

# *NEBRASKA'S NRDS: MONITORING GROUND WATER FOR THE LONG HAUL*

*Dick Ehrman*

*Water Resources Specialist*

*Lower Platte South Natural Resources District*

*Lincoln, Nebraska*

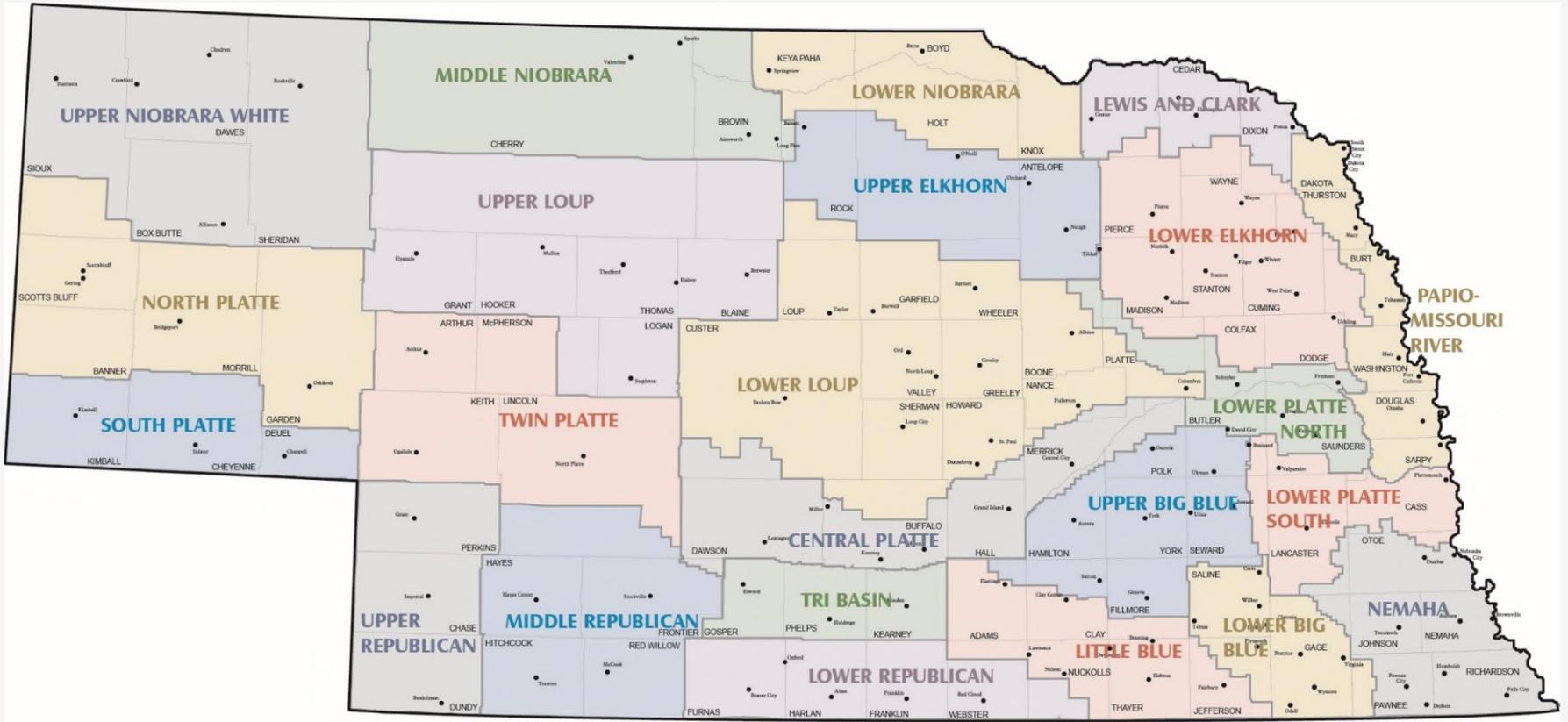




## Nebraska's Natural Resources Districts

- Formed in 1972 from a variety of special-use districts
- Delineated according to major watershed boundaries
- Governed by locally-elected Boards of Directors
- Managed by professional staff
- Property taxing authority

