

# Collaboration is Key

Protecting Source Water in Nebraska through multi-organization efforts to implement management practices, expand education, and engage the public

Amanda Osborn - Source Water Protection Program Coordinator

Connor McFayden - Wellhead Protection Program Coordinator

Groundwater Section

Drinking Water & Groundwater Division

Nebraska Department of Environment and Energy

2023 GWPC Annual Forum  
Source Water Protection Session  
September 12, 2023

# Agenda

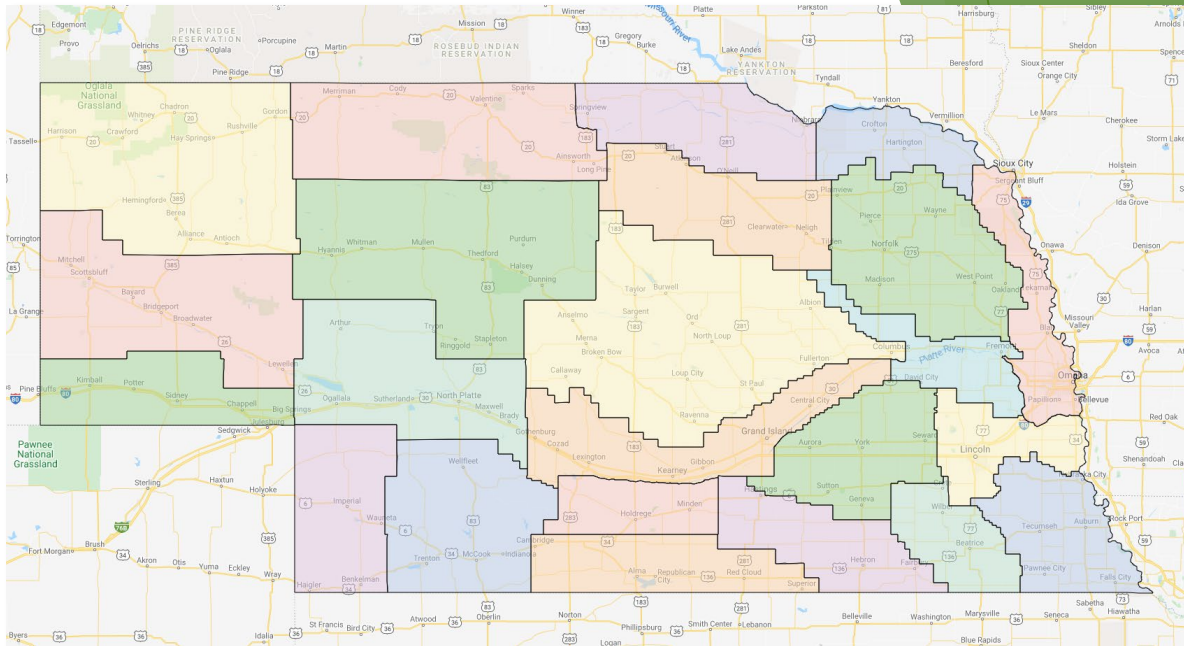
- ▶ Nebraska Water
- ▶ Wellhead Protection
- ▶ Bazile Groundwater Management Area
- ▶ The DWPMP journey and Template
- ▶ Funding
- ▶ Partnerships



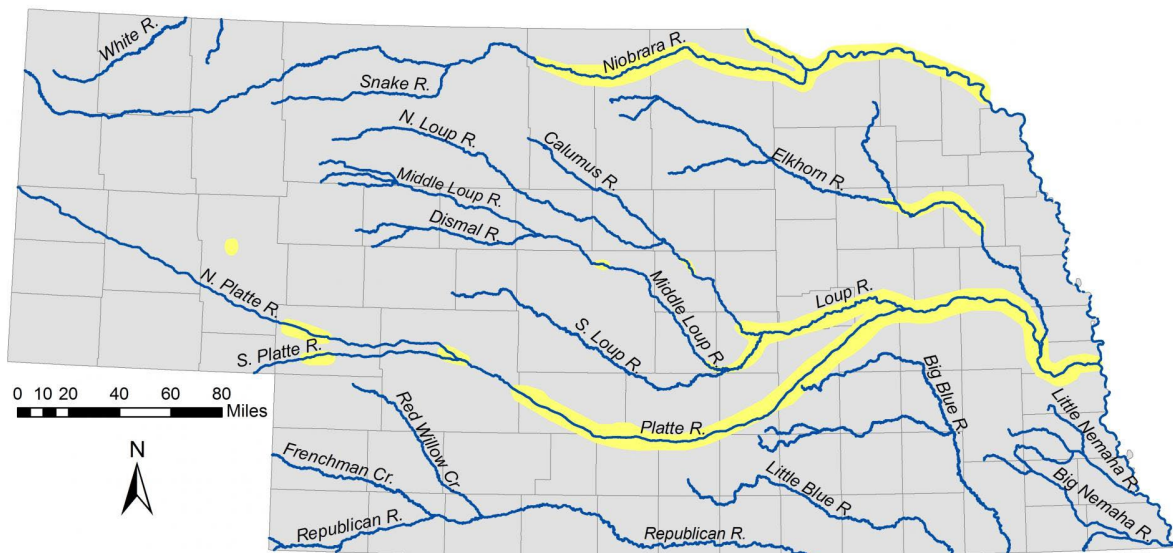
*Photo: Platte Basin Timelapse*

# Nebraska's Natural Resource Districts

- ▶ Unique system of locally-controlled, tax-funded, watershed based conservation districts
- ▶ 23 NRDs
- ▶ Based on watersheds
- ▶ Locally elected board of directors
- ▶ Operate from tax funds
- ▶ Can address local water issues
  - ▶ Precipitation, geology, soil conditions vary drastically across the state

