

Nonpoint Source Program and Source Water Protection through a Groundwater Lens: US EPA Programmatic Opportunities

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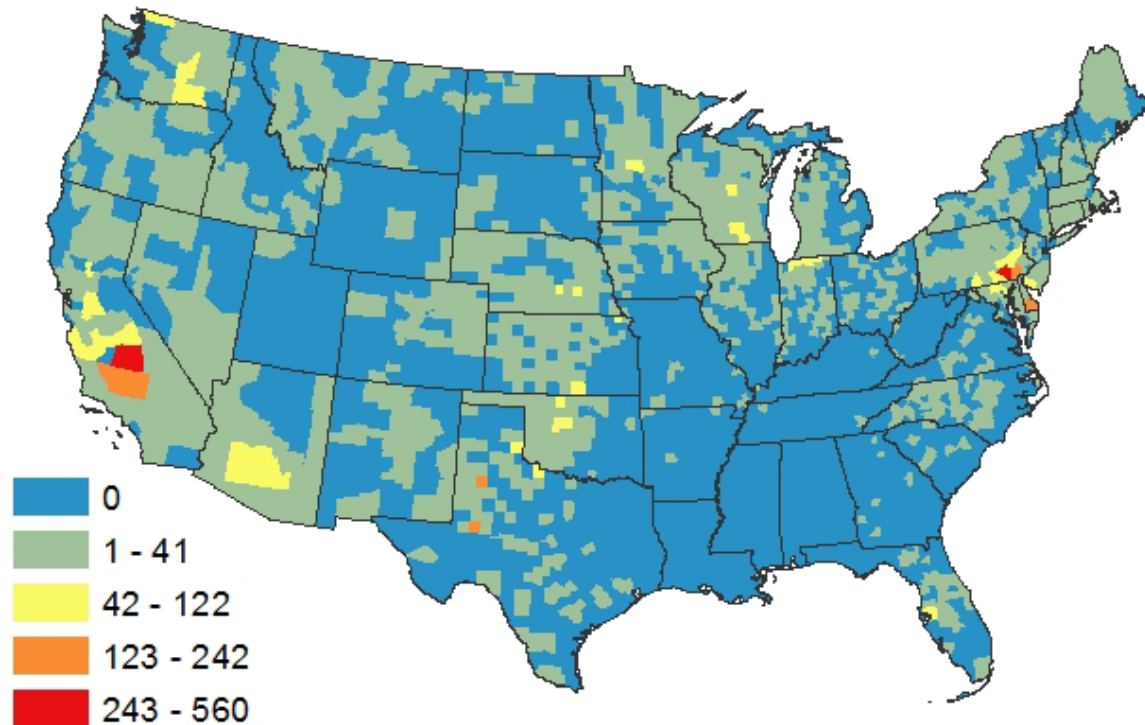
Overview

- EPA Office of Research and Development Findings
- EPA Clean Water Act section 319 National Nonpoint Source (NPS) Program by the numbers
 - Projects
 - Success Story Examples
 - Wisconsin
 - Minnesota
- Leveraging NPS and Clean Water State Revolving Fund resources – important info to share to support NPS projects



Drinking Water Nitrate Violation Trends Across the U.S.