# Nebraska's 23 NRDs



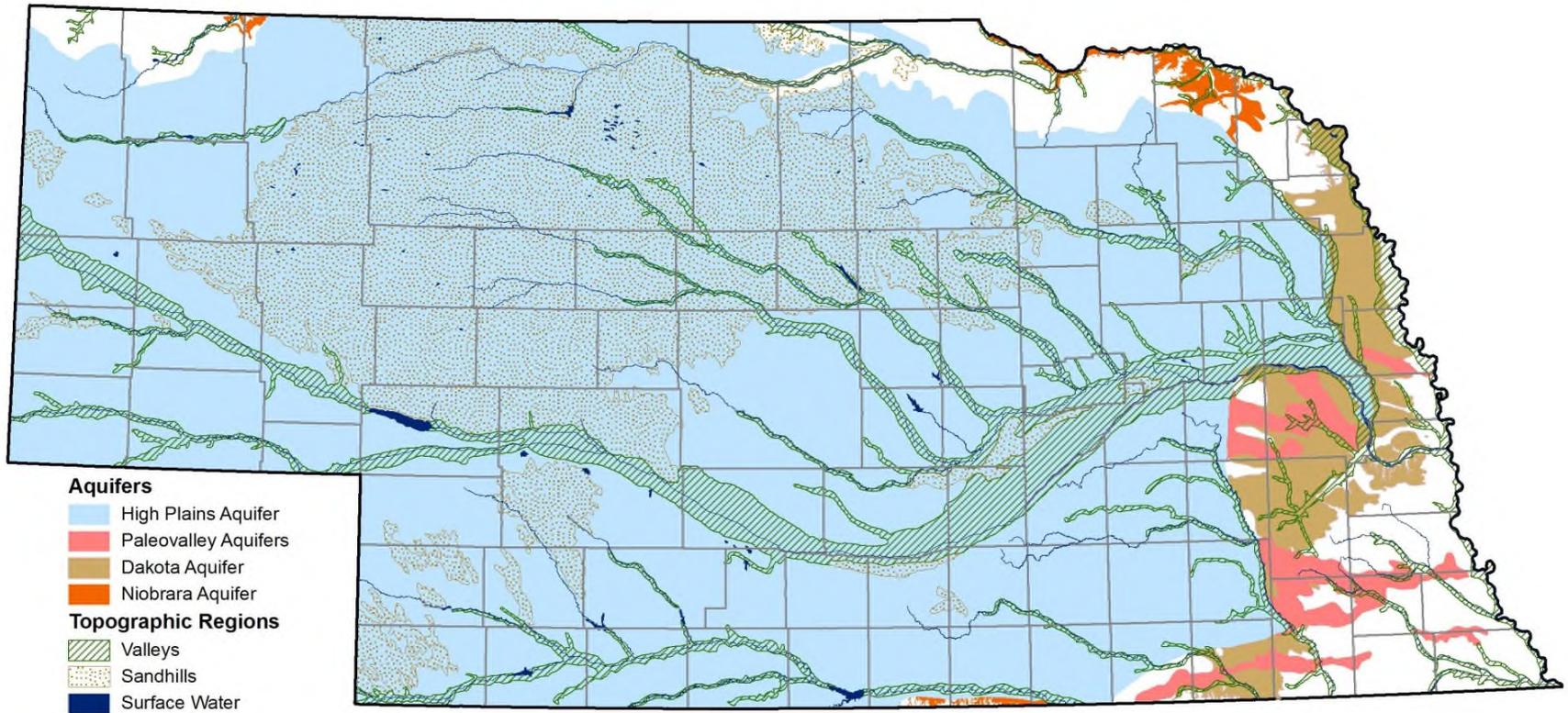
Learn more at [www.nrdnet.org](http://www.nrdnet.org)

# *Areas of Responsibility*

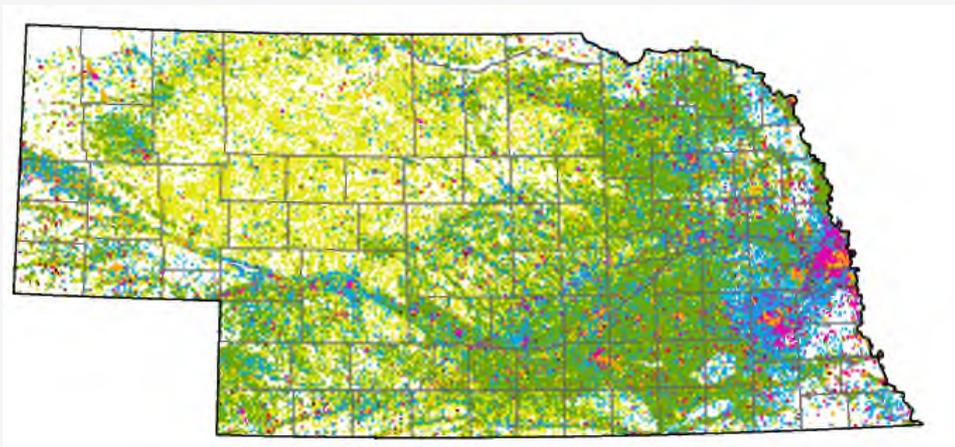
- Water
  - Soil
  - Grazing Lands
  - Trees & Wildlife Habitat
  - Flood Control
  - Urban Conservation
  - Recreation
  - Information & Education
- 
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# Major Aquifers in Nebraska