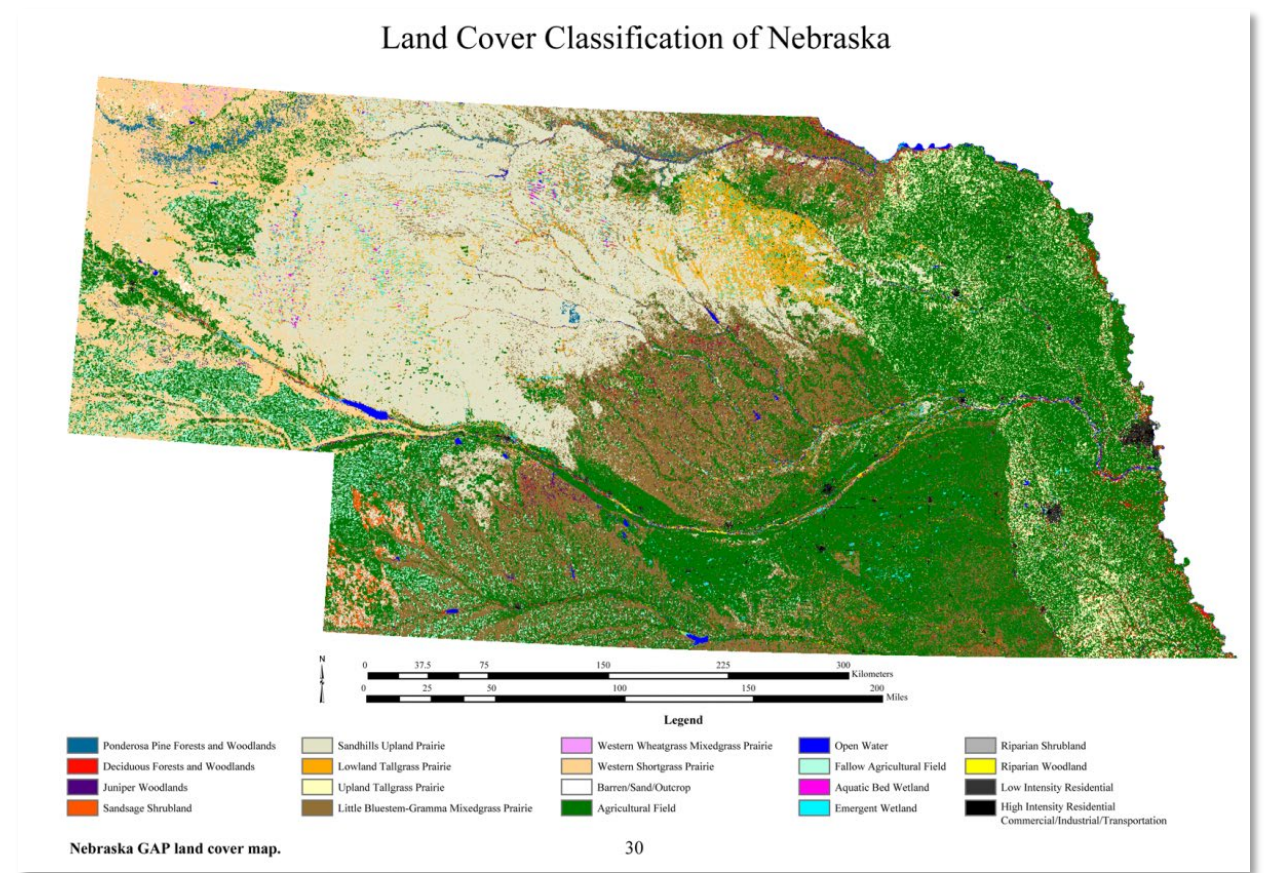
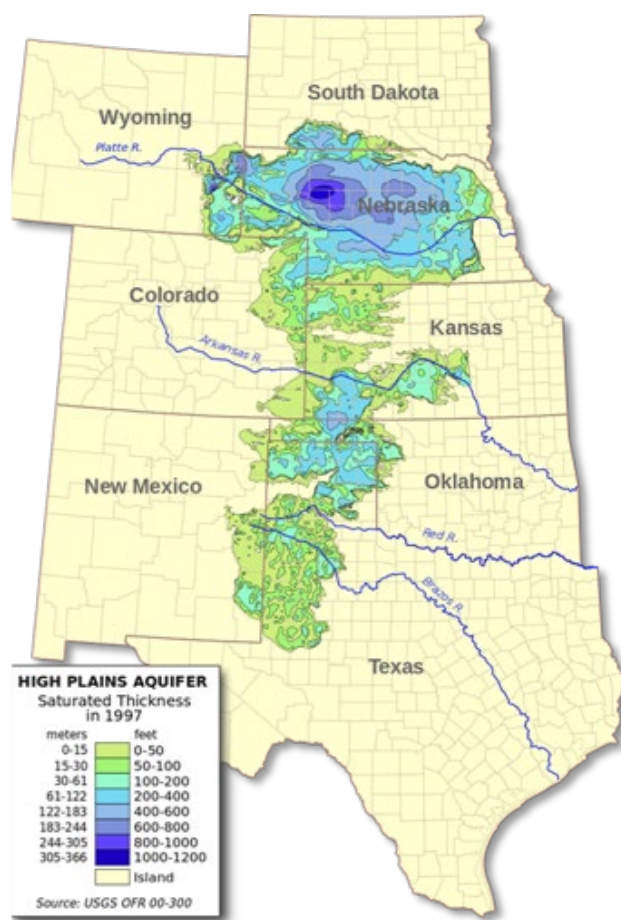