Total Number of Groundwater Nitrate DW Violations per County 1994-2016



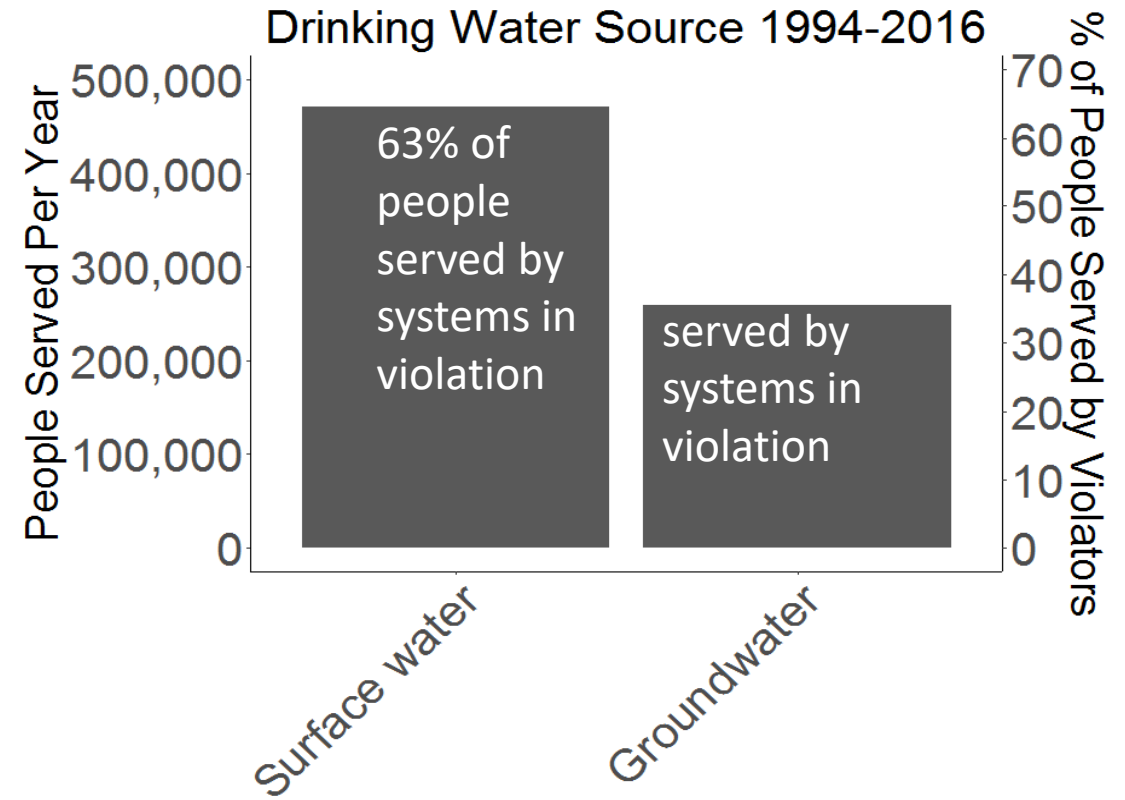
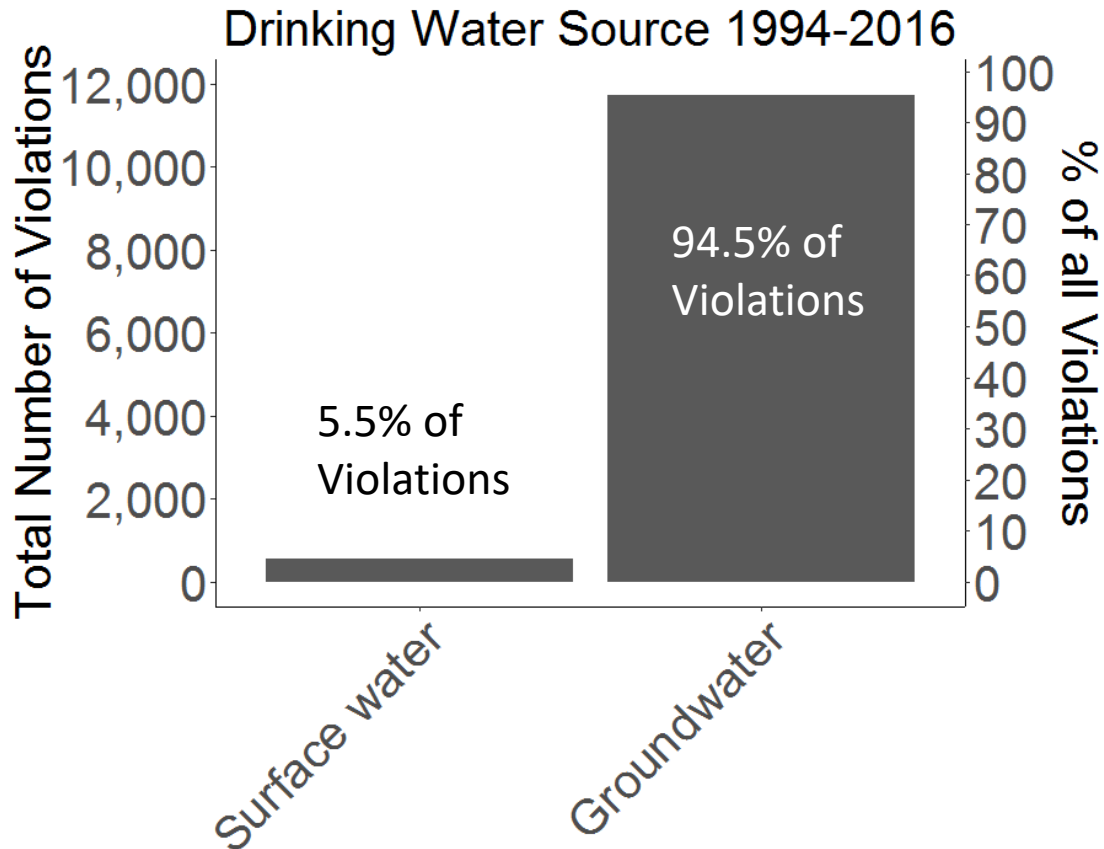
Assessed trends at public DW systems with >10 mg nitrate maximum contaminant level incidents for drinking water violations.

The proportion of groundwater systems with a violation increased from 0.28% to 0.34% (1994 – 2016).

Drinking Water Nitrate Violation Trends Across the U.S.