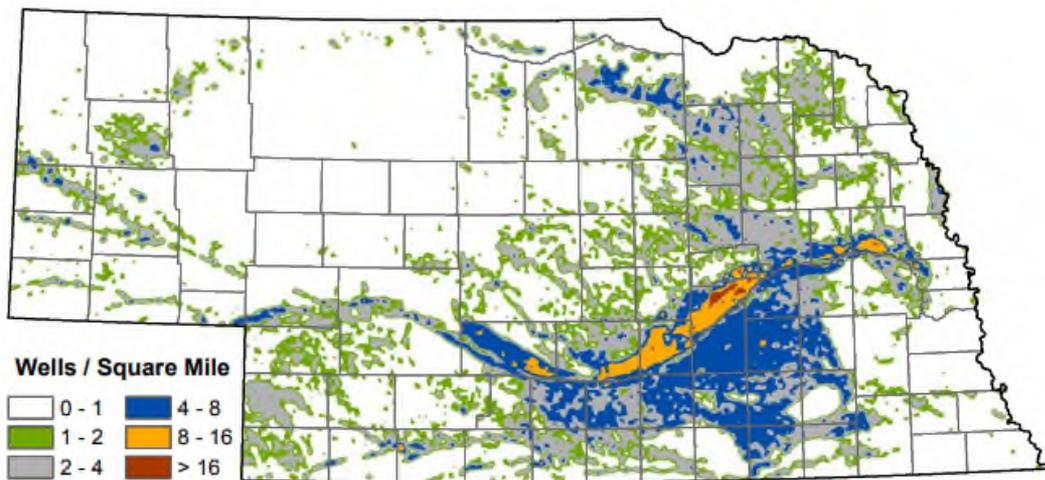
Important Aquifers and Topographic Regions of Nebraska



# NEBRASKA- "The Ground Water State"



Water Use	Active
<span style="color: green;">●</span> Irrigation	96,593
<span style="color: blue;">●</span> Domestic	30,932
<span style="color: yellow;">●</span> Livestock	21,370
<span style="color: orange;">●</span> Monitoring (groundwater quality)	16,912
<span style="color: red;">●</span> Public Water Supply	3,034
<span style="color: purple;">●</span> Commercial/Industrial	1,762
<span style="color: pink;">●</span> Other	13,880
<b>TOTAL</b>	<b>184,492</b>

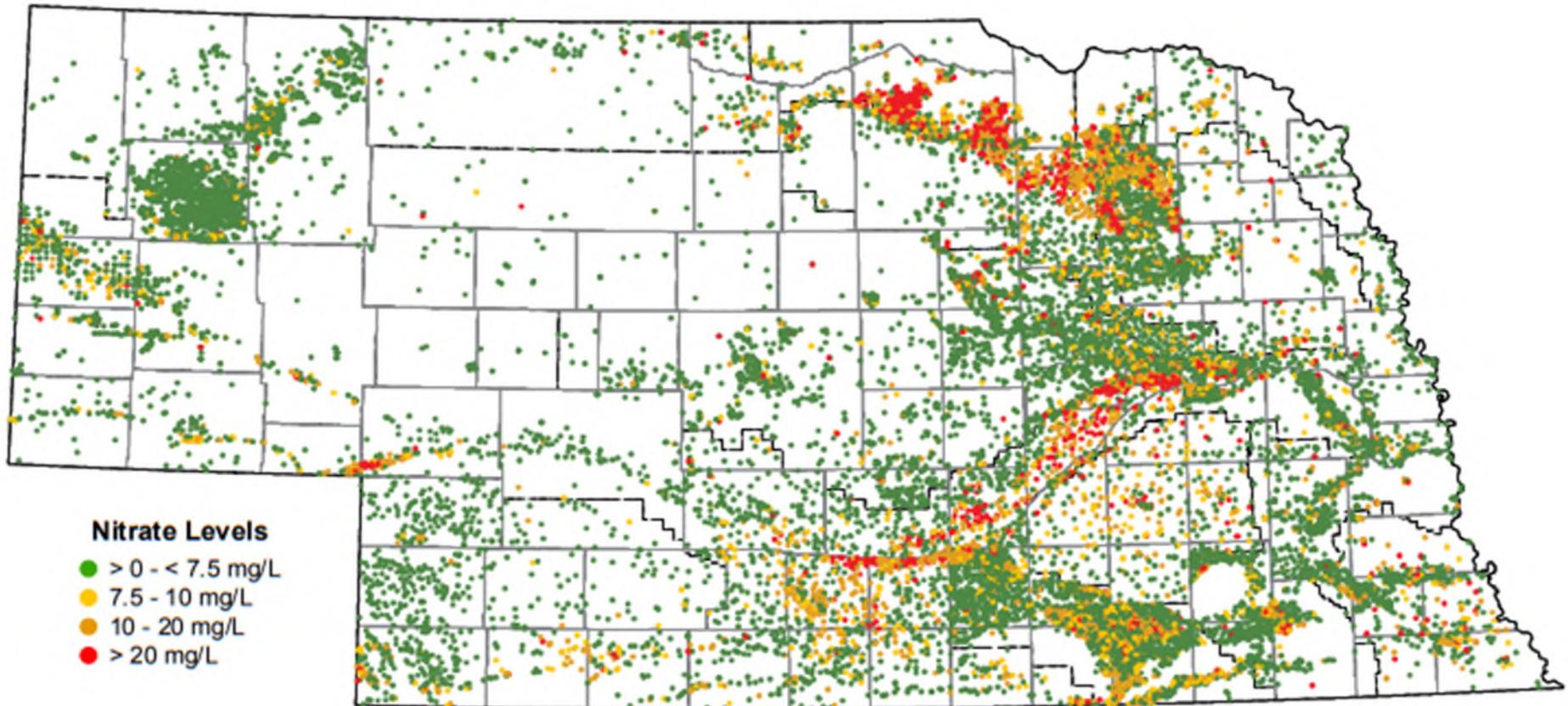


About 88% of Nebraskans use ground water for domestic supply (almost 100% if Omaha isn't included)