<https://www.nrdnet.org/nrds/find-your-nrd>



unl.edu

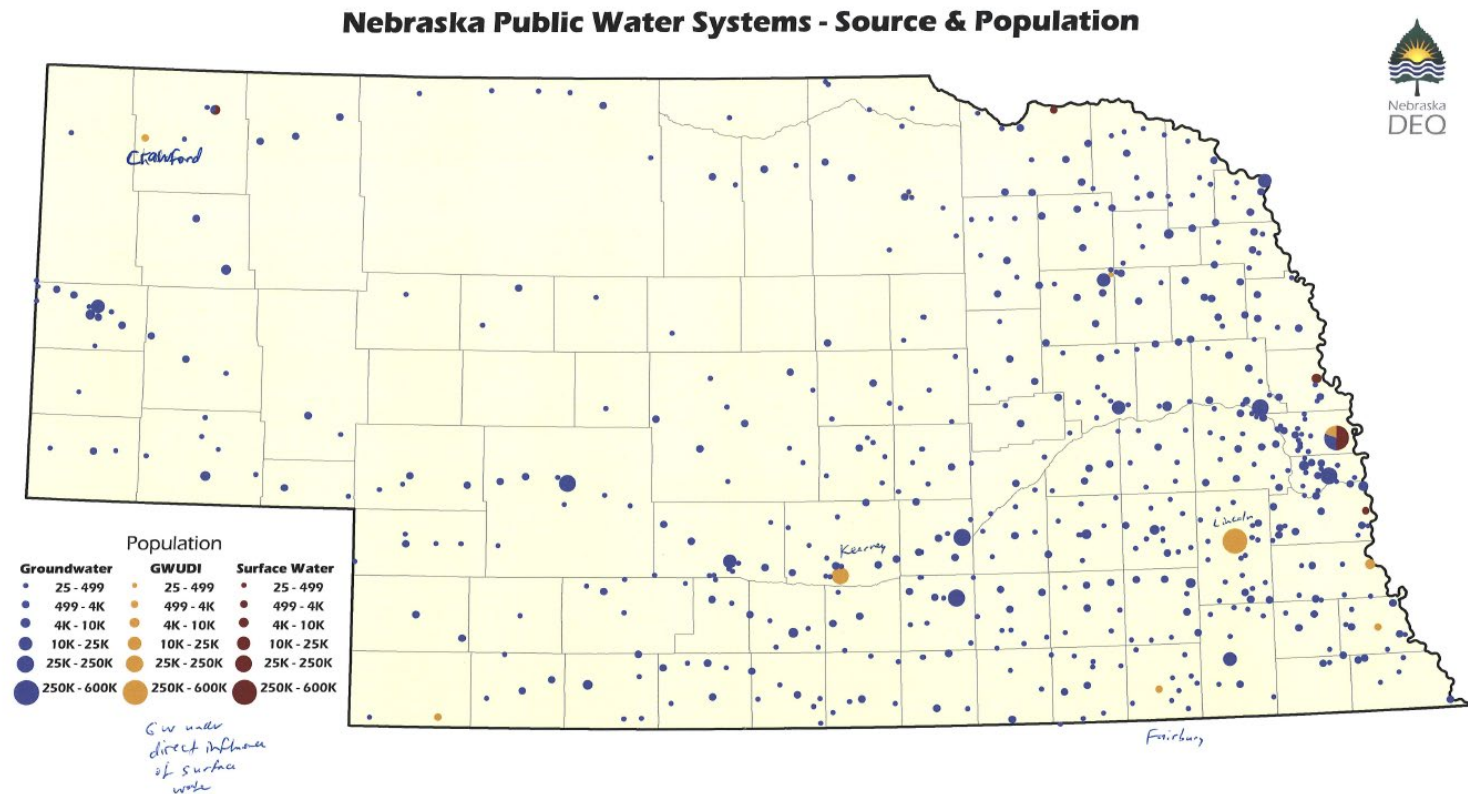




# Nebraska's Water Resources

# Drinking Water in Nebraska

- ▶ <10% of NE population obtains DW from surface water
  - ▶ Surface water resources include 18,000 miles of streams, 430 square miles of lakes
  - ▶ Less than 1% of surface water bodies in NE are used for drinking water
  - ▶ 100% of these PWS require treatment
- ▶ 90% of public water systems in NE rely on groundwater
  - ▶ ~85% of these do not require treatment before distribution

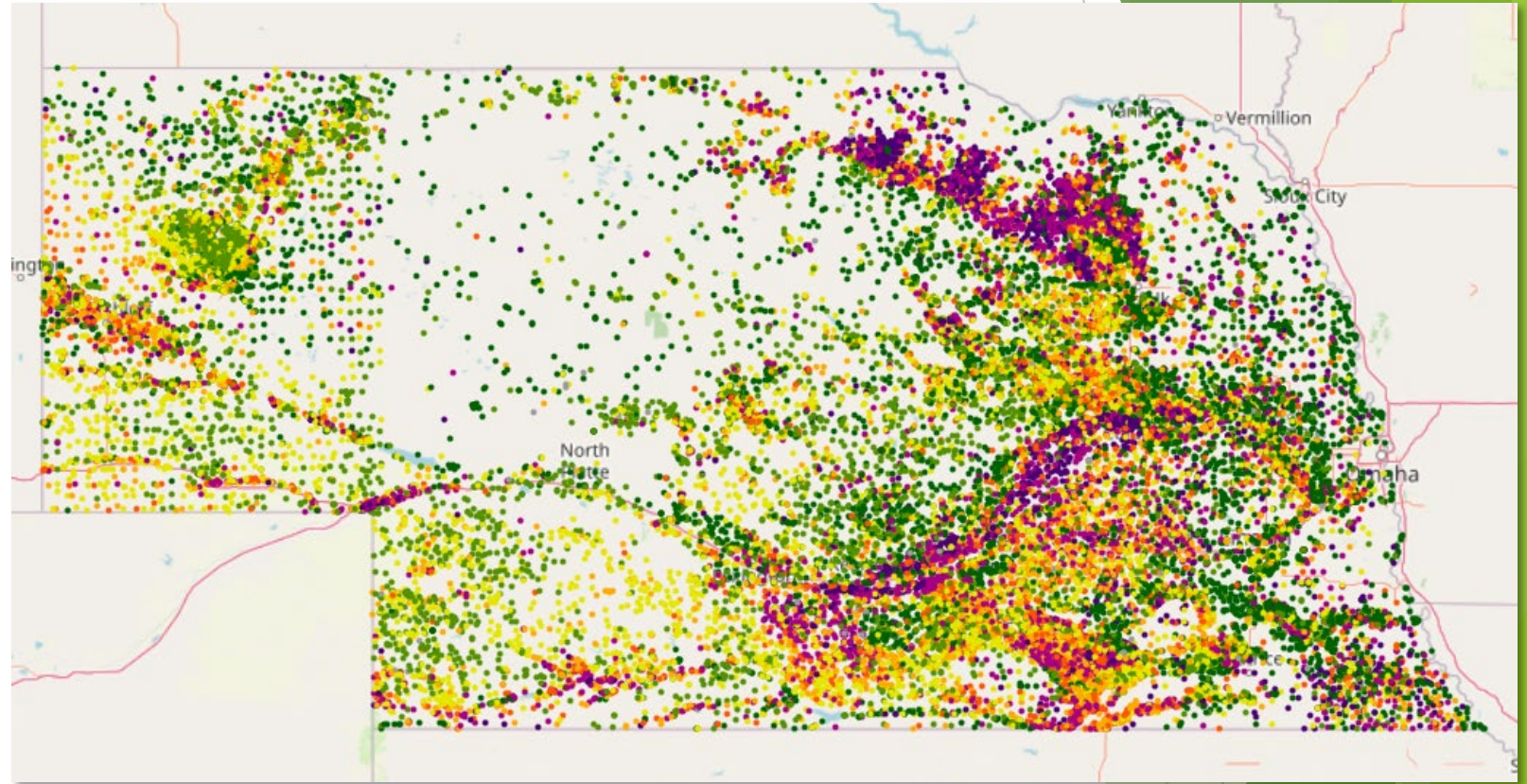
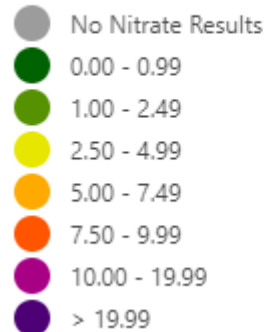




# Nebraska's Nitrate Crisis

- ▶ Primary contaminant in drinking water: Nitrate Nitrogen
- ▶ Clearinghouse shows agrichemical sample results

☒ Most Recent Nitrate Concentrations (Last 20 Years)