Most violations have occurred in groundwater systems

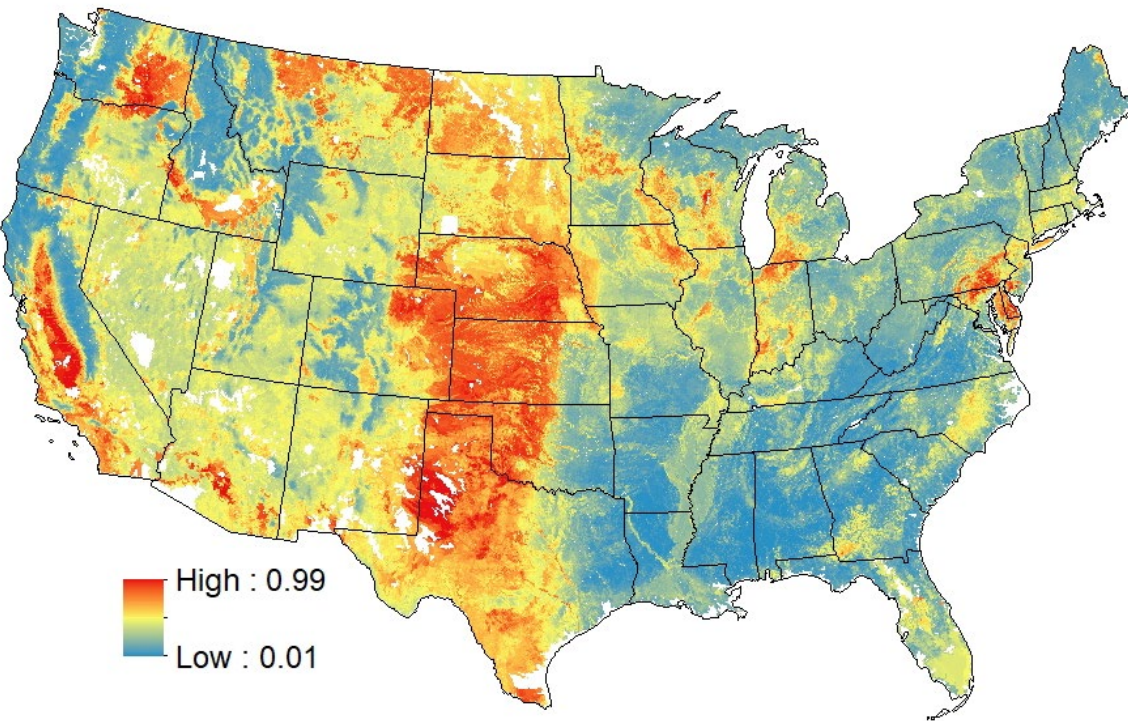
More people have been served by surface water systems in violation



Patterns & Predictions of DW Nitrate Violations Across the U.S.

