufficient cause for non-use to avoid abandonment under state law. Water users may protect a water right from abandonment by enrolling it in the state Water Resources Conservation Program if it is located in an area that is fully appropriated (exceeds safe yield) or has been closed to further appropriation by law or regulation.

Laws that apply to the management of groundwater vary among states that share this multi-state aquifer. The U.S. Geological Survey has compiled water level and water use information from each state and frequently publishes reports on the decline of the aquifer. There has been limited coordination among states agencies that share this multi-state aquifer. Some federal legislation has been introduced by congressional representatives from New Mexico that would provide federal funding to the state geological surveys in each state and the U.S. Geological Survey for coordinated data collection and analysis.

CONCLUSIONS

Groundwater Management Districts are sharing the responsibility for planning and water management with the state in addressing challenges of a depleting water supply. Local organizations and water interests in the Ogallala-High Plains Aquifer area prepared recommendations that were included in the Kansas State Water Plan. Protocols for defining high priority areas for enhanced water management are included in the Groundwater Management District Management Programs. The Groundwater Management Districts and state agencies are working together to establish realistic goals, define incentive programs, and identify regulatory options that will extend the life of the depleting aquifer and protect a water supply for the future.

REFERENCES

Hecox, G.R. et. al., Calculation of Yield for High Plains Wells: Relationship between saturated thickness and well yield, Kansas Geological Survey Open File Report 2002-25C, 2002.

Huntzinger, Thomas L., and Campas, Nick, A Different Perspective for Sustainable Management of a Declining Groundwater Supply in the High Plains, Abstract of Presentation, American Water Resources Association Annual Conference, San Diego, CA., November 2-5, 2003.

Kansas Administrative Rules and Regulations under Kansas Water Appropriation Act, Due and Sufficient Cause for Non Use, K.A.R. 5-7.

¹³ Kansas Administrative Rules and Regulations, K.A.R. 5-7

Kansas Statutes Annotated, Kansas Water Planning Act, KSA 74-2601 et. seq.

Kansas Statutes Annotated, Kansas Water Appropriations Act, KSA 82a- 701 et. seq.

Kansas Statutes Annotated, Kansas Groundwater Management District Act, KSA 82a-1020 et. seq.

McGuire, V.L. et. al., Water in Storage and Approaches to Ground-Water Management, High Plains Aquifer, 2000, U.S. Geological Survey Circular 1243, 2003.

Ogallala Aquifer Management Advisory Committee, Discussion and Recommendations for Long-Term Management of the Ogallala Aquifer in Kansas, Kansas Water Office Advisory Committee Report, October 16, 2001.

Schloss, Jeffrey A. et. al., An Atlas of the Kansas High Plains Aquifer, Kansas Geological Survey Educational Series 14, 2000.



Figure 1. Location of the Ogallala-High Plains Aquifer, Central United States

High Plains Aquifer Boundary, GMD Boundaries and KWO Basin Boundaries

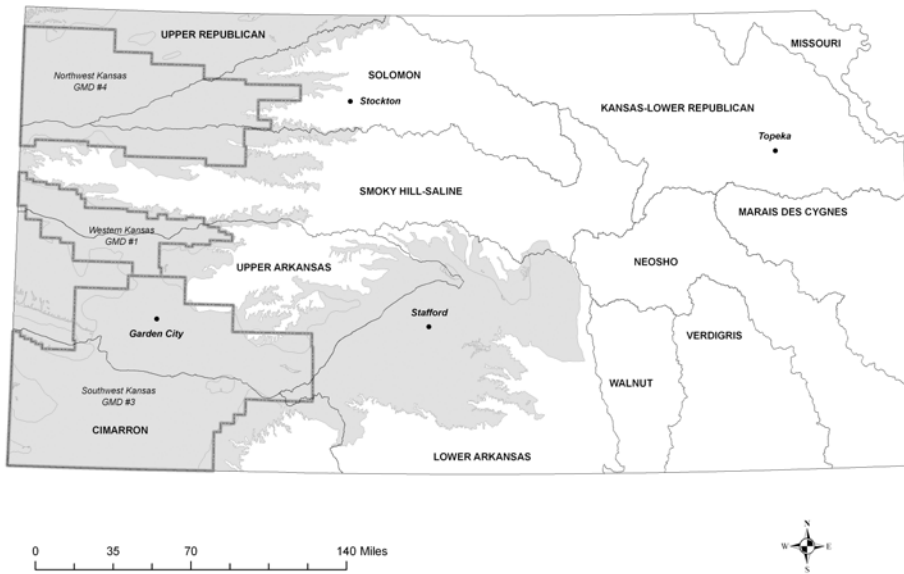


Figure 2. Groundwater Management Districts in Kansas

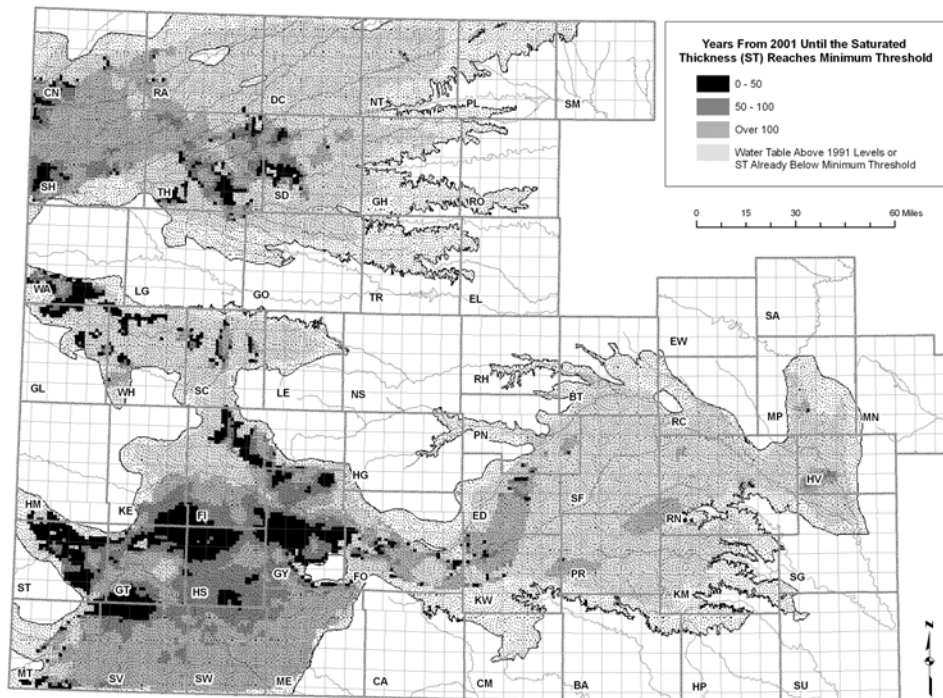


Figure 3. Estimated Usable Lifetime for the High Plains Aquifer in Kansas (Based on groundwater trends from 1991 to 2001 and the minimum saturated thickness required to support well yields at 400 gpm under a scenario of 90 days of pumping with wells on 1/4 section.)