NDEQ, 2018

# *Nitrates in Nebraska Ground Water*

## **MOST RECENT NITRATE-N CONCENTRATIONS**



# *NRD Authorities*

- Restricted to nonpoint source (NPS) ground water issues
    - Point source (PS) & surface water: NDEQ
  - Ground Water Management Plans & Management Areas
    - GWMA's can be designated by NRD or State
  - Controls for ground water quality:
    - Use of best management practices
    - Water/soil analysis & submittal of data
    - Attendance at educational programs
    - Water quality monitoring/reporting
    - Additional reasonable rules and regulations
    - Additional controls for water quantity
-

# “Phase” Approach

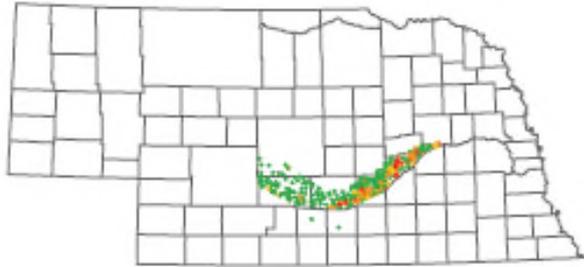
- Based on nitrate levels in NRD monitoring network wells
  - Various private well types—irrigation, domestic, stock, etc.
  - Dedicated monitoring wells—2064 in all 23 NRDs
  - Typically sampled at least annually
  - State law requires NRDs to submit monitoring results to NDEQ
    - Clearinghouse Database: **495,000 analyses** (mostly nitrate)
- Increasing nitrate levels “trigger” management actions
  - Trigger levels are generally a percentage of federal MCL for nitrate (10 mg/ℓ)
  - E.g., for Lower Platte South NRD:
    - **Phase I:** Entire NRD
    - **Phase II:** 50% of network wells > 50% of MCL (5 mg/ℓ)
    - **Phase III:** 80% of network wells > 80% of MCL (8 mg/ℓ)
  - Can be either for entire NRD or sub-areas
    - LPSNRD uses Ground Water Reservoirs & Wellhead Protection Areas
  - Majority of NRDs have Phase I and Phase II areas; relatively few with higher Phases
    - Currently, no GWMA for any contaminant other than nitrate



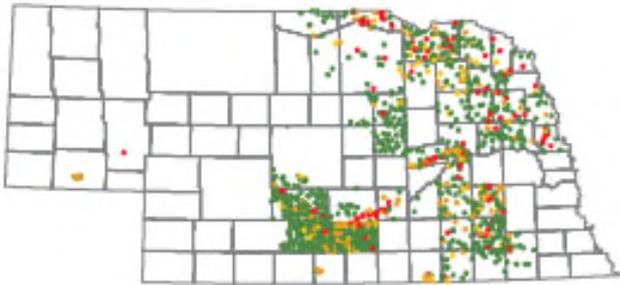
# *“Typical” Controls / Regulations*

- Nitrogen education certification (usually in conjunction w/ University of Nebraska Extension)
    - Classroom, take-home, or online
    - Certification typically applies across NRD boundaries
  - Soil sampling for residual nitrogen carryover consideration
    - University of Nebraska formula commonly used
  - In irrigated areas, irrigation water sampling for nitrogen credit
    - Timing and amount of irrigation/rainfall is critical
  - Timing restrictions on fall/preplant nitrogen fertilizer application
    - Anywhere from November 1 to March 1
    - May require split application between preplant & sidedress
  - Requirements typically greater/more restrictive at higher Phases
-

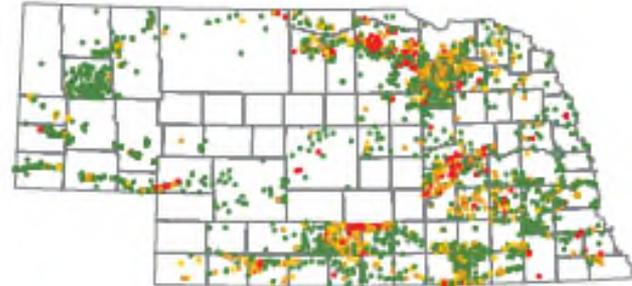
# Success???



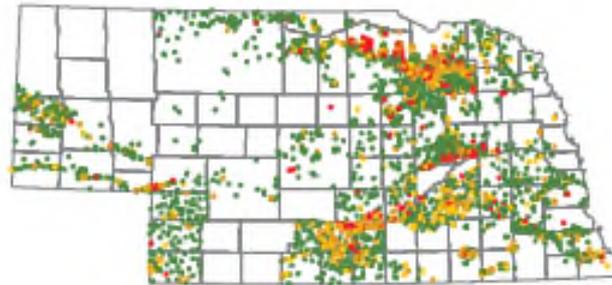
1974 - 1975 (397 wells, 397 analyses)



1987 (1322 wells, 1370 analyses)



