

NEBRASKA

Authors: Nebraska Dept. of Natural Resources - Jeff Fassett, Jesse Bradley, Jennifer Schellpeper, Melissa Mosier & Shea Winkler

Nebraska Association of Resource Districts - Dustin Wilcox

Nebraska Dept. of Environmental Quality- Ryan Chapman

Introduction

Nebraska has long relied on its water resources to support its citizens and the economic development of the state. The economic viability of so many of Nebraska's cities and towns is directly tied to having sustainable, resilient water supplies to provide safe and dependable drinking water, as well as to fuel the agricultural economy of the state. This is evidenced by Nebraska's top ranking in the number of acres served by irrigation supplies (Figure 1). Agriculture relies on supplemental irrigation water supplies to increase crop production. The Nebraska Farm Bureau estimated the annual economic benefits of irrigation within the state at over \$11 billion in 2012.

Recent projections developed by the United States Department of Homeland Security (2015) indicate that, at current usage rates, the majority of the state has in excess of 200 years of aquifer life. More vulnerable counties in the state are projected to face aquifer depletion at

current usage rates in 50 to 100 years (Figure 2). Thus, with limited concerns related to aquifer life goals, Nebraska's primary groundwater management objectives relate to managing the wide-spread interconnectivity between the state's aquifers, rivers, and streams. This unique condition amongst Ogallala region states has allowed Nebraska water policies to be directed toward focused efforts to manage hydrological interconnectivity and ensure that stream flow resources are sustained in conjunction with the aquifer.

Science and Data

A comprehensive understanding of water supplies and uses is needed to facilitate water management decisions. Nebraska is fortunate to have a highly-developed monitoring network that supports a robust system of groundwater modeling tools and allows for a comprehensive understanding of water supplies and water uses. Much of this data is readily available to Nebraskans through a variety of online

sources, including the Nebraska Department of Natural Resources' (NeDNR) INSIGHT web portal. The understanding of water supplies and water uses is continually enhanced through the cooperation and collaboration of NeDNR with local natural resources districts (NRDs) and local water users. This scientific foundation ensures that managers and water users can rely on a comprehensive network of information when making decisions.

Nebraska's science and data network is continually assessed and augmented with

Top 10 States in Total Irrigated Acres

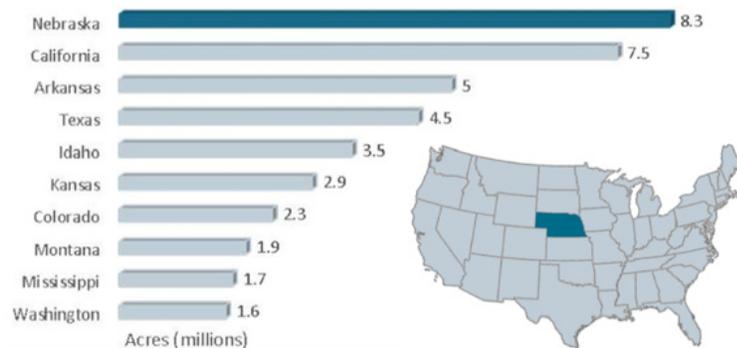


Figure 1: Top 10 states in total irrigated acres: 2013. (2012 Census of Agriculture, USDA, National Agricultural Statistics Survey)

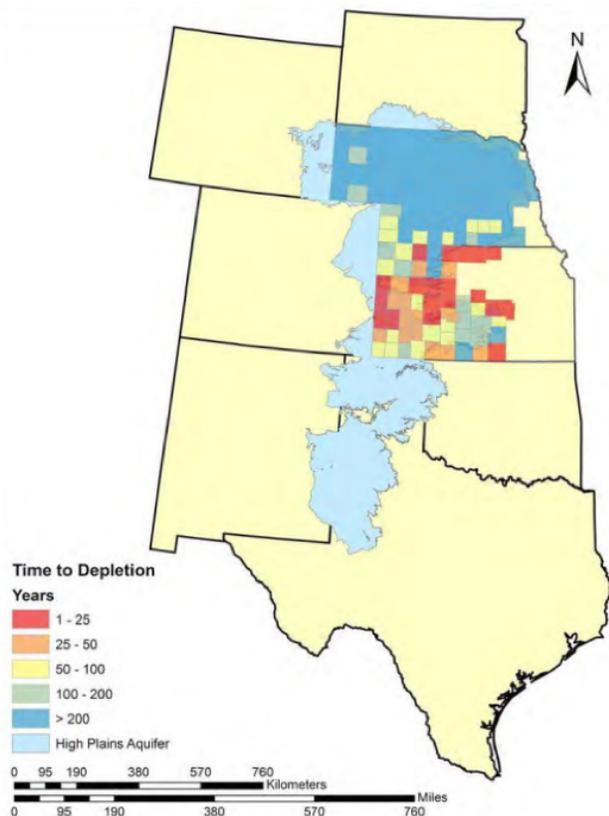


Figure 2: Time to depletion of High Plains Aquifer due to continued pumping (U.S. Department of Homeland Security, 2015)

