

# Water, Climate and Health

**Jesse E. Bell, PhD.**

Claire M. Hubbard Professor of Water, Climate and Health

*Director, Water, Climate and Health Program at UNMC*

*Director, Water, Climate and Health at Daugherty Water for Food Global Institute*

UNMC College of Public Health

UNL School of Natural Resources

# Threats in the Heartland



LINCOLN JOURNAL STAR Search The Lincoln Journal Star

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ALERT TOP STORY EDITOR'S PICK

# Long Lincoln heat wave sets records, causes headaches

Matt Olberding Aug 25, 2023 3

Nebraska Public Media PBS NPTV

Watch Listen News Sports Kids/Education Labs

## Nebraska village comes together to clean up after severe flooding

By Sireen Abayazid / Nebraska Public Media June 2, 2023, 3 p.m. · 2 min read



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One person has died from West Nile virus as the state sees more positive pools

Updated: 4:38 PM CDT Aug 22, 2023

McKenzy Parsons Digital Editor

### WEST NILE DEATH

- DHHS says person lived in Nebraska panhandle
- Nebraska sees average 6 West Nile deaths per year



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## Increased wildfire smoke with air quality impacts Wednesday

**FIRST ALERT WEATHER AIR QUALITY ALERT**

AIR QUALITY ALERT Poor air quality expected Wednesday



Canadian wildfire smoke returns to Nebraska skies this week -- and with it, a decrease in air quality.

## Wildfire season is starting early, with three major fires burning across Nebraska

BY PAUL HAMMEL - APRIL 12, 2023 8:58 PM



6 NEWS WOVW 46° Omaha, NE

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## 15 Tornadoes Confirmed Across Eastern Nebraska From Friday's Storms

**FIRST ALERT WEATHER TORNADO DAMAGE**

SW OF OAKLAND - NWS OMAHA DAMAGE SURVEY



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JUST IN Air Force member in critical condition after setting himself on fire outside Israeli embassy in DC

## February Health Matters: Climate change already impacting Nebraskans' health

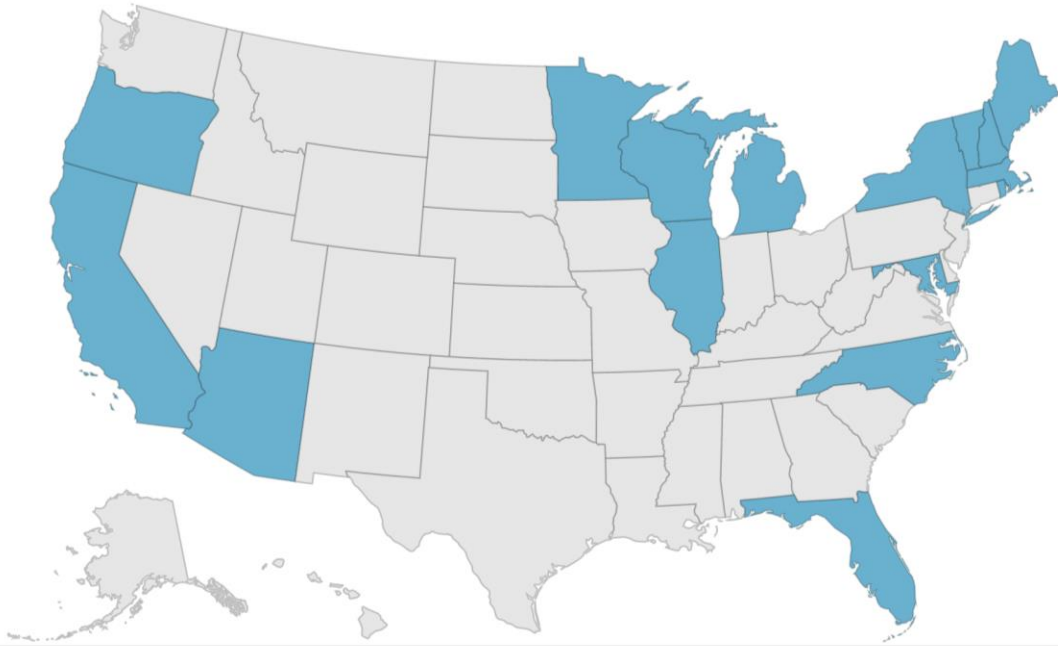
Nancy Gaarder, Julie Anderson Feb 19, 2023 Updated Dec 22, 2023 65 15 min to read