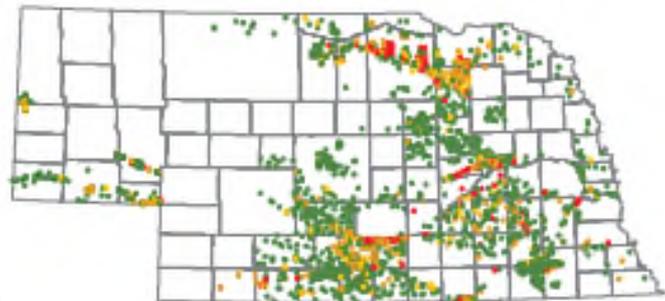
2007 (3099 wells, 3610 analyses)



2017 (4245 wells, 4482 analyses)

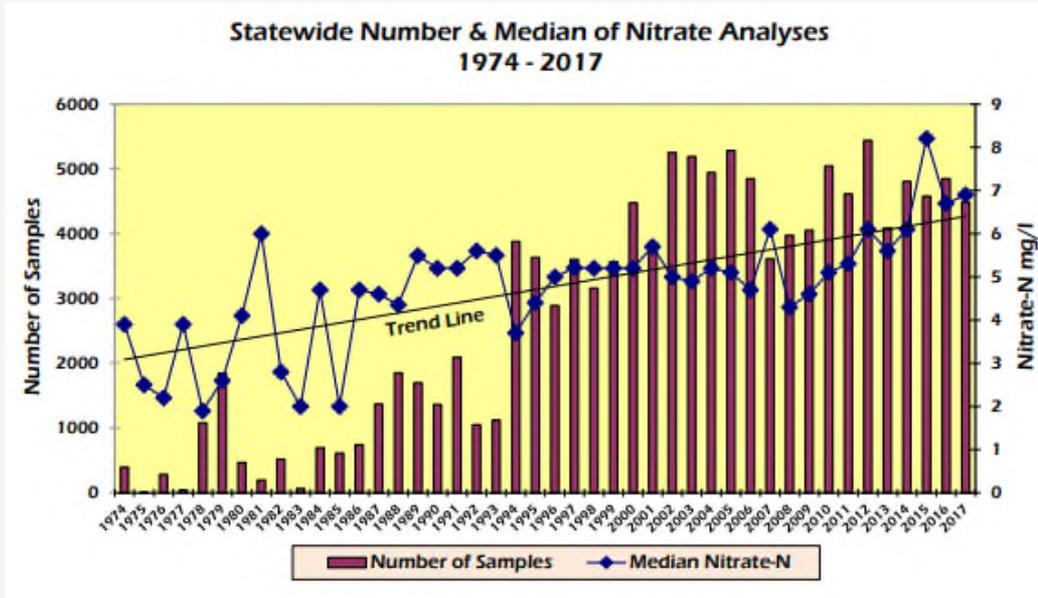
Nitrate Levels

- < 7.5 mg/l
- 7.5 – 10 mg/l
- 10 – 20 mg/l
- > 20 mg/l

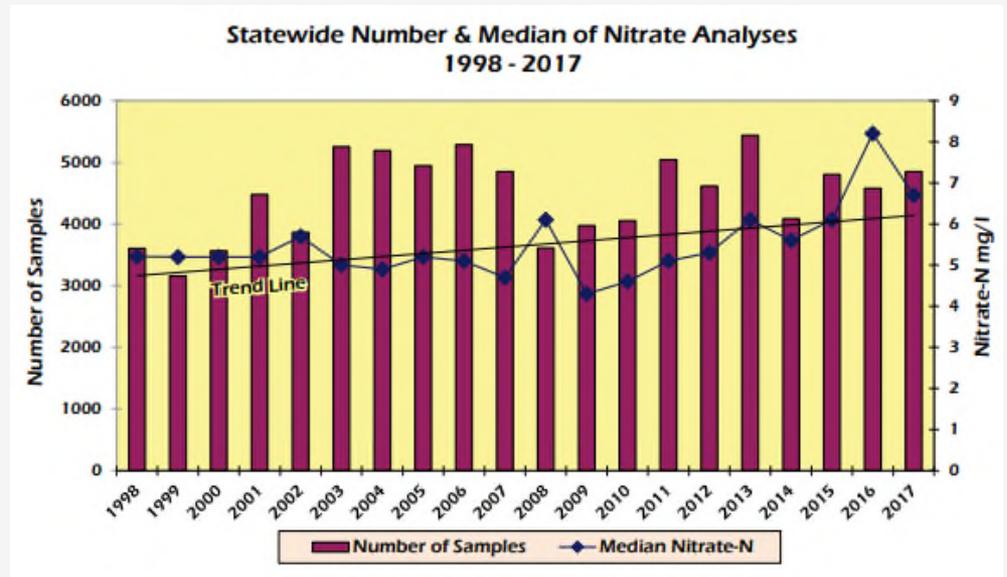


1997 (2623 wells, 3604 analyses)

