AGRICULTURE

NEWSLETTER

NOVEMBER 2024

The Ogallala Aquifer

Published Mar. 2017 Id: BAE-1531
By Saleh Taghvaeian, R. Scott Frazier, Dustin Livingston, Garey Fox

The Ogallala aquifer, also known as the High Plains aquifer, is the primary source of water for many communities throughout the High Plains region. Stretching from South Dakota to Texas, the Ogallala aquifer is one of the largest aquifer systems in the U.S. It underlies nearly 122 million acres of land, used primarily for agriculture, producing nearly one-fifth of the nation's wheat, corn and cotton [3, 11]. Approximately 14 percent of the total aquifer area consists of irrigated acres capable of producing $7 billion in crop sales [1]. The Ogallala aquifer provides one-fourth of the total water supply used for agricultural production across the U.S. [3]

During the 1950s and 1960s, agriculture in the High Plains began to expand both in irrigation systems and irrigated acres [11]. The new irrigation systems provided a way to grow crops even during drought; however, larger and deeper wells were required to meet demands. The irrigation expansion and increased pumping resulted in considerable losses of water storage in parts of the Ogallala aquifer. As a result, Congress directed the U.S. Geological Survey to start monitoring water level changes in this critical groundwater resource, a mission that has continued. The data collected by USGS have yielded critical water-level information, specifically characterizing declines.

The most recent USGS publication estimates a drop in water level of about 15 feet, when averaged over the entire Ogallala area [6]. However, the change in water level is highly variable in different areas of the aquifer; no change or even water level rise was observed mainly in the northern area and significant declines measured in the southern High Plains (Figure 1). When comparing 2013 water levels to those measured in the 1950s, the maximum water rise was 85 feet at an observation well in Nebraska and the maximum water decline was 256 feet at a well in Texas.

The southern High Plains has an arid/semi-arid climate with rainfall amounts less than evaporation and far less than the water requirement of many agricultural crops. The Ogallala aquifer in this region has a very low recharge rate; resulting in very little precipitation reaching the groundwater. Water users in the southern High Plains have experienced significant declines in water levels, and consequently, increases in pumping costs. Areas like the Texas Panhandle and southwestern Kansas have created local districts to monitor water levels and help stakeholders sustain the groundwater supply. In Texas, Groundwater Conservation Districts are formed by people living in geographic areas where groundwater has declined. These GCDs regulate well spacing and pumping rates within their boundaries to ensure long-term groundwater protection and conservation [10].

Oklahoma

The Ogallala aquifer is one of the major aquifers in Oklahoma, underlying the Panhandle and parts of the northwest regions. In the eastern part of the Oklahoma Panhandle, the Ogallala formation often sits directly on top of consolidated sediments, which are more than 250 million years old. In Cimarron and western Texas counties, a younger formation of shale and sandstone called the Dockum group overlies the redbed. Other formations, including the Dakota Sandstone and Morrison Formation, also are found in the Oklahoma Panhandle [4].

The Panhandle region has a semi-arid climate with the average annual rainfall of about 20 inches during the past 120 years (1895-2015). Drought is common in the area, with one out of every six years having received less than 16 inches of rainfall during the same 120-year period. The Ogallala aquifer supplies more than 98 percent of total water demand in the Oklahoma Panhandle and other sources (e.g. alluvial aquifers and streams) contribute less than 2 percent [9]. Alluvial aquifers, which are shallower and generally connected to surface water resources, are limited. Local rivers and creeks (mainly the Beaver River and the upper Cimarron River) can have periods of low to no flow and are unreliable as a major water supply. Optima Reservoir, the only major Panhandle reservoir, does not sustain water.