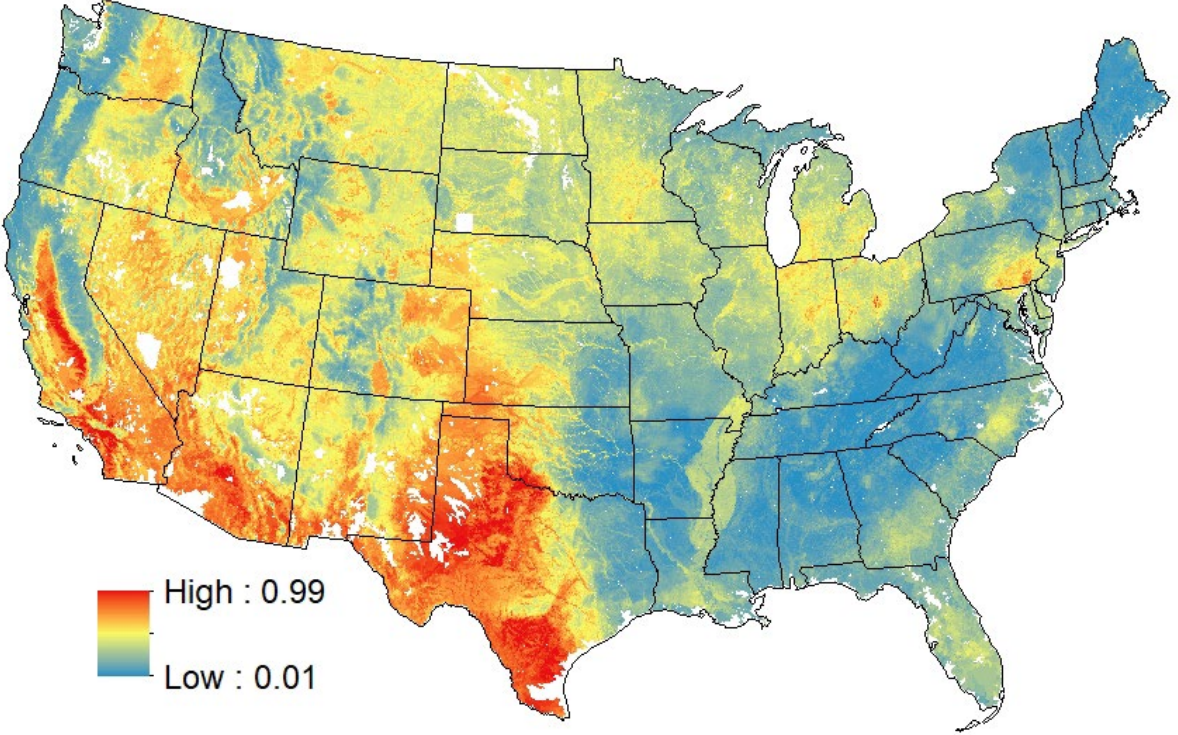
Groundwater Nitrate

Predicted Probability of Violation



Surface Water Nitrate

Predicted Probability of Violation

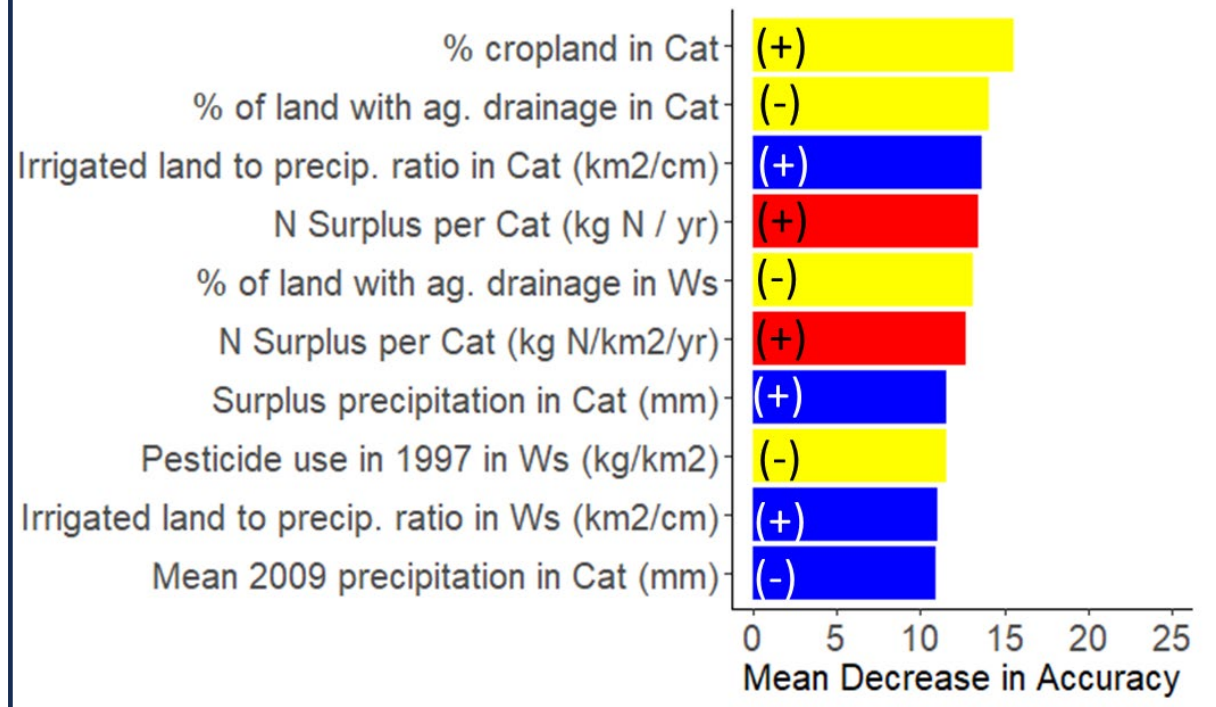


Patterns & Predictions of DW Nitrate Violations Across the U.S.