*Success???*



NDEQ, 2018



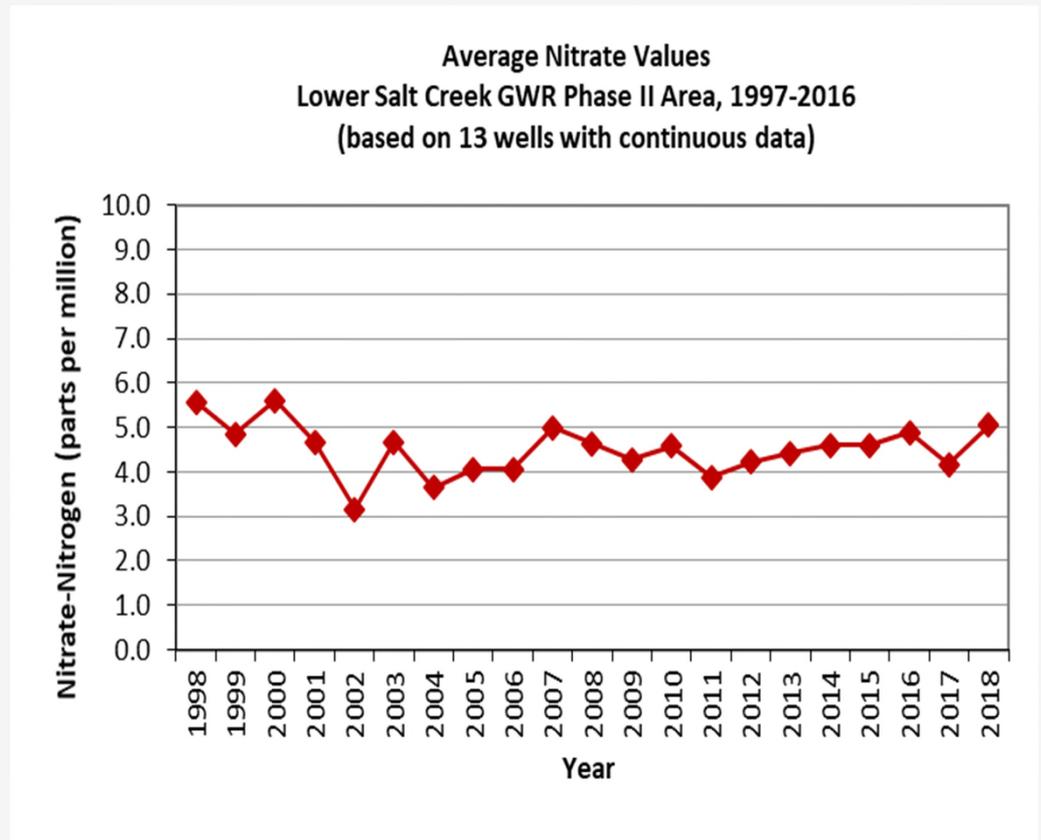
- Central Platte NRD:

- Phase II & III areas
- 1998-2012 data
- Ground water nitrate declined from 19 to 15 mg/ℓ
- Soil nitrate declined from 110 to 50 kg/ha (100 to 45 lbs/a)

(Ferguson, 2015. JEQ 44:449-459)

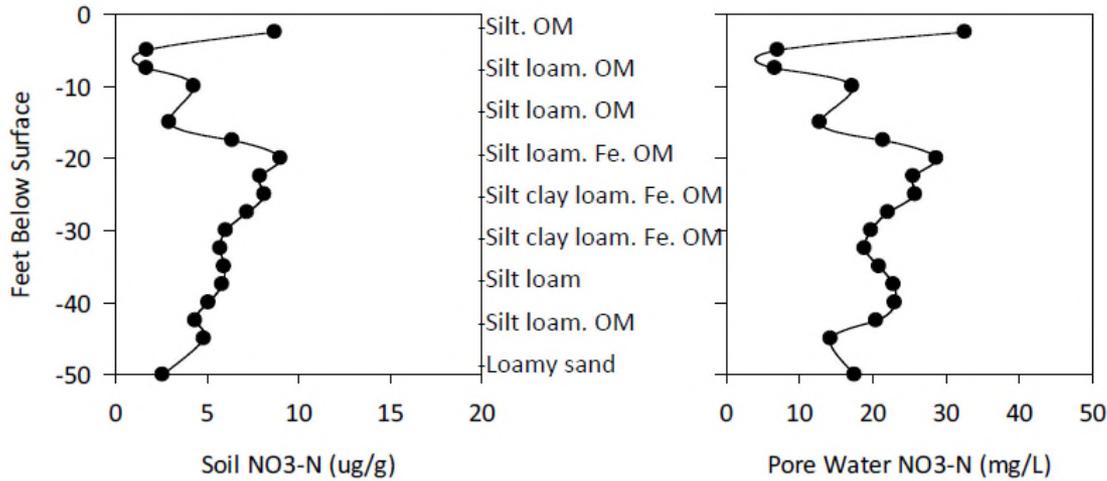
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*Success???*