Continued page 2

BEAVER County Extension Office

Address
PO BOX 339
111 W. 2ND ST.
BEAVER, OK 73932

Phone
580-625-3464

Email
Elizabeth.mcbee@okstate.edu

Loren.sizelove@okstate.edu

connie.mcminn@okstate.edu

Website
https://extension.okstate.edu/county/beaver/

Social Media
Beaver County OSU Extension

IN THIS ISSUE

The Ogallala Aquifer continued from page 1

Agricultural Water Use

Irrigation is the largest use of water in the Panhandle. Based on 2007 crop mix data, there are approximately 230,000 acres of irrigated land in Cimarron, Texas and Beaver counties, requiring more than 290,000 acre-feet of water per year [9]. This is about 85 percent of the total water demand in the region and is expected to increase to about 306,000 acre-feet by 2060. The major irrigated crops are grain corn and wheat, accounting for about three-fourths of the total irrigated area. According to the USDA National Agricultural Statistics Service, the total harvested area of irrigated corn and wheat in 2012 was more than 106,000 and 65,000 acres, respectively. Grain sorghum ranked lower, with a total irrigated area of about 20,000 acres.

The expansion of irrigated agriculture in Oklahoma Panhandle has been a major driving force for economic development and prosperity of this region. However, this growth has come at the cost of declining non-renewable water resources.

Since the predevelopment period (prior to 1950), about 3,000 irrigation wells have been drilled into the Ogallala aquifer. The largest number of drilled wells (more than half) were in Texas County, followed by Cimarron, Beaver and Ellis counties. Hence, it is not surprising that the largest decline in groundwater has been experienced in Texas County. According to the Oklahoma Water Resources Board, water levels in the Ogallala aquifer have declined more than 70 feet in Texas County and more than 50 feet in Cimarron County since predevelopment. These large declines can be attributed to the high density of irrigation wells.

The highest rate of adding new wells occurred during the 1960s, with about 107 new wells being drilled every year in three counties of the Panhandle area. The period from 2010 to 2015 was characterized by a major drought in the region. During this five-year period, 226, 95 and 31 new irrigation wells were drilled in Texas, Cimarron and Beaver counties, respectively. The water level declines were more than 13 feet in Texas County, 9 feet in Cimarron County and 4 feet in Beaver County over the same period [8].

Figure 3 provides a closer look at the changes in Ogallala aquifer water levels for Oklahoma. As mentioned before, Texas County shows largest declines in water levels, while parts of the Ellis County experienced a rise in water level. Some of the largest declines in water levels across the entire aquifer have happened in Texas Panhandle just south of the Oklahoma border. *(figure at end of article)*

Figure 3 provides a closer look at the changes in Ogallala aquifer water levels for Oklahoma. As mentioned before, Texas County shows largest declines in water levels, while parts of the Ellis County experienced a rise in water level. Some of the largest declines in water levels across the entire aquifer have happened in Texas Panhandle just south of the Oklahoma border.

Irrigation Systems

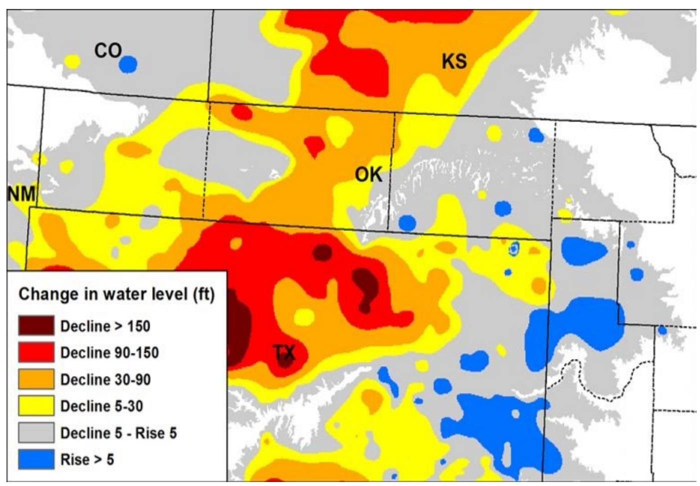
Irrigated agriculture in the Oklahoma Panhandle has changed significantly during the past several decades. Green squares are typically flood (gravity) irrigated fields, while green circles represent center pivot (sprinkler) irrigation. As it can be observed, the majority of irrigated fields were under flood irrigation in 1976, with only a few center-pivot systems present in the satellite image. During the next 33 years, most of irrigated fields switched to center-pivot systems. Compared to flood irrigation, center-pivot systems can apply water in smaller amounts and more uniform patterns, resulting in reduced deep percolation and improved crop yield. In addition, the new center pivot systems have nozzles at a lower elevation, which helps reduce direct evaporation and wind drift losses.