new information. This process is structured through data hierarchies aimed at ensuring the best available information can be used in support of local and regional water planning. This approach supports the inherent variability in data sources and provides direct conduits for local NRD investments in improving data collection to be incorporated throughout the water planning process, which is important for ensuring technical credibility and a common factual basis for state and local decision makers.

Policy and Planning

State policy regarding aquifer water management is guided by the Ground Water Management and Protection Act, which affirms that water in the State of Nebraska is held by the state for the benefit of its citizens, with the 23 local NRDs charged with the

primary responsibility to manage the quantity and quality of groundwater resources. Groundwater management occurs through a modified correlative rights system, which differs from the prior appropriation system used by NeDNR to manage and administer surface water rights. Water rights in Nebraska do not constitute ownership of water - only the right to use it for beneficial purposes.

With the Ogallala aquifer supporting a significant portion of the agricultural economic output in Nebraska, many programs, policies, and planning efforts have been directed toward conserving and sustaining this resource. Examples of such activities include the development of Ground Water Management Plans, with locally developed NRD-specific rules and regulations for both water quantity and quality; Integrated Management Plans and Basin-Wide Plans, both of which address hydrologically connected ground and surface water resources and are collaboratively developed by NeDNR, NRDs, and local stakeholders; and the establishment of other locally sourced management efforts and funding mechanisms to support conjunctive water management.

Water policy and planning in Nebraska places a significant emphasis on the integrated water management planning process that relies on a strong partnership between the NeDNR and local NRDs in conjunction with stakeholders and other water management agencies. The primary policy tenants guiding these processes include:

- Customized and decentralized water management plans led by local NRDs with NeDNR support in conjunction with strong public engagement with multiple constituents and stakeholders groups ensures that both local and state needs are addressed.

- A commitment to the protection of existing water uses and continuing investments in water resource development and protection, such as reservoirs and groundwater recharge projects.

Expansion of science based conjunctive use and integrated water management strategies leveraged to optimize water supply utilization.

Agricultural producer level innovation in water quantity and water quality management.

Creation of flexible markets and management tools to address both short-term and long-term water supply shortages and challenges.

Continuous improvement amongst water agencies to improve the coordination of water quantity and water quality management.

This water planning process relies on a highly-developed scientific foundation that allows for a thorough understanding of the water supplies and demands on those supplies. Building from that scientific understanding, stakeholders are engaged by NeDNR and partnering NRDs to review and develop goals and objectives specific to each local area. With that stakeholder input, NeDNR and local NRDs work to develop strategic actions aimed at achieving those goals and objectives (Figure 3).

The current status of NRD-level integrated

management planning across the state is illustrated in Figure 4. With the high degree of variability in both water supplies and water demands in each basin across the state, the goals and objectives of plans can differ dramatically from one NRD to another. However, many common features tend to exist within a given basin, which gives rise to the desire for increased coordination among the various planning goals and objectives contained within each NRD plan. This coordination and supplemental planning is accomplished through basin-wide plans. Basin-wide plans have been developed in many of the basins in the state with the aim of further leveraging opportunities through collaboration of multiple NRDs and gaining efficiencies in plan implementation. The integrated management planning process does not stop with the development of a plan. The planning process is continual and adaptive with the aim of achieving goals and objectives and also identifying if new goals and objectives need to be incorporated, with emphasis toward improving outcomes for water users.

There are several state and federal programs used to support groundwater quantity and quality management in Nebraska. The state funded Water Resources Cash Fund and Water Sustainability Fund are used to



Figure 3: Foundations of water planning in Nebraska.

support programs targeted at reducing use and increasing water supplies through re-timing and storage, as well as investments in water supply infrastructure. These funds are matched with 40% local cost shares, typically with NRD participation. NRD funding is derived from locally sourced taxing authorities, property tax levies, and occupation taxes on irrigated acres that support plan implementation. Federal programs and funding sources, which are matched by state and local funds, are also leveraged and include the Conservation Reserve Enhancement Program (CREP), Agricultural Water Enhancement Program (AWEP), Natural Resources Conservation Service (NRCS) funding sources, along with federal grants from the United States Bureau of Reclamation (USBR) and Environmental Protection Agency (EPA).