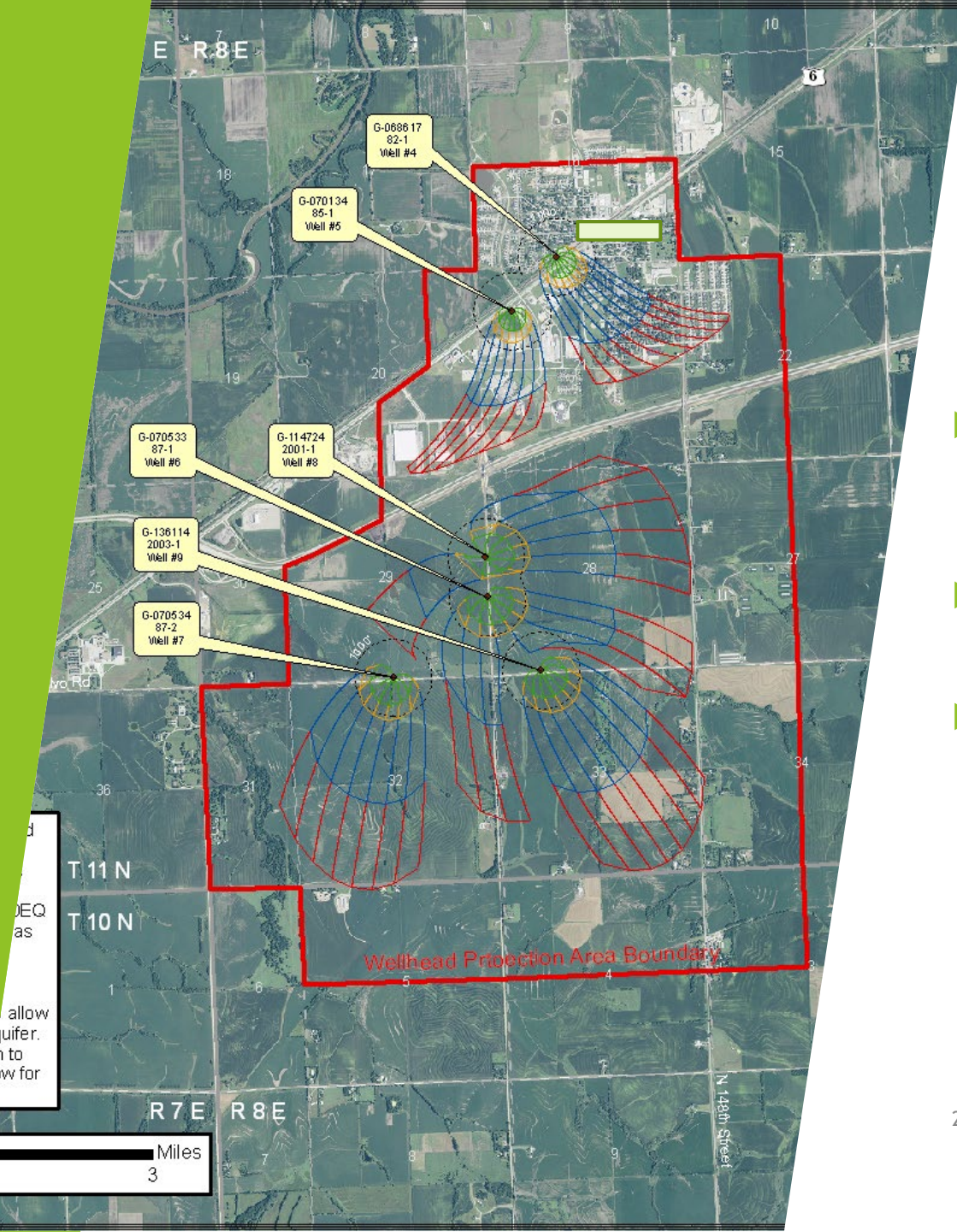


[Clearinghouse.Nebraska.gov](http://Clearinghouse.Nebraska.gov)



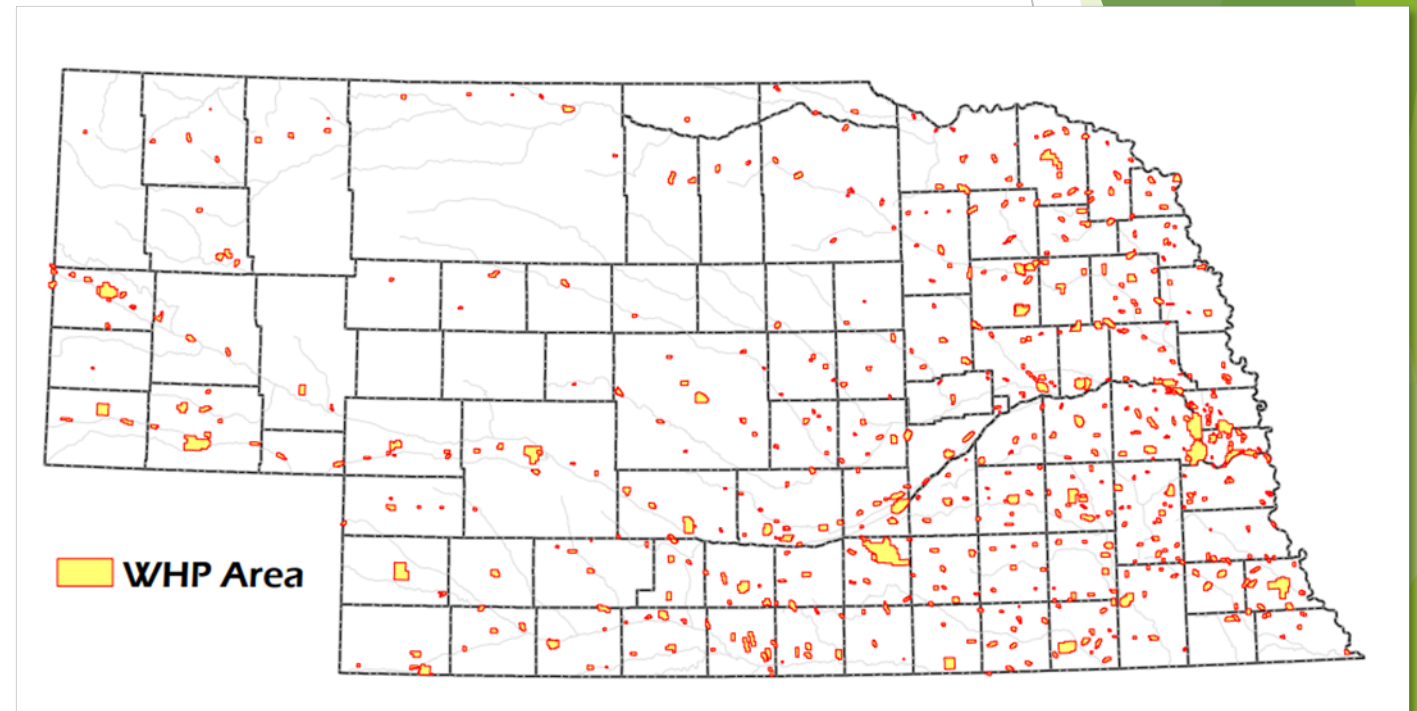
# Wellhead Protection Program

- ▶ Voluntary program that assists communities in protecting their groundwater
- ▶ 1. Delineating Wellhead Protection Areas
- ▶ 2. Promoting and approving Wellhead Protection Plans