The decline in the Ogallala water level has created numerous challenges for irrigated agriculture in the Oklahoma Panhandle. A main challenge is the reductions in pumping rates, resulting in higher energy costs and decreased revenue, as crop yields are decreased due to not meeting the full crop water requirement or planting a smaller area. In addition, as the Ogallala level decline and water is being extracted from deeper parts of the aquifer the quality of water may degrade [2].

Since the Ogallala aquifer has a very low recharge rate [7] and other water resources are so scarce, efforts to increase the life of this valuable resource should focus on managing demand. This requires a close collaboration between stakeholders, state/federal agencies and universities. Local groups of stakeholders, such as the Oklahoma Panhandle Agriculture and Irrigation Association, have been active in this field. An example of their efforts is the development of the Panhandle Regional Water Plan in collaboration with other local groups.

Click on the link to see the other charts and references: https://extension.okstate.edu/fact-sheets/the-ogallala-aquifer.

Figure 3: A closer look at the change in the Ogallala aquifer water level from predevelopment (1950s) to 2013. Data obtained from [6]



Enhancing Reproductive Success in the Cow-Calf Herd

Rosslyn Biggs, DVM, OSU College of Veterinary Medicine, State Beef Cattle Extension Specialist

Reproductive management is at the foundation of a successful cow-calf herd. However, enhanced reproductive technologies are not readily incorporated as seen in the results of the 2017 USDA National Animal Health Monitoring System Beef Cow-calf study. Results of this study indicated, of heifers bred for calving in 2017, 76.8 percent were bred only by bulls, and 15.1 percent were bred by a combination of artificial insemination and bull breeding. Of cows bred for calving in 2017, 92.9 percent were bred only by bulls, and 5.5 percent were bred by a combination of artificial insemination and bull breeding. Estrus synchronization was utilized in only 7.3 percent of all operations.

As producers approach breeding season, plans should be developed to fit the needs of the operation in coordination with veterinary input. Breeding soundness evaluations and pregnancy detections should be standard in all breeding herds. Reproductive technologies when used appropriately improve herd health, efficiency, genetics, and overall profitability. Enhanced reproductive protocols can be utilized for operations incorporating artificial insemination as well as exclusively bull bred herds.

Estrus synchronization involves manipulating the estrous cycle of heifers and cows so that a large group of females come into heat at the same time. Various hormone-based protocols are used to achieve estrus synchronization, making it easier to manage breeding and improve pregnancy rates.

By synchronizing estrus, producers can breed multiple cows simultaneously, potentially reducing the time and labor required for heat detection and insemination. Although this technique is most often used in conjunction with artificial insemination to maximize reproductive efficiency, advantages can also be seen in bull-bred herds.

Estrus synchronization allows for more precise timing of calving.

Artificial insemination (AI) is one of the most widely used reproductive technologies in the beef industry. AI allows producers to access superior genetics enabling them to improve a variety of traits in the resulting calf crop. Moreover, AI reduces the need for keeping a large number of bulls on-site, thereby lowering bull maintenance costs, decreasing disease transmission, and improving animal and human safety.

Great resources exist for producers seeking to integrate or improve their reproductive strategies. Notable examples are those provided by the Beef Reproduction Task Force. The task force offers a variety of free resources including webinars, synchronization protocols, and decision tools such as the Estrus Synchronization Planner and AI Cowculator. More information on these resources can be found at http://www.beefrepro.org.