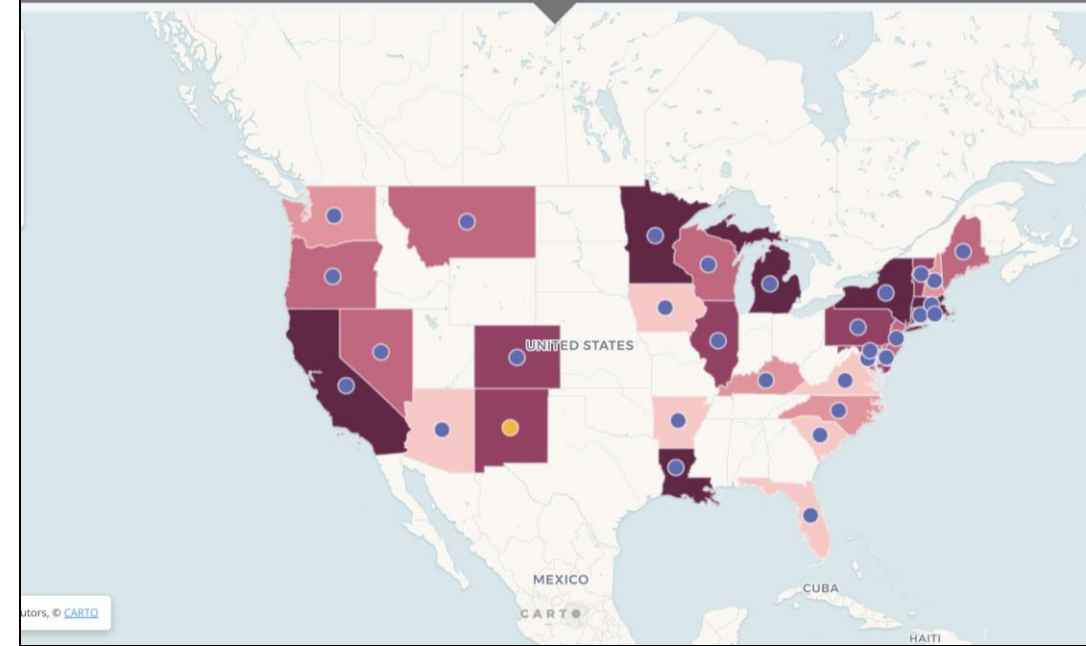


## CDC Climate-Ready States and Cities Initiatives

Previous CRSCI Grant Recipients



U.S. State Climate Action Plans



# Missouri River and North Central Flooding



March 2019

\$10.8 Billion Dollars of Economic Loss

3 Deaths

Hundreds Displaced


Costliest inland flooding event in U.S. history

At least 2 hospitals sustained damage

At least a dozen long term care facilities were evacuated

Lack of access to care

- Flooded roads
- Damaged infrastructure

A collage of images surrounding the central text. Top left: A city skyline with modern glass buildings. Top center: A close-up of blue ocean waves. Top right: A smiling woman carrying a young child on her shoulders. Middle right: A field of golden wheat under a dark, stormy sky. Bottom left: A close-up of cracked, dry brown earth. Bottom center: A vibrant green field of crops. Bottom right: A landscape with rolling green hills and trees under a bright sky.

The Water, Climate and Health Program  
pioneers interdisciplinary research, education,  
and collaborative solutions to public health  
challenges associated with water and climate in  
Nebraska and around the world.



Research



Education



Engagement



Policy  
Development

# Our Team



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Biostatistics



Yeongjin  
Gwon, PhD

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Program  
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Christine  
Allmon Vetro

Research Assistant  
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Babak  
Fard, PhD

Postdoctoral  
Researcher



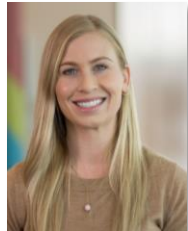
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Arianna Li,  
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Laura  
Nagengast,  
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Administrative  
Associate



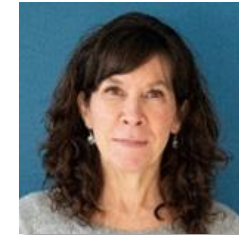
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Epidemiologist



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Consultant



Sue Dempsey,  
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Communications  
& Outreach



Summer  
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# Our Students



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Abdoulaziz



Ryan Cannady



Hunter Jones



Qianting Li



Raheleh  
Mohammadi

## EMET Medical Students



Anna  
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Bailey  
Newsome



Morgan  
Penry



Denise  
Torres

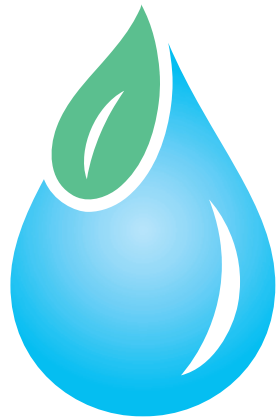
## MPH Students



Jessenia Hincapie



Ruth Mencia



THE DAUGHERTY

# WATER *for* FOOD

GLOBAL INSTITUTE

*at the University of Nebraska*

- The Daugherty Water for Food Global Institute at the University of Nebraska works to address the global challenge of achieving food security with less stress on water resources through water management in agricultural and food systems.