Dominant Drivers of Nitrate in Drinking Water

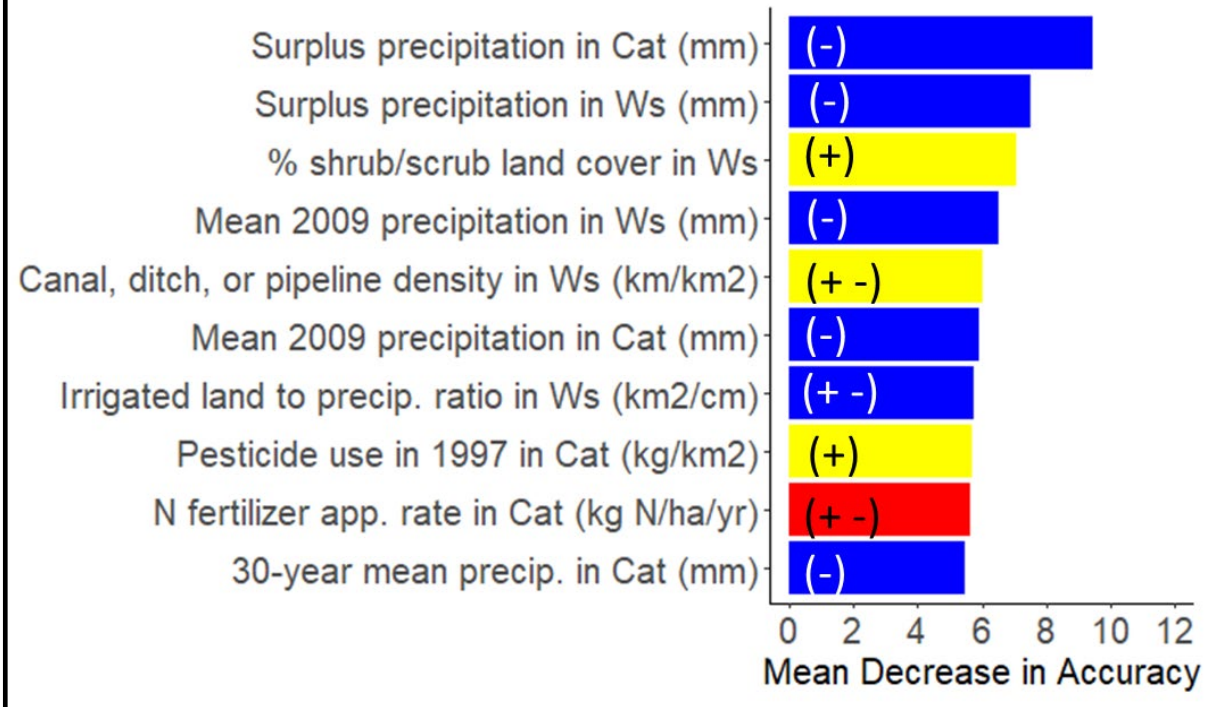
Groundwater

Classification: Probability of Violation



Surface Water

Classification: Probability of Violation



Categories: **N Inputs**; **Human Land Use**; **Climate/Hydrologic**

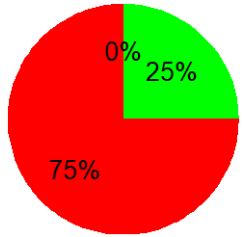
Cat = Catchment scale; Ws = Watershed scale

Wildfire Impacts

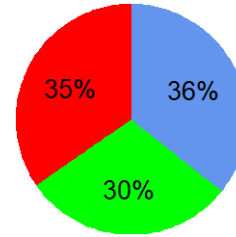
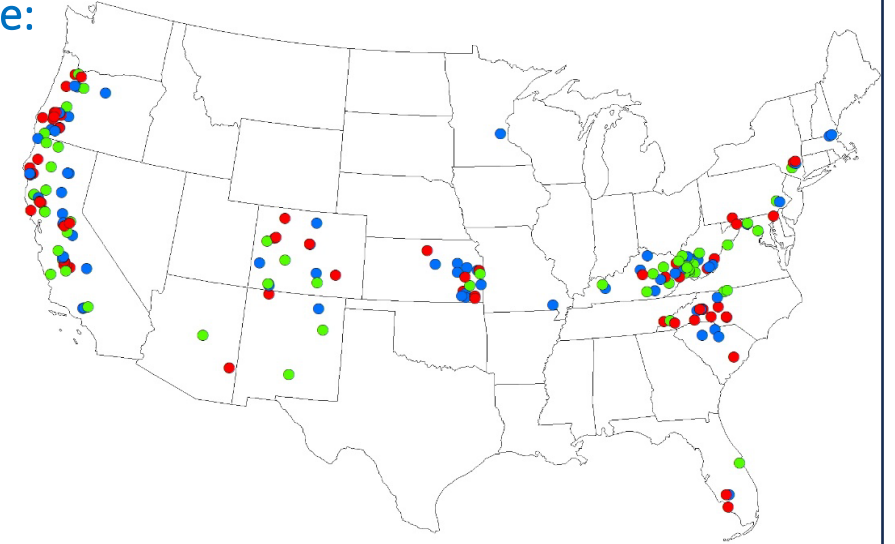
Violations

Concentration

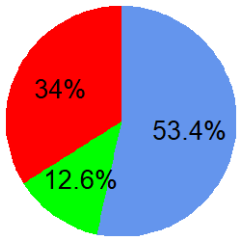
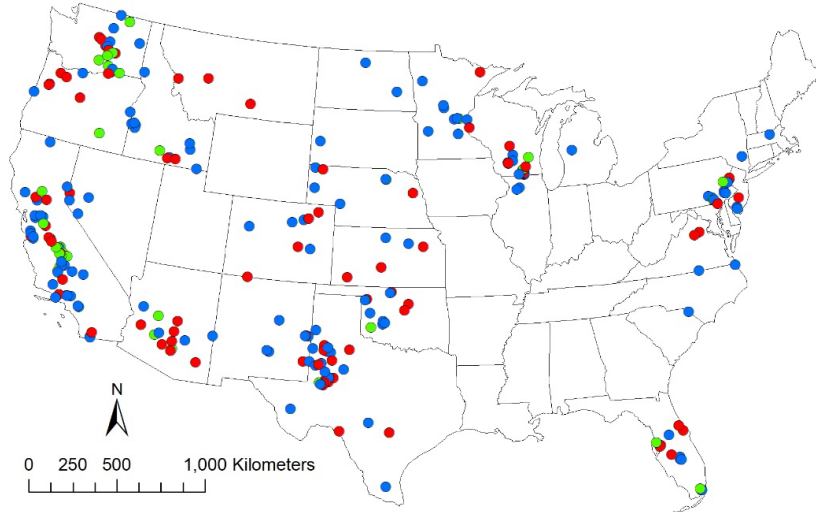
SWDW Nitrate:
7-yr window