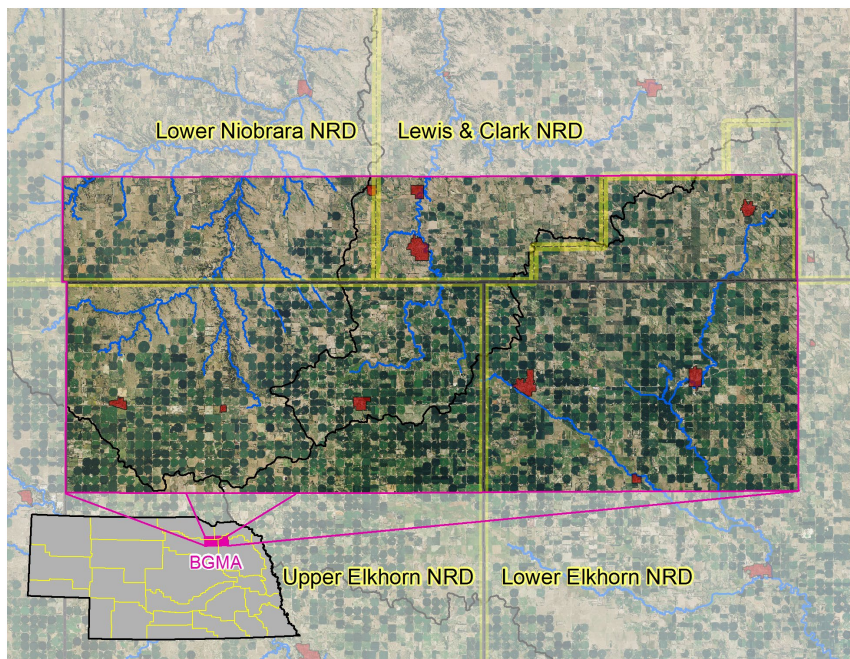
# Wellhead Protection Plans (WHPP)

- ▶ Consist of 5 elements
  - ▶ Delineate WHPA
  - ▶ Contaminant Source Inventory
  - ▶ Contaminant Management Plan
    - ▶ Incentives, education, and mandates
  - ▶ Contingency Planning
  - ▶ Public Participation
- ▶ 96 active plans
- ▶ Funding through Source Water Protection Grant
- ▶ Great first step for systems





# Bazile GMA



Priory Areas	Acres	Average NO <sub>3</sub> -N of most recent samples	Reduction % needed	Acres Needing BMPs
Tier 1	31,224	17.6	45%	14,051
Tier 2	53,112	14.2	30%	15,934
Tier 3	10,167	14.9	46%	4,677
Tier 4	389,337	12.6	21%	81,761
Total	483,840			116,422

Data courtesy of Laura Johnson, NDEE

- ▶ 2016 - Bazile Groundwater Management Area Plan was approved by EPA, reviewed as an alternative to a 9-element plan

- ▶ 756 square miles
- ▶ 4 NRDs
- ▶ 3 basins
- ▶ 8 public water systems, providing drinking water to 10 communities (7,000 people)

## Plan Goals:

- ▶ Short Term: Halt trend of NO<sub>3</sub> in Tier 1-3 areas
- ▶ Long Term: reduce concentrations below 10 mg/L in Tier 1 (WHP) areas, halt contamination and nonpoint source related impairments to surface water

## Tasks:

- ▶ Education & outreach
- ▶ Nitrogen Mgmt (split application, cover crop, irrigation mgmt)
- ▶ Monitoring: water, soil (vadose zone), crop tissue and residue, analyze crop reporting forms

## Why is BGMA so important?

- ▶ FIRST federally recognized groundwater focused plan to address nonpoint source pollution in the nation
- ▶ FIRST TIME 4 NRDs agree to manage this area under the same rules
- ▶ Locally led effort
- ▶ Nebraska petitioned EPA for use of CWA Section 319 funds for GW protection when “responding to a nonpoint source pollution emergency or *urgent nonpoint source pollution public health risk*”
  - ▶ NE was able to address GW pollution through 319 for the first time, utilizing up to 50% of program funding for groundwater



Courtesy of Laura Johnson, NDEE



10



# Plan Progression

We've set up a funding mechanism...

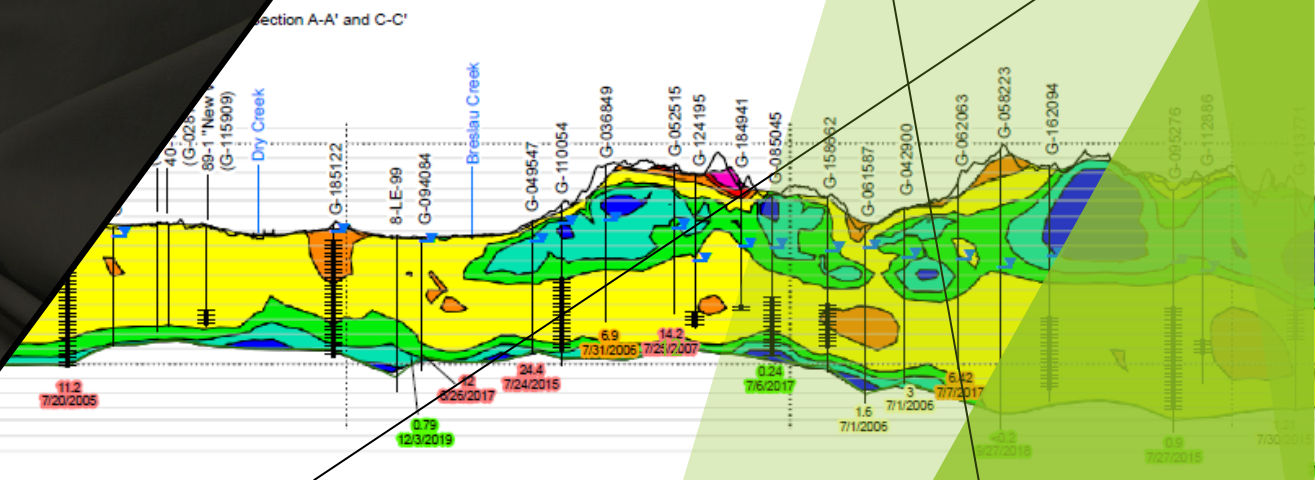
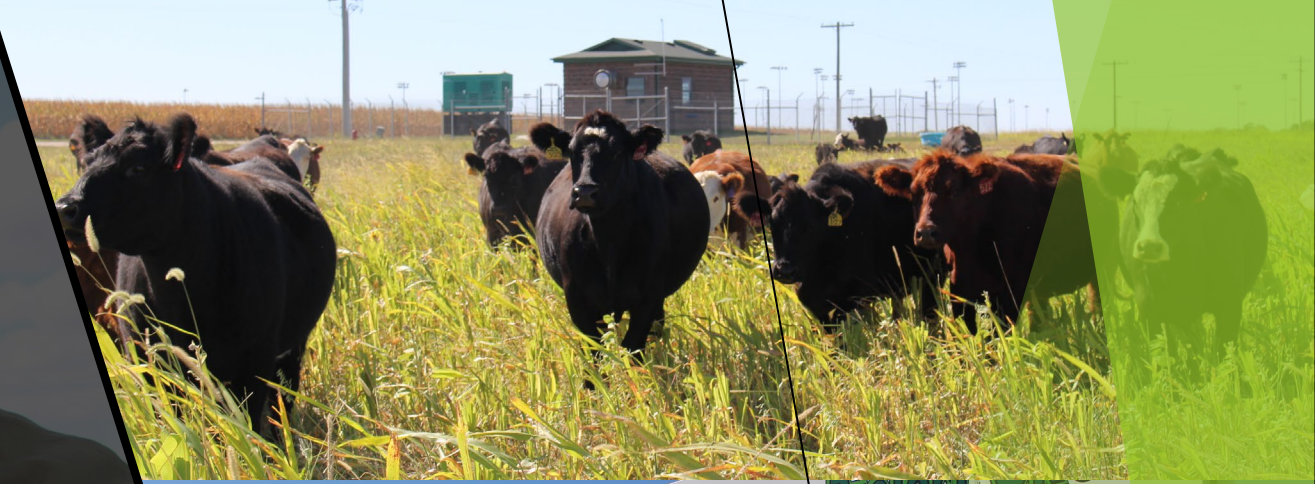