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# Our Research Areas

Water Quality & Health

Climate Change & Health

Extreme Heat & Health

Flooding, Drought, & Extreme Weather

Air Quality & Health



# Extreme Heat

# Mapping Heat in Omaha



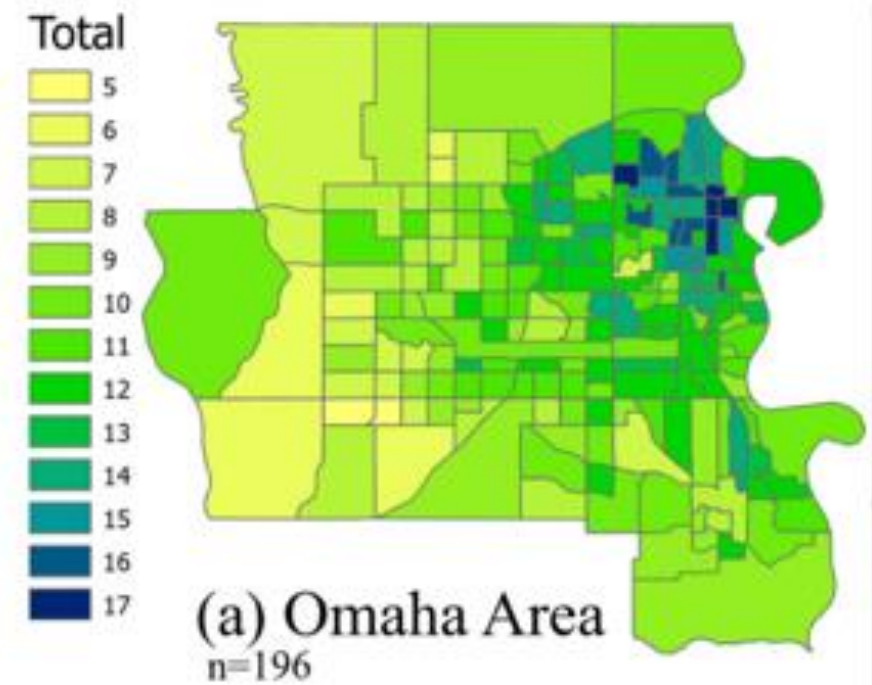
Nebraska Public Media PBS npr

## Omaha Study Examines Heat Differences in City

Abdoulaziz Abdoulaye of UNMC demonstrates a sensor used in the heat study (Photo by Fred Knapp, Nebraska Public Media News)

Jalalzadeh Fard, B., et al. (2021). Mapping heat vulnerability index based on different urbanization levels in Nebraska, USA. *GeoHealth*, 5, e2021GH000478.

## Heat Vulnerability



## Hospitalizations

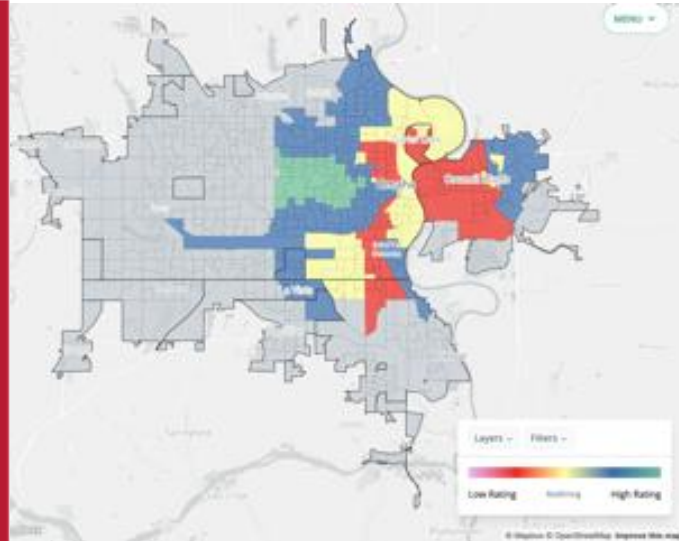
Multiple heat stroke, heat exhaustion cases reported at local hospitals

WEATHER NOW 7 FEELS LIKE TEMPERATURES

87	95	92	93
93	95	96	97
94	99	102	104 102
	101	104	
104		103	
	104		

OMAHA, Neb. — As Omaha experiences extreme heat, hospitals in the area have had multiple cases of heat stroke and heat exhaustion.

## Redlining





# WATER FOR FOOD GLOBAL CONFERENCE

*at the University of Nebraska*

Working to ensure a water and food secure world.