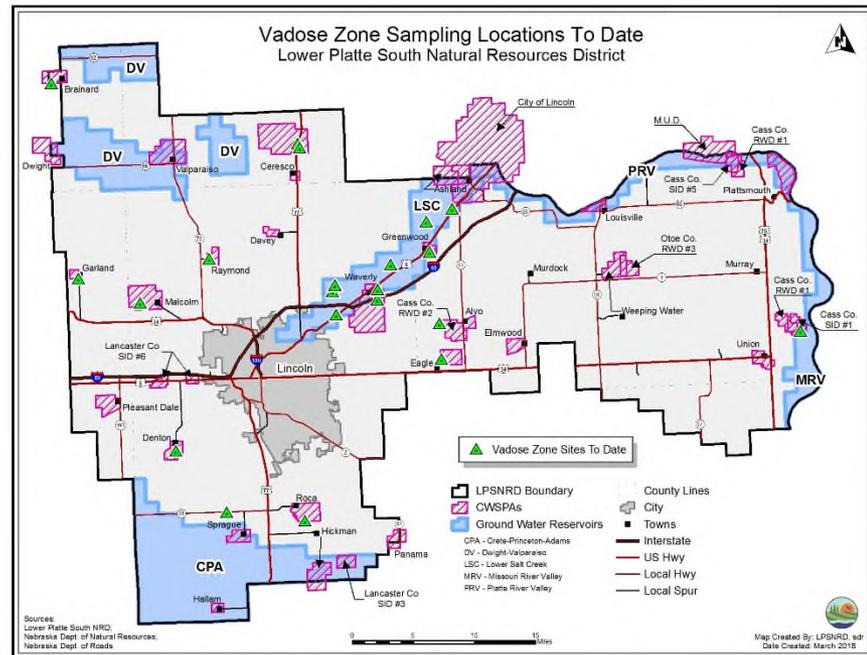
(LPSNRD, 2018)

# We're in it for the long haul...



Nitrogen accumulation in unsaturated/vadose zone

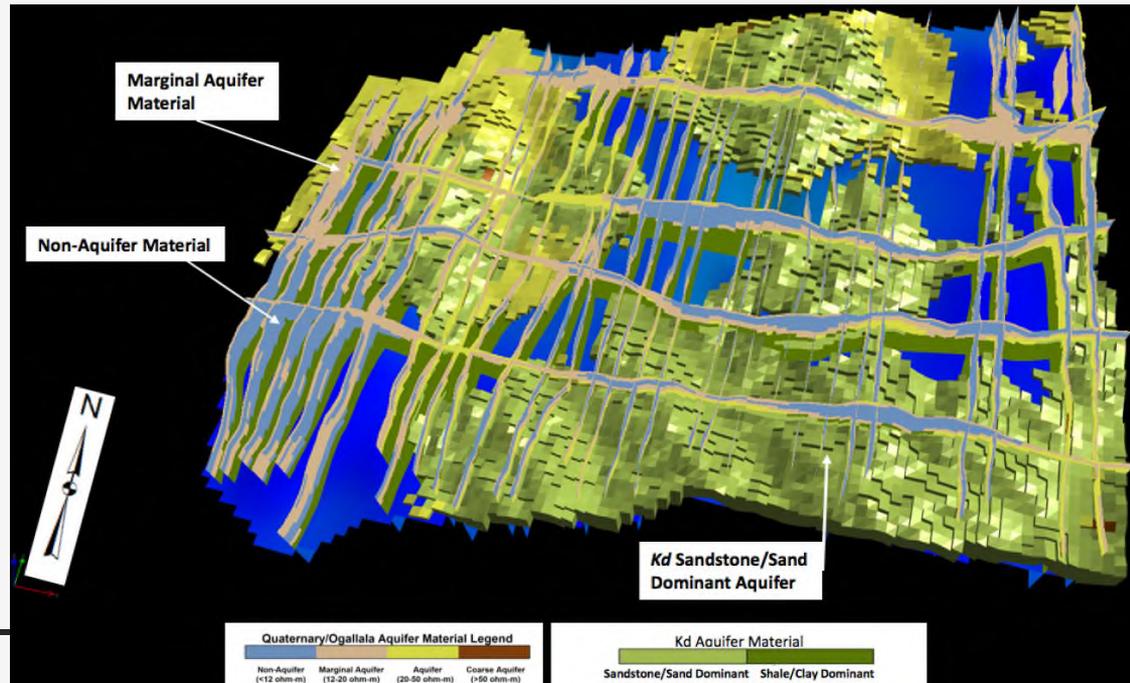
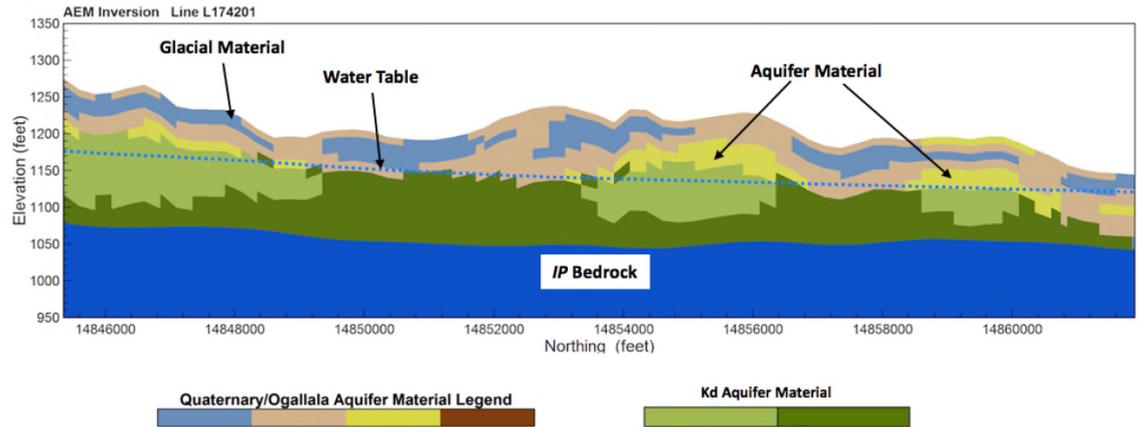
(Snow, 2018)