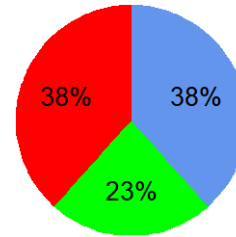
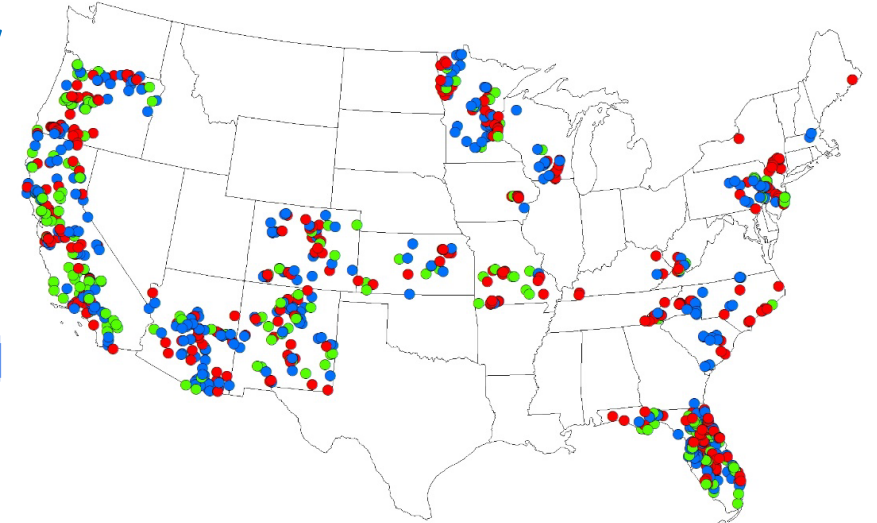
SWDW Nitrate:
1-yr window



GWDW Nitrate:
4-yr window



GWDW Nitrate:
9-yr window



● Increased Post-Burn ● Decreased Post-Burn ● No Change Post-Burn

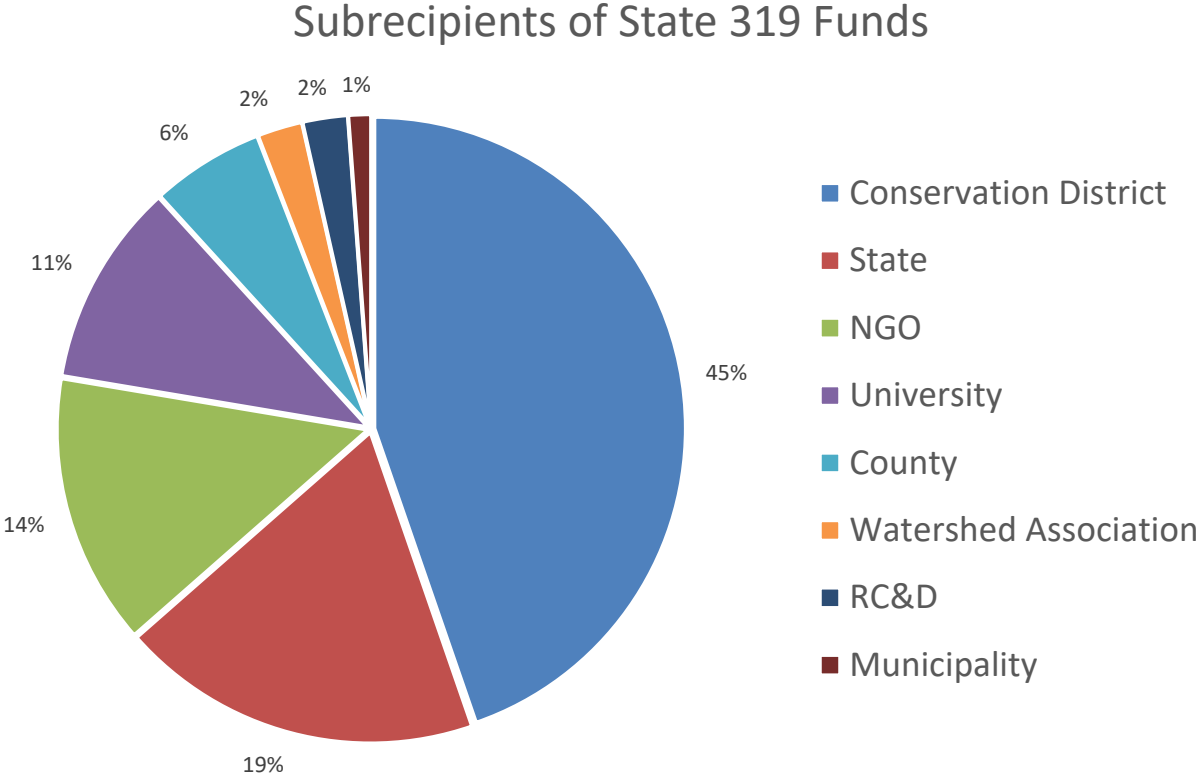
US EPA Section 319 Groundwater Projects

Since 2014, **over 160** Section 319 funded projects that identify “groundwater” as the waterbody type to be addressed have been recorded.