## Water Quality & Health at the WCHP

# Water Quality & Health in Nebraska



WATER QUALITY

## Nebraska's nitrate problem is growing worse and it's likely harming our kids

Yanqi Xu Flatwater Free Press Oct 28, 2022 Updated Dec 5, 2022 8

## Nebraska's nitrate problem is serious, experts say. Can we solve it?

Matthew Hansen and Yanqi Xu Flatwater Free Press Dec 31, 2022 Updated Jun 5, 2023 1

EDITOR'S PICK TOPICAL TOP STORY

FIGHTING NITRATES

## Clean water doesn't come cheap: Nebraska towns are shelling out millions to treat nitrate-laced drinking water

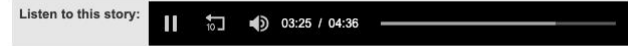
YANQI XU Flatwater Free Press Dec 15, 2022 Updated Jan 20, 2023 3

## Nitrates A Costly, Persistent Problem For Small Towns

by Grant Gerlock, NET News/Harvest Public Media



Cover crops like this rye grass growing in a harvested field of corn can allow farmers to use less fertilizer. (Photo by Grant Gerlock, NET News/Harvest Public Media)



October 23, 2015 - 6:45am

Nitrogen fertilizer on farm fields helps crops grow. But if there's too much left over in the soil, it can pollute water supplies as nitrates. A big city lawsuit in Iowa over nitrates has grabbed headlines, but many small towns have the same problem.

Earlier this year, Des Moines, Iowa, [made news](#) when the city announced it would sue farmers in a legal battle over fertilizer. The city's water supply from the Des Moines and Raccoon Rivers often surpasses the [legal limit for nitrates](#) (10 mg/L), which commonly appear in water contaminated by runoff from farm fields.

Too many nitrates are a health hazard, particularly for infants whose blood can lose its ability to absorb oxygen. So nitrates must be reduced or removed, but cleaning nitrates from the city's water is a huge expense. When nitrate levels rise above the safe drinking water limit, Des Moines fires up a [filtering system that costs thousands of dollars to operate](#) each day.

Des Moines is unusual, though. In most cases, nitrate pollution is not a big city problem. It's most often a small town problem, says [Bruce Dvorak](#), professor of environmental engineering at the University of Nebraska-Lincoln.



Creighton, Nebraska water operator, Kevin Sonnichsen, stands before the \$1.3

"Nitrates in drinking water is the most common source water problem in the region," Dvorak said. "And for many small towns this is a very major cost issue. It may mean water rates, if they're lucky, *only double*. And some cases it may go up by eight to ten times."

That's the case in Creighton, a small town in northeast Nebraska. Creighton installed a \$1.3 million water filtering system in 1993 to reduce nitrate levels in town's drinking water. It has been running ever since, pulling nitrates out of about 300,000 gallons of water per day.

Omaha World-Herald  
**MIDLANDS**  
SUNDAY, MAY 3, 2020  
SECTION B



Water from this spring-fed spigot runs constantly in downtown Steele City, according to Margo D'Angelo, who owns a bar across the street. She says residents fill up water jugs from the spigot every day. Steele City, with a population of 58, has been under a state order to find a clean water source since 2007.

## Nebraska towns pay more for water

Communities are collectively paying millions of dollars to fight nitrate contamination as they watch their bills increase

By JESSICA PARKES WASH

SPECIAL TO THE WORLD-HERALD

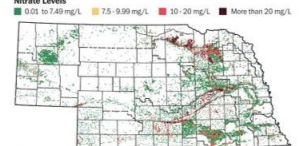
Residents in Nebraska towns as big as Hastings and as small as Glenvil have one thing in common these days: higher water bills. That's because a growing number of communities, most of them small, are spending collectively millions of dollars to build water pipelines to other towns or drill test wells or permanent wells because nitrate contamination has made their water unsafe to drink under federal standards.

In one of many examples, Edgar, with a population of about 400, is building a water line to Fairfield, about 12 miles

away, at a cost of \$2.98 million. While federal grant and loan money is covering the costs, residents face higher water bills. Nearly 33,000 Nebraskans are affected by nitrates in their drinking water. Nitrates are seen as a public health danger because excessive amounts can cause blue baby syndrome, which reduces the amount of oxygen in the blood. Some researchers believe nitrates in the groundwater also have a link to some types of cancer. Nebraska's age-adjusted pediatric cancer rate is the highest in the Midwest and seventh-highest in the country.