and protect water resources. The NRDs have been successful in working with state and local partners including NeDNR, the Nebraska Department of Environmental Quality (NDEQ), Universities, and UNL Extension, to research groundbreaking technology, cropping strategies, and input practices that best address local management needs. This research has been used to engage producers and stakeholders and demonstrate both the economic and conservation impacts of best management practices. Several NRDs have developed their own programs and networks that work to demonstrate efficiency impacts and offer producers real-time data and information to assist in making effective conservation-minded management decisions. While there are special Water Quality and Quantity Management Areas where certain practices are required, many of the most effective practices being implemented by producers across the state are done so voluntarily. Utilizing NRD funds to leverage state and federal dollars, local boards have been able to provide cost-share incentives

Producer Practice

Nebraska producers have implemented cost saving irrigation efficiency practices that have also proven to dramatically conserve

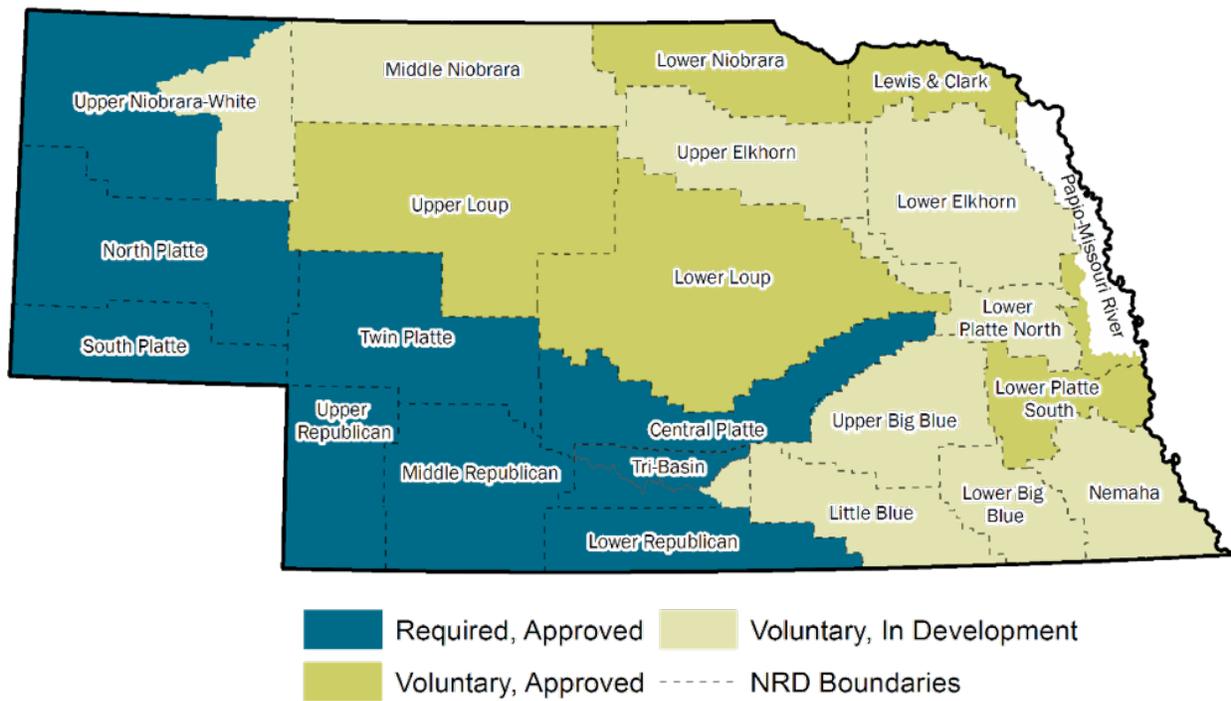


Figure 4: NRDs currently involved in integrated management planning (2018).

| Program Target | Program | Description | Results |
|-----------------------|-------------------------------|--|--|
| Quantity | Soil Moisture Sensor Program | NRD-level cost-share program offering technical assistance and 0-100% on purchase of soil moisture sensing equipment | Offered by 18 of 23 NRDs > 436,000 acres > 2,000 producers |
| Quantity | Ground-water Well Flow Meters | Required flow meters on groundwater wells over specified capacity | Required by 20 of 23 NRDs |
| Quantity | Allocations | Allocates a certain number of inches that can be pumped over a certain number of years | Required by 12 of 23 NRDs |
| Quality | Soil Sampling | Required soil sampling for water quality indicators | Required by 15 of 23 NRDs |

Table 1: Selected examples of producer programs offered or required by NRDs.

to producers for innovative, research-driven advances in irrigation management. A few examples of some of the programs offered or required by NRDs are listed in Table 1.