Pollutant Type	Project Count
Nitrogen	47
Phosphorus	39
Sedimentation-Siltation	36
Biochemical Oxygen Demand (BOD)	10
Nitrate	4
Pathogens	2
Pesticides	2

Top 10 BMP Types	Project Count
Cover Crop	14
Grassed Waterway	12
Riparian Forest Buffer	12
Conservation Tillage Residue Management	10
Terrace	9
Alternative Water Sources	8
Critical Area Planting	7
Fence	7
Diversion	6
Nutrient Management	6
Streambank & Shoreline Protection	6

US EPA Section 319 Groundwater Projects



Average project budget: \$488,558

State	Project count
NC	28
WA	19
WI	18
NE	14
KS	13
PA	13
MD	11
NM	9
OR	9
CO	4
ND	4
NH	3
RI	3
ID, IN, NV, OK, VA, MA, NY, TN, TX	1-2

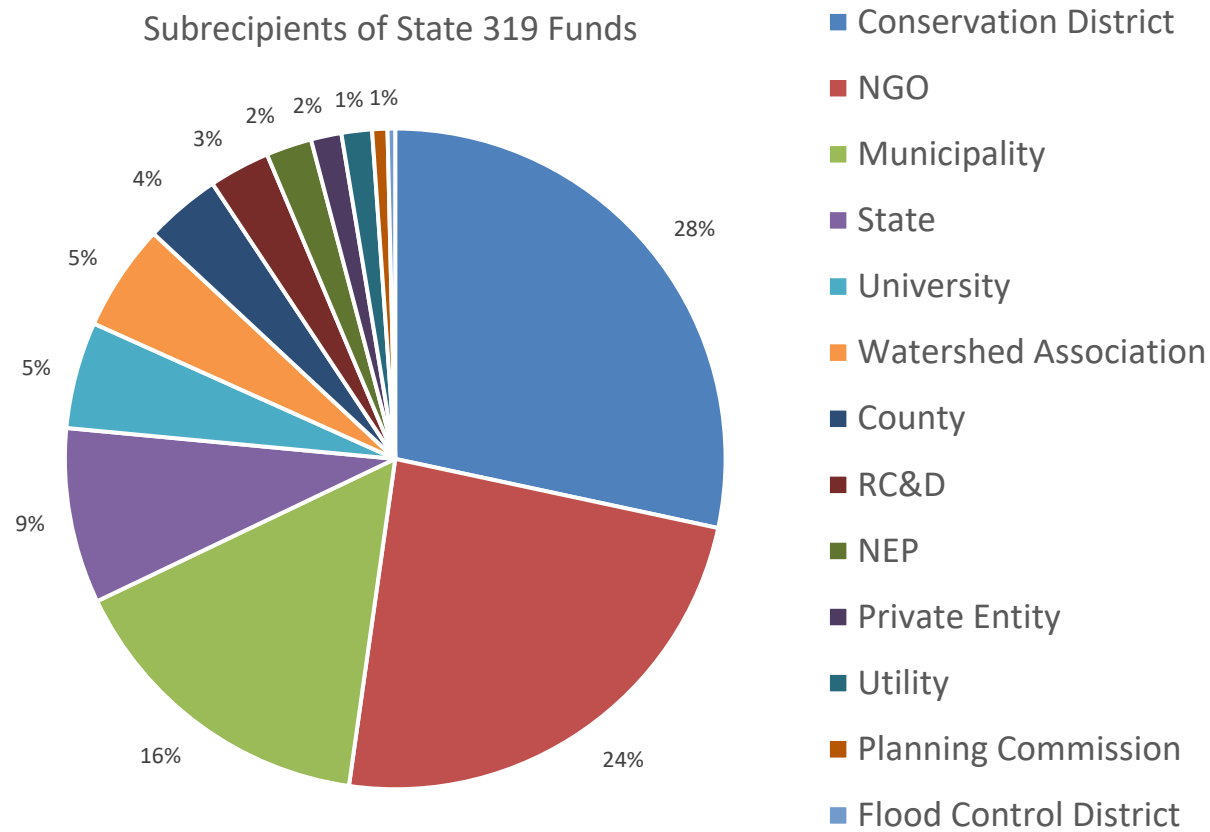
US EPA Section 319 Projects Addressing Nitrate/Nitrogen/Nutrients

Since 2014, ~**380** Section 319 funded projects addressing nitrate, nitrogen, or nutrient pollution and include source/drinking water, groundwater, and/or karst in the project description have been recorded.