See Nitrates: Page 2

**NITRATE-N CONCENTRATIONS IN NEBRASKA**  
Most recent recorded concentrations of 38,259 wells from 1999-2018



NOTE: Empty areas indicate no data reported, not the absence of nitrate in groundwater. SOURCE: Quality Assessment/Technical Support for Nebraska Groundwater, 2019 THE WORLD-HERALD

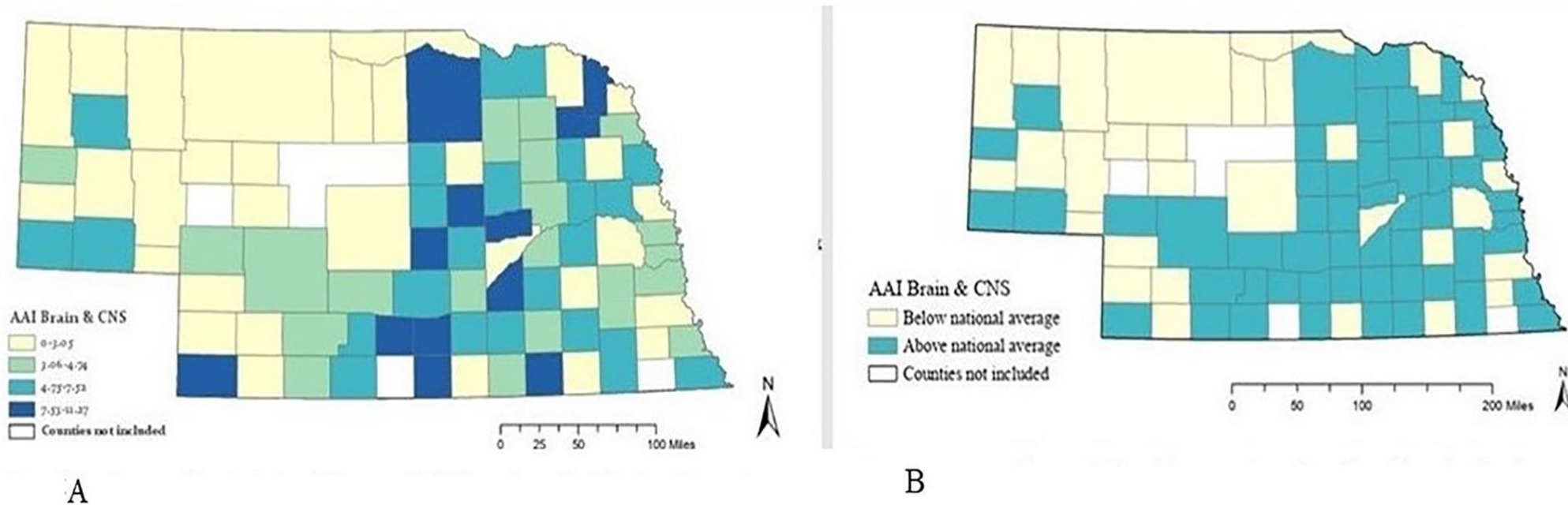
## Researchers detect insecticides in water, home near troubled Nebraska ethanol plant

Nancy Gaarder Jun 16, 2022 Updated Aug 24, 2022 3

# WCHP Research: Pediatric Brain & Other CNS Cancers 1987- 2016



Nebraska counties with elevated atrazine or nitrate levels reported more childhood cancers than counties with lower levels of these chemicals.



Relative to the national average, the age-adjusted incidence of pediatric brain and other CNS cancers is higher in 63% (54/86) of the Nebraska counties.