2016 → 2017 → 2018 → 2020 → 2022 → 2023



# The DWSRF side...

- ▶ Source Water Protection Grant Program
- ▶ 200k annually from DWSRF 15% Set Aside
- ▶ Communities 10,000 or fewer
- ▶ Wellhead Protection and Drinking Water Protection Plans (can be combined into one plan that fulfills criteria of both)
- ▶ Projects to protect source water
  - ▶ Hydrogeologic / aquifer vulnerability
  - ▶ Well abandonment
  - ▶ Outreach and education
  - ▶ BMP implementation







# DRAFT

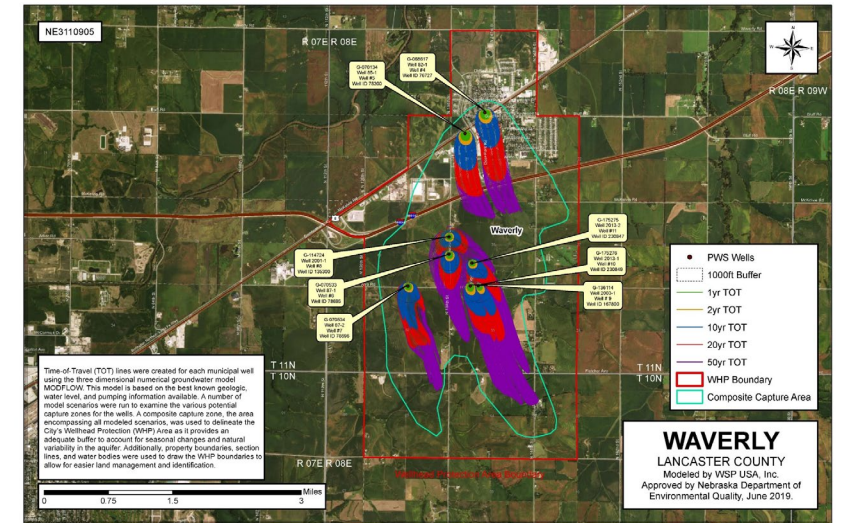
## DRINKING WATER PROTECTION MANAGEMENT PLAN TEMPLATE AND GUIDANCE

Prepared for:  
Nebraska Department of Environment and Energy  
Lincoln, Nebraska

and

The Groundwater Protection Council  
Oklahoma City, Oklahoma

April 2022



## Drinking Water Protection Management Plans: what's the status?

Still learning! 8 approved, more in review...

Partnership between NDEE and Groundwater  
Research and Education Foundation to  
develop a guidance to share with states.

# DWPMP Layout

- ▶ Intro
  - ▶ Community, water system, water quality, document organization
- ▶ Goals and Objectives
  - ▶ Example: reduction of pollutant of concern
- ▶ Source Water Area
  - ▶ Wellhead Protection Area delineation, topography, climate, land cover, soils, surface water/groundwater interaction, groundwater and aquifer characteristics, 50 TOT model
- ▶ Pollution Sources (calculating loads)
  - ▶ Spreadsheet Tool for Estimating Pollutant Loads (STEPL)
  - ▶ University of Nebraska Economically Optimum Nitrate Rate (EONR) Algorithm (estimates rate for several crops with focus on economic returns and includes calculations of excess fertilizer applications that may leach to groundwater).
  - ▶ Environmental Policy Integrated Climate (EPIC) model developed by Texas A&M University and used by NRCS to estimate nitrogen losses in the U.S. in areas with homogenous soils and management.
- ▶ Management Strategies
  - ▶ Urban and rural Best Management Practices
- ▶ Implementation Strategy
- ▶ Monitoring and Evaluation (short, medium, long)



*Photo: Michael Forsberg*



# 2018 Farm Bill

- ▶ 10% of all NRCS conservation funds to go toward source water protection (2.5M in NE)
- ▶ Subcommittee of NE State Technical Committee met to build framework for funding priority areas



## NRCS Source Water Protection

Apply by March 13, 2020, to be eligible for this year's funding.



### 2018 Farm Bill Source Water Protection Funding

The 2018 Farm Bill provides a new opportunity for farmers and landowners to receive financial assistance for applying conservation practices on agricultural land located in source water protection (SWP) priority areas.

If your farm is located in any of the priority areas on the map below, you may be eligible to receive increased financial assistance from the following Farm Bill conservation programs:

- Environmental Quality Incentives Program (EQIP)
- Conservation Stewardship Program (CSP)
- Regional Conservation Partnership Program (RCPP)
- Agricultural Conservation Easement Program (ACEP)

Nebraska NRCS is now accepting SWP applications. Approved applicants can receive funding to install conservation practices used to address water quality, that include:

- Nutrient management
- Irrigation water management
- Cover crops
- Conversion of flood to pivot or subsurface drip irrigation systems.