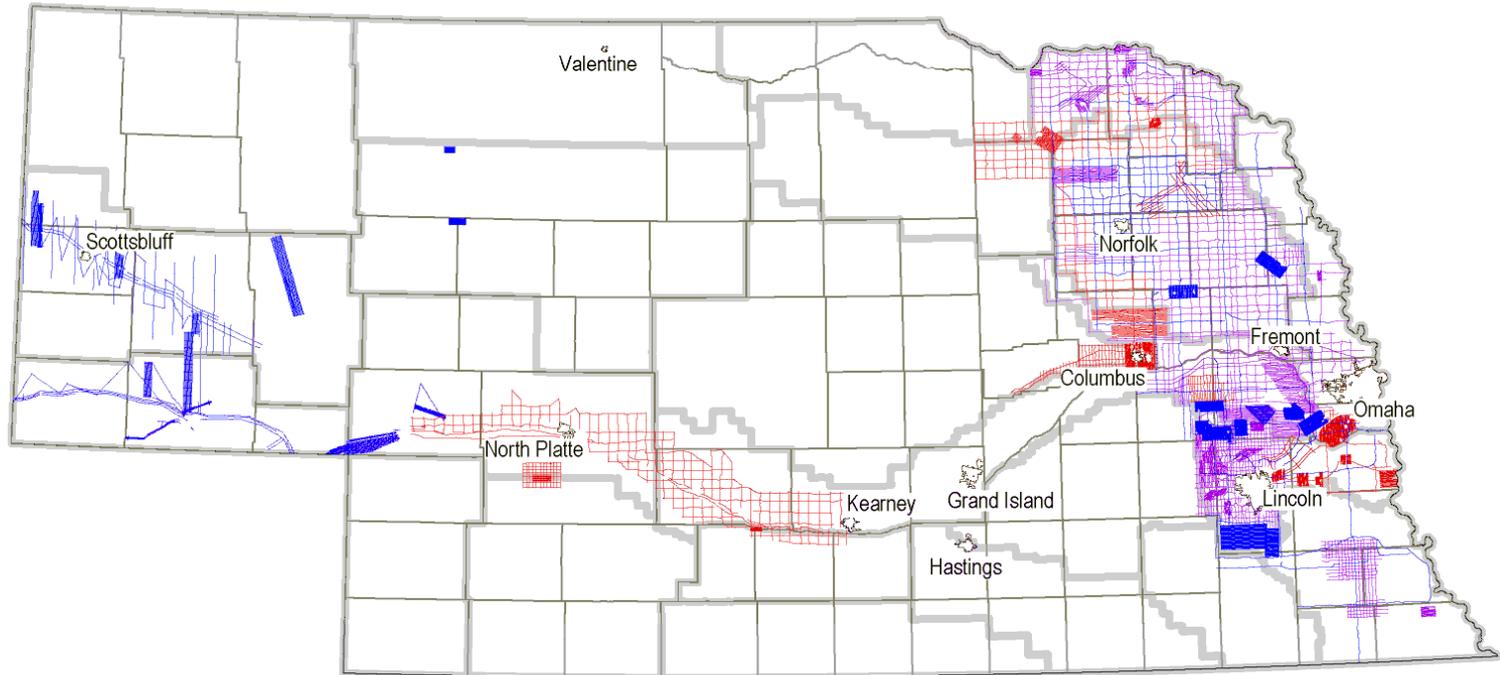
# New Tools....



Airborne Electromagnetic (AEM) Survey Unit



# Existing Airborne Electromagnetic (AEM) Surveys in Nebraska July 2018



## Legend

- 2018 AEM Surveys
- 2016 AEM Surveys
- 2007 to 2015 AEM
- ▭ NRD Boundaries
- ▭ Counties
- ▭ City

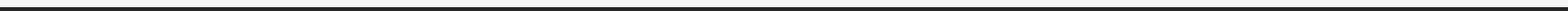


0 20 40 80 Miles

Map Created: Dec 21, 2018  
By: Katie Cameron, ENWRA Project Coordinator

## *Helpful References:*

- Website links for all 23 Nebraska Natural Resources Districts:  
[www.nrdnet.org](http://www.nrdnet.org)
  - Nebraska Department of Environmental Quality:  
[www.deq.ne.gov](http://www.deq.ne.gov)
  - Ag Chemical Clearinghouse Database:  
[http://clearinghouse.nebraska.gov/  
Clearinghouse.aspx](http://clearinghouse.nebraska.gov/Clearinghouse.aspx)
  - Eastern Nebraska Water Resources Assessment (ENWRA):  
[www.enwra.org](http://www.enwra.org)
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# *Questions????*

Dick Ehrman

Water Resources Specialist

Lower Platte South Natural Resources District

(402) 476-2729 office

(402) 429-1327 cell

[dehrman@lpsnrd.org](mailto:dehrman@lpsnrd.org)

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