# Nitrate and Drinking Water

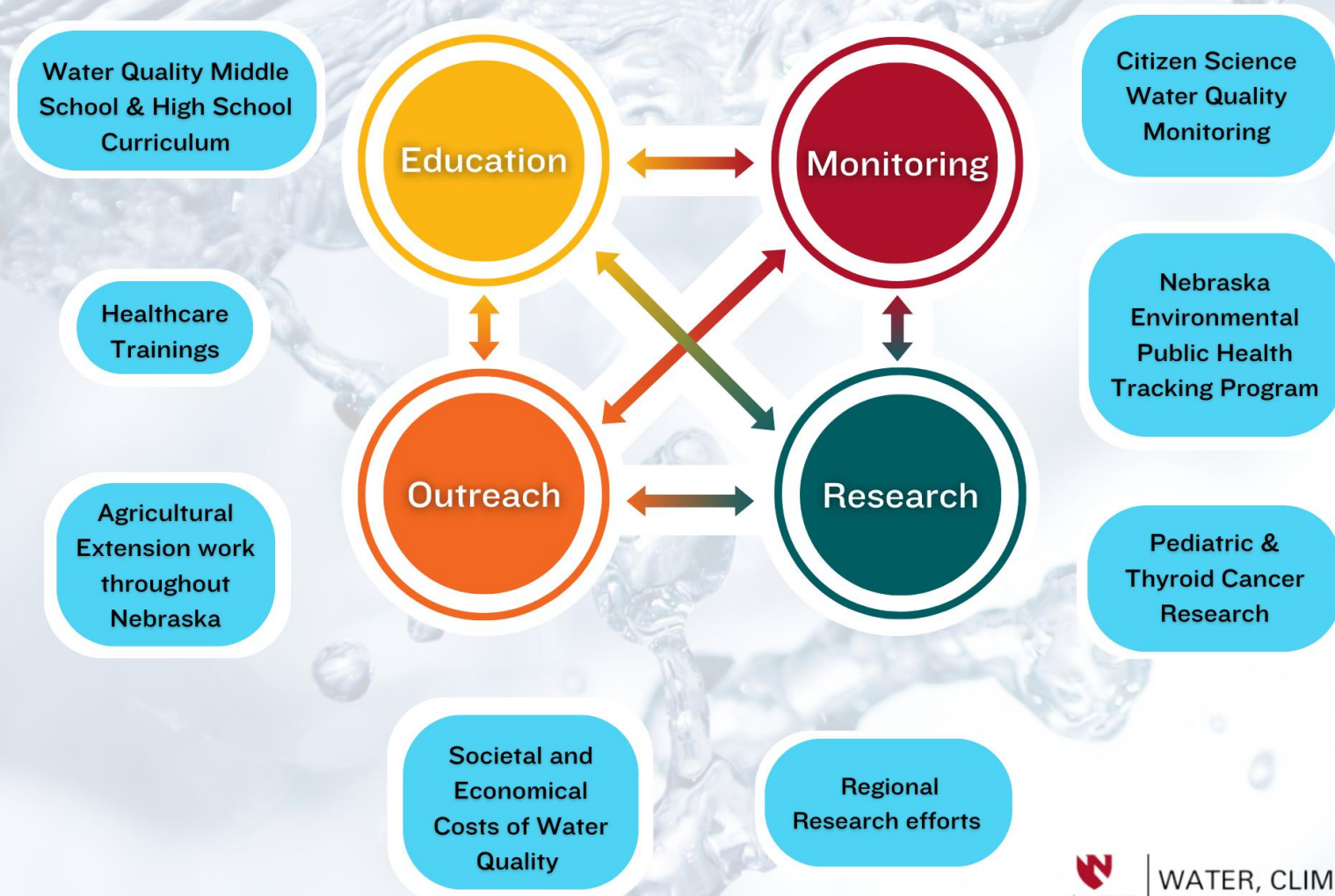
- **Sources:** Nitrogen fertilizers, animal and human waste
- **Regulatory limit:** 10 mg/L as NO<sub>2</sub>-N (USA)
- **Greatest exposure**
  - Agricultural areas
  - Private wells
    - Not regulated
    - Sparse measurements



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# Water Quality at the WCHP





# Water Quality Education & Engagement



## Nebraskans Can Treat Their Drinking Water for Free!

If your drinking water has high concentrations of nitrate, the Nebraska Department of Environment and Energy (NDEE) is offering an opportunity for you to treat it for free with the Reverse Osmosis System rebate program.



Application opens: January 1st, 2023  
Application closes: June 23, 2024

### Eligibility Requirements:

1. This program is open to anyone with a private well.
2. The private well must be registered.
3. Applicants will need to submit water quality data from the State laboratory, with testing results dated no earlier than January 1, 2022.
4. Only wells with samples above 10 ppm nitrate will be eligible for this program.

### Why Apply?

Treating your drinking water helps protect the health of you and your loved ones.

There are known health impacts for drinking nitrate contaminated water. The strongest linked are:

- blue baby syndrome
- preterm birth issues
- birth defects
- pediatric cancers
- adult cancers