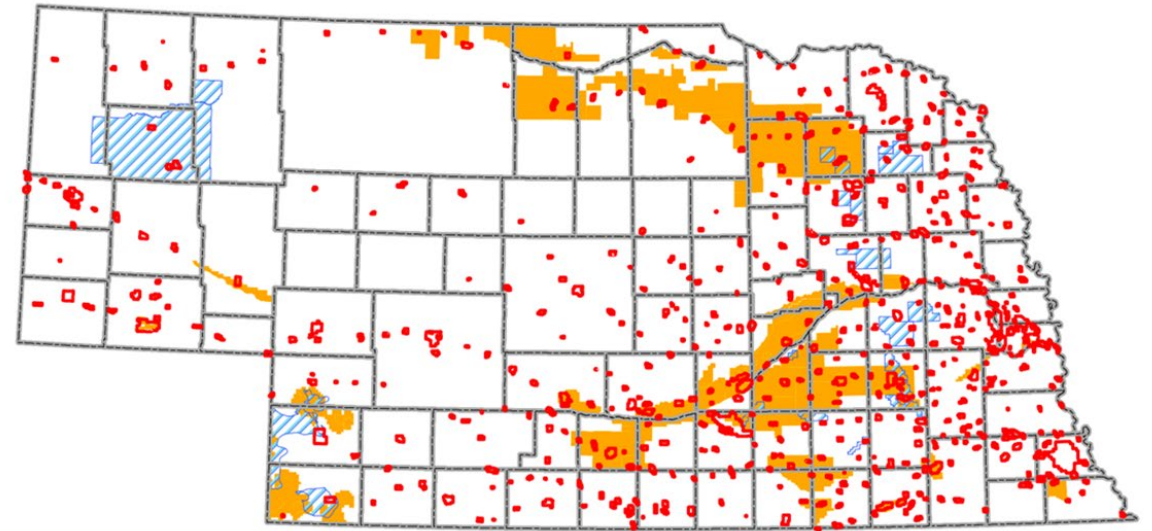
NRCS field office staff can determine if your application is eligible for SWP priority area financial assistance. Applications are accepted anytime, but to receive funding this year, applications must be received by March 13, 2020. Visit your local NRCS field office to learn more.

# NDEE and NRCS Partnerships

- Fall 2019 - Meeting to prioritize funding from 2018 Farm Bill SWPI (10% of conservation funds to SWP)
- Priority best management practices are ID'd for water quality, are included in DWPMs

**Source Water Protection Initiative Priority Practices**

Practice Number	Practice Name
314	Brush Management (only very low density scenario)
328	Conservation Crop Rotation
340	Cover Crop
351	Water Well Decommissioning
441	Irrigation System, Micro Irrigation
442	Sprinkler System
449	Irrigation Water Management
590	Nutrient Management
595	Integrated Pest Management
657	Wetland Restoration
Not Available in 2020	
420	Wildlife Habitat Planting
604	Saturated Buffer



**Legend**

- Wellhead Protection Areas (High Priority)
- NRD GMA - Quantity Mgmt Areas (Medium Priority)
- NRD GMA - Phase II or higher (Medium Priority)
- County Boundary



USDA is an equal opportunity provider, employer, and lender.

February • 2020

Nebraska

Natural  
Resources  
Conservation  
Service

[ne.nrcs.usda.gov/](http://ne.nrcs.usda.gov/)



# Nitrate and Human Health

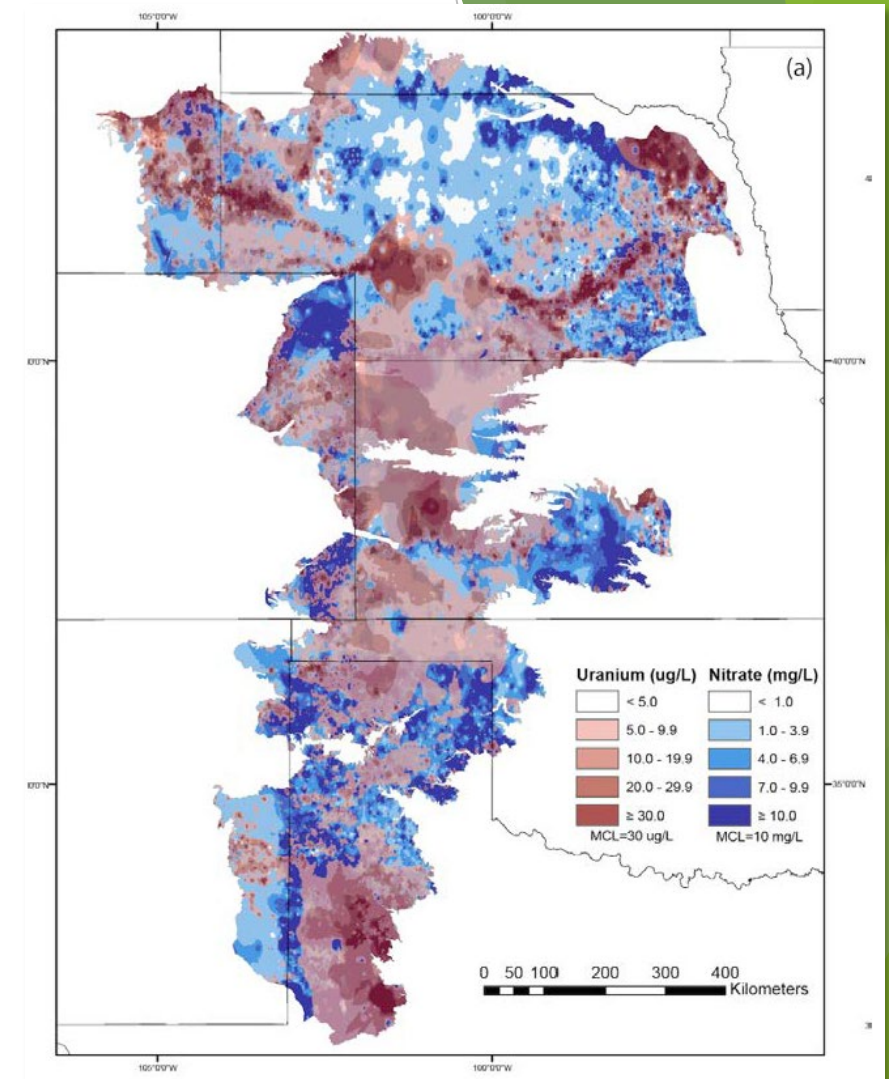
- ▶ Regulatory limits of nitrate in drinking water are set for infant development of methemoglobinemia, not for other health outcomes
- ▶ Numerous scientific studies have looked at the relationship of nitrate in drinking water on human health
- ▶ High concentration of nitrate in drinking water have been linked to adverse health outcomes
- ▶ Strongest links:
  - ▶ Minor health ailments
  - ▶ Methemoglobinemia
  - ▶ Preterm birth issues
  - ▶ Birth defects
  - ▶ Pediatric cancers
  - ▶ Adult Cancers



*Courtesy of Jesse Bell, Director, Water Climate & Health Program*

# Adult Health Issues

- ▶ Increased heart rate, nausea, headaches, and abdominal cramps
- ▶ Cancer
  - ▶ Colorectal cancer (5 studies; 4 positive)
  - ▶ Thyroid disease (3 studies; 3 positive)
  - ▶ Kidney cancer (2 studies; 2 positive)
  - ▶ Bladder cancer (4 studies; 2 positive)
  - ▶ Non-Hodgkin lymphoma (3 studies; 1 positive)
  - ▶ Non-Hodgkin Lymphoma had a three-fold increase in risk with nitrate and atrazine in Nebraska study (Rhoades et al 2013)
- ▶ Alzheimer's, Diabetes, and Parkinson's Disease
- ▶ NOTE: these studies are recent, current emphasis and studies are focused on determining correlation vs causation