In addition to support from extension offices, NRDs, and NRCS district conservationists, locally driven producer groups, such as the Nebraska Water Balance Alliance, have worked to provide producer seminars and education events on technologies and practices that can be adopted by producers to improve irrigation management.

A recent example of a creative program to engage producers in adoption of new technologies is the esting Ag Performance Solutions (TAPS) program (taps.unl.edu). This program provides opportunities for producers to virtually compete against each other as well as UNL scientists for (1) most profitable farm, (2) highest input (water and nitrogen) use

efficiency, and (3) greatest grain yield. The goal of the competition is to promote efficiency and profitability while giving a chance to learn from those who grow corn profitably. The competition is supported by UNL Extension, NRDs, non-profit organizations, and agricultural industries, among others.

Moving Forward

Challenges to the reliability and protection of the Ogallala aquifer do exist. Many areas of the state face nitrate concentrations in excess of 10 mg/l (Figure 5). With much of the state's drinking water being provided through aquifer extractions, efforts to provide safe and affordable drinking water supplies for rural communities will need to be enhanced. Portions of the state are more susceptible to drought, resulting in increased

in-season aquifer drawdowns and less resilient streamflows. These drought related impacts can create well interference issues between irrigation wells and domestic wells, and reduced streamflows can create challenges in meeting the requirements for Compacts and Interstate Agreements.

These challenges will serve to sharpen the focus of water management and planning in Nebraska. The science and monitoring being developed to support planning efforts must continue to be invested in to ensure that the extensive data networks throughout the state can support the information needed to make well-informed management decisions. Funding will continue to be necessary to revitalize and repurpose water supply infrastructure to meet the new challenges of the future. With a continued focus on leveraging activities such as conjunctive management, retiming water supplies, producer driven innovation, and implementation of best management practices, Nebraska will work to create more resilience within each basin. It is through these

extensive water planning efforts, scientific investment, and locally sourced collaborative solutions, that Nebraska intends to meet its management challenges.

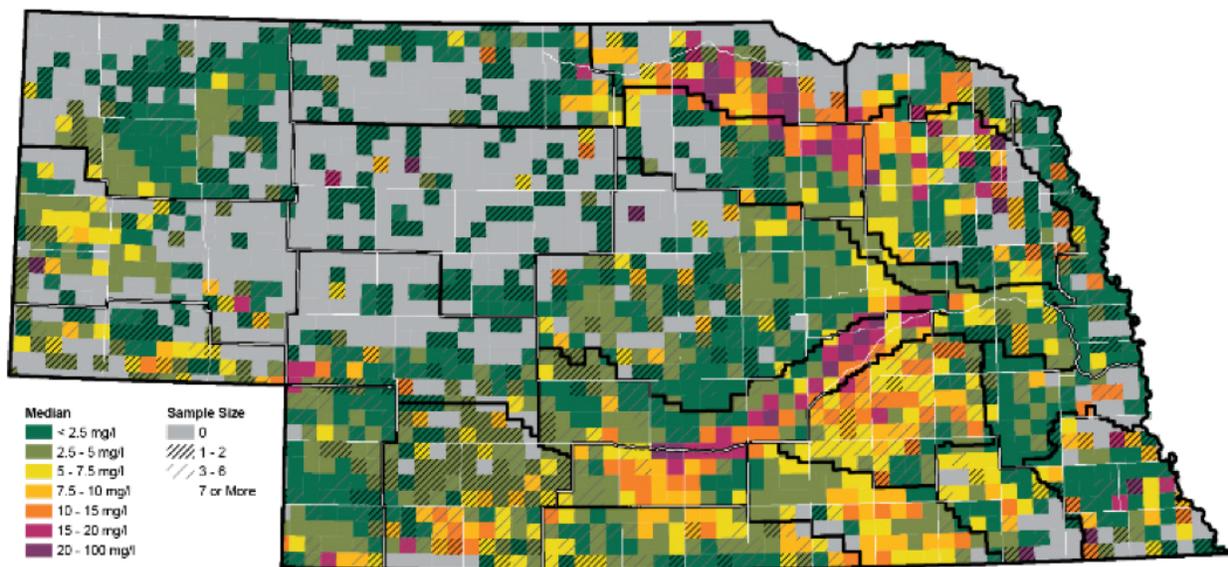


Figure 5: Median of the most recent Nitrate-N concentrations by township of 18,160 wells from 1997-2016. Empty areas indicate no data reported, not the absence of nitrate in groundwater. (Source: Quality-Assessed Agrichemical Database for Nebraska Groundwater, 2017. Published by Nebraska Department of Environmental Quality, 2017)