Application for R.O. rebate program  
<https://go.unl.edu/roapp>



Order state lab kit  
<https://go.unl.edu/ordertestkit>



Check if your well is registered  
<https://go.unl.edu/checkwell>



How to register your well  
<https://go.unl.edu/registerwell>



More program details  
<https://go.unl.edu/programdetails>

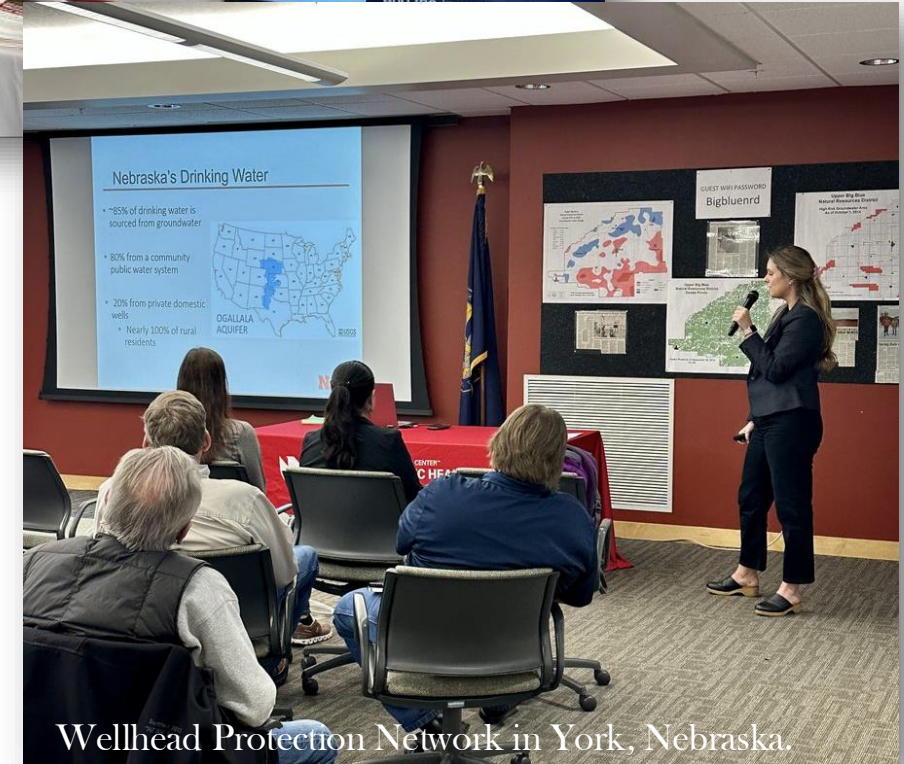


Get up to \$4,000 reimbursed!

University of Nebraska Medical Center

## Water Quality and Health

Laura Nagengast, MPH  
Source Water Protection Extension Educator  
University of Nebraska- Lincoln  
University of Nebraska Medical Center  
Nebraska Department of Environment and Energy



Lara Nagengast, MPH, Extension Educator works specifically with water quality.

Wellhead Protection Network in York, Nebraska.

# WCHP In the Community & Beyond



Drs. Gold and Bell discussing private well testing on UNMC's *Rural Health Matters*, 2023



WCHP at the DWFI Water for Food Global Conference 2023





“Flatwater Free Press Forum on Nitrates in Nebraska’s Water” in Norfolk, NE in March 2023.



Taylor Hamblin,  
PhD at the  
WCHP's  
*Research Seminar  
Series* in Spring  
2023

**Why might we develop middle school and high school curriculum and train teachers to focus on water quality and citizenship skills?**