*J Nolan, KA Weber - Environmental Science & Technology Letters, 2015*



# Nitrate and Public Health

- ▶ Water, Climate, and Health Program at UNMC - founded in 2019
- ▶ Spatial relationship between NO<sub>3</sub> concentration and incidence of pediatric cancers at the watershed level
- ▶ Suggesting different agricultural activities across the state might compromise the health of the pediatric population in regard to central nervous system tumors

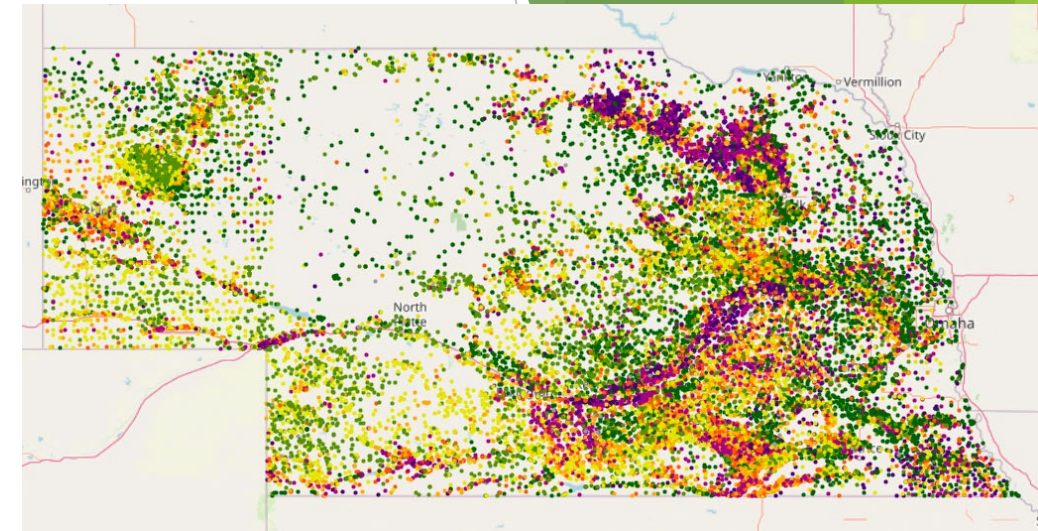
\$5 million gift creates program on water, climate and health

by Lisa Spellman, UNMC strategic communications | August 27, 2020



More News Feeds

Featured News  
Community  
Education  
Inside UNMC  
Outreach  
Patient Care  
Research



[clearinghouse.nebraska.gov](http://clearinghouse.nebraska.gov)

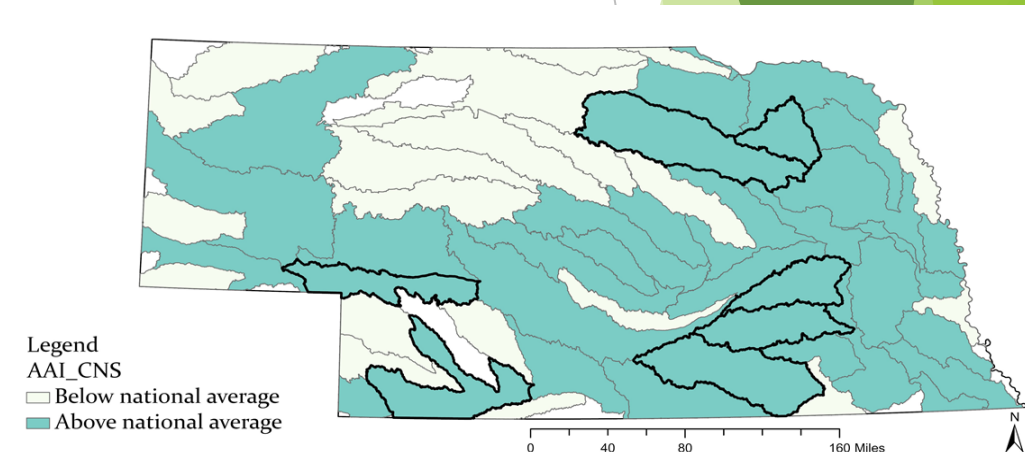
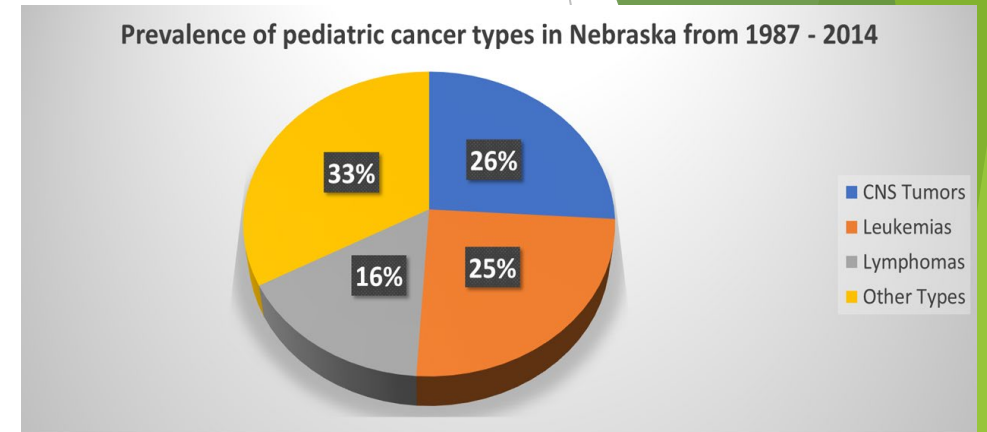


Fig 1. Age-adjusted pediatric CNS cancers vs. groundwater nitrate concentration. Watersheds outlined in black have nitrate concentration above 10mg/L

*Ouattara, Balkissa & Rogan, Eleanor. UNMC College of Public Health. DWFI Brown Bag Presentation June 10, 2021*

# Most Vulnerable Populations

- ▶ Pregnant women and their fetus (especially at 30 weeks of pregnancy)
- ▶ Young infants (< 6 months of age)
- ▶ Children
- ▶ People with oxygen transport or delivery conditions like anemia, cardiovascular disease, lung disease, sepsis and presence of other structural hemoglobin variants
- ▶ People with high nitrate in their well water
  - ▶ Diet also plays a role



*Ouattara, Balkissa & Rogan, Eleanor. UNMC College of Public Health. DWFI Brown Bag Presentation June 10, 2021*







Partnerships are everything

# Questions?



## Contact us:

Amanda Osborn

Source Water Protection Program Coordinator  
Groundwater and Drinking Water Division, NDEE  
[amanda.osborn@nebraska.gov](mailto:amanda.osborn@nebraska.gov)  
402-471-9249

Connor McFayden

Wellhead Protection Program Coordinator  
Groundwater and Drinking Water Division, NDEE  
[connor.mcfayden@nebraska.gov](mailto:connor.mcfayden@nebraska.gov)  
402-471-3376