Controlling Insects in and Around the Home

by David Hillock

The first important step in the process of insect control is to identify the insect that is present so that the proper control procedure will be used. OSU county extension educators and pesticide dealers can help identify the pest for the homeowner, or the pest may be sent to the OSU Entomology & Plant Pathology Department for identification.

Sanitation and good housekeeping are possibly the most important aspects in controlling or preventing pests, but even well-kept homes sometimes become infested. The homeowner can usually control light infestations of pests in the house by carefully following directions on the pesticide container and by doing a thorough job of application.

Certain pests found outside may be eliminated before they enter the home. (For information on control of pests outdoors, refer to OSU Extension Fact Sheet EPP-7306 - Ornamental & Lawn Pest Control (for Homeowners). However, some insects live entirely within the home, where they must be controlled by applying spray, dust, bait or aerosol pesticides to areas where they are most frequently found. If the infestation is severe and widespread, it is advisable to employ the services of a pest control firm, which has pesticides and application equipment not generally available to homeowners.

For more information on pesticides and their use in and around the home see EPP-7312 Household Pest Control.

Safety Tips

- Read and follow all directions on the container label.
- Avoid repeated or prolonged contact of insecticides with the skin and prolonged inhalation of spray mist.
- Do not spray oil solutions near an open flame (pilot lights).
- Do not risk contaminating food by treating near food, dishes or cooking and eating utensils.
- Dispose of empty pesticide containers, and do not puncture or incinerate aerosol or pressurized spray cans.
- Store insecticides in the labeled original containers, in a dry place where they cannot contaminate food items and where children and pets do not have access to them.
- After using pesticides, always wash your hands and face and any other exposed body areas.
- For further information on handling, mixing, and applying pesticides, consult your area or state extension entomologists, visit your local county extension educator, and/or refer to OSU Extension Fact Sheet EPP-7540 for information on safe use of pesticides.

Prevention and Control Hints

Before applying insecticides for pest control, the homeowner can help ensure better control by doing the following:

1. Clean out areas that make good homes for the pests.
2. Clean up areas that collect grease, food scraps or other spillage which might provide a food source.
3. Eliminate excessive storage boxes from the attic and garage and clean up foliage or other hiding places from around the outside foundation of the house.
4. Seal up cracks and crevices around the home to keep insects looking for a place to hibernate over the winter from entering the home.
5. If grain or flour pests are present, locate the infested material. Go through all cereal boxes, flour, beans, dry pet food, and spice containers until the infestation source is located. Dispose of the infested material, then a light application of pesticide.
6. Carefully check newly purchased dried foods for insect infestations, and store foods in tightly sealed glass, plastic or metal containers rather than in sacks, bags, or boxes.

NOTE on ultrasonic electronic or sound control devices: To date, these devices have not been proven to be effective or practical.

Beaver County Extension Office
PO Box 339
Beaver, OK 73932

BEEF REPRODUCTION MINI-SERIES
(AI Course)

Profitability in the beef herd encompasses more than just a live calf on the ground.

For some producers, better understanding genetic selections, reproductive technologies, and synchronization can take profitability to the next level.

FEBRUARY 13 | Expected Progeny Difference (EPD) + Physiology

FEBRUARY 20 | Synchronization + Heat Checking

FEBRUARY 27 | Practical Application + Tools

MARCH 6 | Practical Application.

Hands-on training will be provided using replicare productive tracts and simulators.

CALENDAR

NOV 17 .... COW/CALF CONFERENCE

NOV 23 .....BEAVER CO. JR LIVESTOCK TROPHY AUCTION

DEC 19 .... PESTICIDE CEU COURSES

JAN 21, 28, FEB 4, 11...............................WOMEN IN AG

FEB 1.................................BEAVER LOCAL STOCKSHOW

FEB 10................ BEAVER COUNTY JR LIVESTOCK SHOW

FEB 13, 20, 27, MARCH 6 ....AI COURSE