# Opportunities for Moving Forward



Partnership and Collaboration



Communication and Outreach

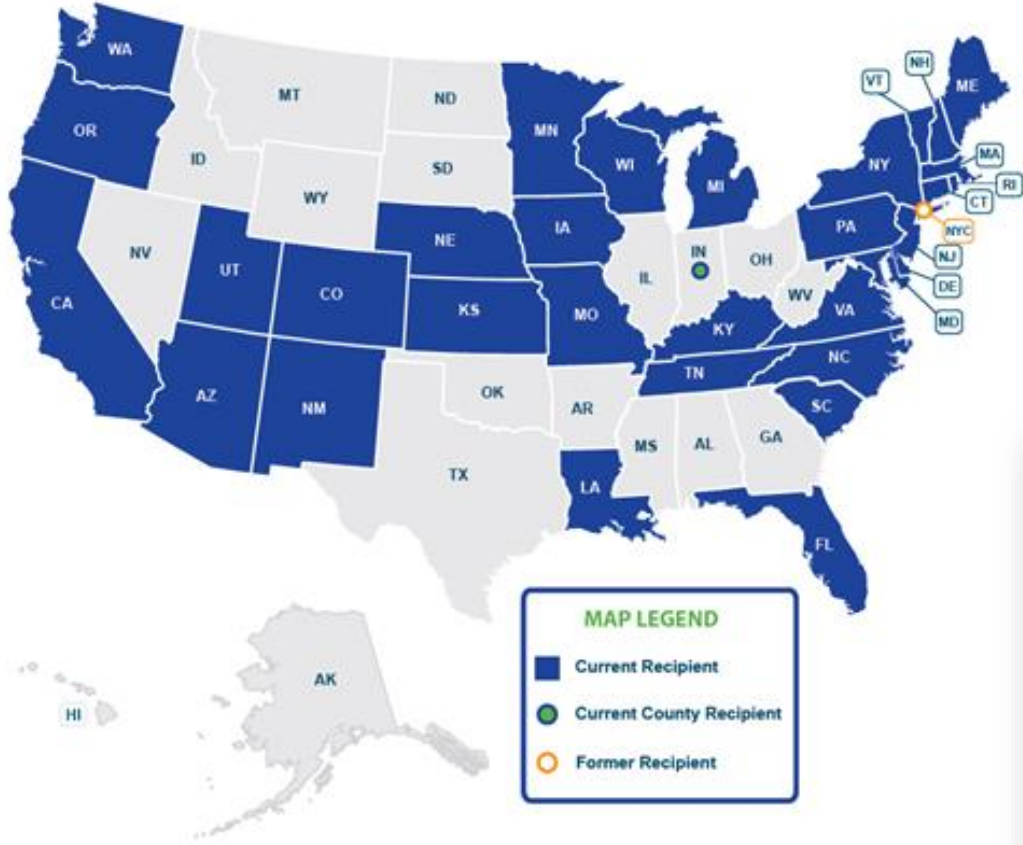


Interdisciplinary Research and Applications



Learning from Communities

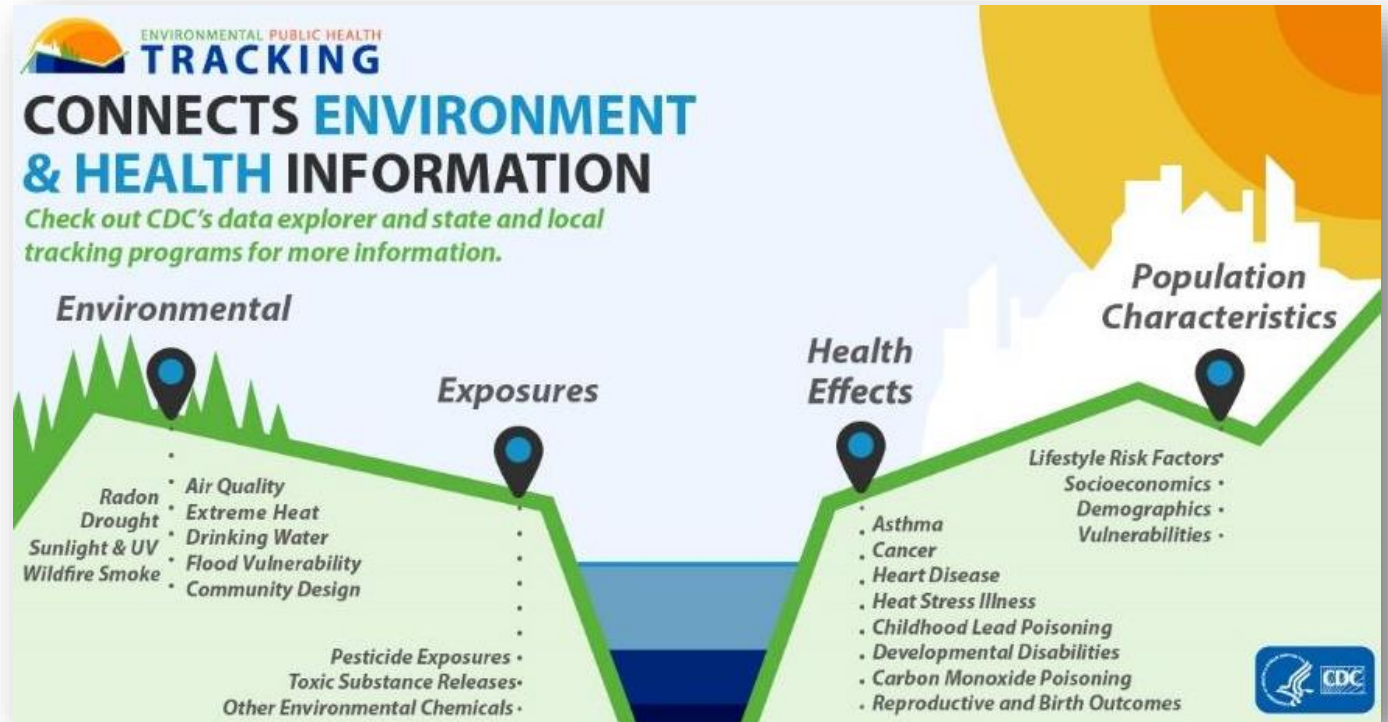
# Nebraska Environmental Public Health Tracking



Nebraska awarded in August 2022

5-Year grant to become a one-stop shop for environmental health data

Data includes key water quality metrics



August 2022

**NEBRASKA**  
Good Life. Great Mission.





The Water, Climate and Health Program is made possible through generous support provided by:



The  
Claire M. Hubbard  
Foundation

Our Key Partners:



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*at the University of Nebraska*



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AND NATURAL RESOURCES**

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