Pollutant Type	Project Count
Nitrate	8
Nitrogen	367
Nutrients	4

Top 10 BMP Types	Project Count
Cover Crop	81
Fence	66
Heavy Use Area Protection	57
Alternative Water Sources	46
Riparian Forest Buffer	43
Critical Area Planting	40
Raingarden/Bioretenion Basin	39
Nutrient Management	34
Streambank & Shoreline Protection	33
Access Control (Use Exclusion)	27
Riparian Herbaceous Cover	27

US EPA Section 319 Projects Addressing Nitrate/Nitrogen/Nutrients



Average project budget: \$493,985

States Reporting Highest # N-Focused Projects	Project Count
NY	83
KS	43
FL	22
ID	20
WA	20
MO	18
ME	16
SC	13
NE	12
MN	11
TN	11
KY	10



Section 319 NONPOINT SOURCE PROGRAM SUCCESS STORY

Oklahoma

[Coopers Creek](#) (2011) [Caddo Creek](#) (2022) and [Timber Creek](#) (2023) conservation practices included agricultural cropland and grazing BMPs.

The Oklahoma Conservation Commission's education program, "Blue Thumb", includes Groundwater screening as a part of their engagement.

California

[San Antonio Creek](#) (2018) In 2006, producers in the region were required, via state law, by the California Central Coast Regional Water Quality Control Board to enroll in a program and implement actions to achieve TMDL load allocation by taking actions including conducting surface and ground water monitoring, developing nitrogen management plans, submitting reports on the TN applied for crops with a high potential of loading nitrogen into groundwater, and implementing management practices to reduce nutrient loading. **Results:**

- Reduced Nitrogen occurred in San Antonio Creek because of farmers' actions through their program participation.





Section 319 NONPOINT SOURCE PROGRAM SUCCESS STORY

Maryland



[Minebank Run](#) (2009) BMPs addressing stormwater runoff included reconnecting the stream to the floodplain and evaluation. (Baltimore County) **Results:**

- Reduced surface water and groundwater nitrate and nitrite concentration.
- Nitrogen concentrations declined by 25 to 50 percent (1.5 to 0.8 milligrams per liter), while denitrification rates increased nearly twofold in test wells.

[Corsica River watershed](#) (2013) BMPs included cover crops buffers and fencing and urban storm water pond wetland complex. (Town of Centreville, Queen Anne's County and the Queen Anne's Soil Conservation District, Corsica Conservancy and the Chester River Association) **Results:**

- Monitoring data from 2005–2011 show decreasing trends of instream nitrogen and phosphorus concentrations in the nontidal tributaries.
- Groundwater monitoring on crop fields during 2005–2007 spring sampling periods indicates that cover crop planting may have reduced nutrient loadings.



Minnesota Section 319 Project Examples

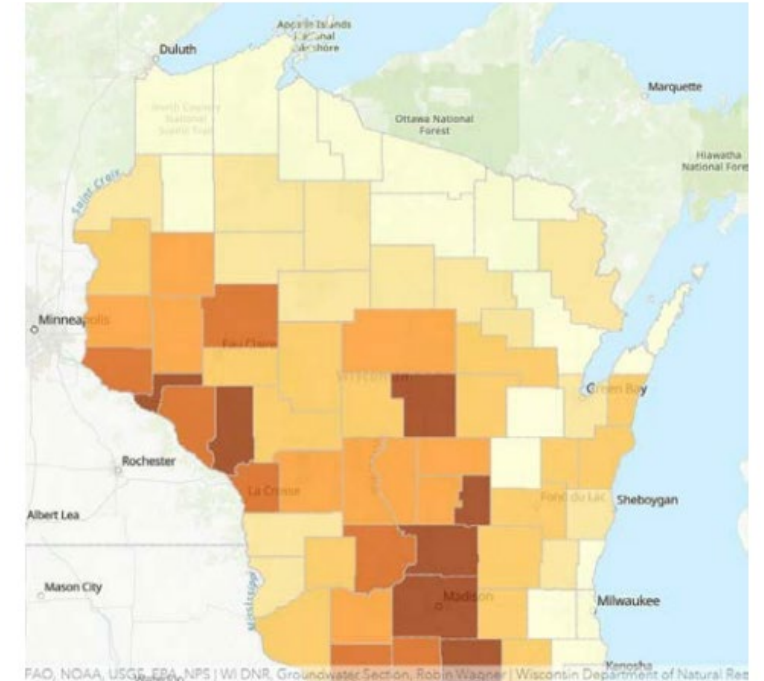
- [Section 319 Small Watershed Focus Program](#)
 - Six “karst region” watersheds
- Small Watershed project examples:
 - 2010: [Southeast Regional Grant for Water Quality](#)
 - 98% avg. before and after fecal coliform decrease in MinnFARM examples from 4 feedlots in Winona County.
 - 2013: [Reducing Runoff from Southeast Minnesota Feedlots](#)
 - 2295 producers signed up for the Open Lot Agreement. Runoff reduction designs completed for over 1,500 feedlots and over 170 feedlot fixes implemented.
 - 2017: [Whitewater Watershed Nitrogen Reduction Project](#)
 - MDA and UMN conducted an adaptive nitrogen program with farmers in SE Minnesota. 47% of participants indicated they intend to reduce their N application rates to UMN recommended levels.
- The Wells Creek NKE draft (Group D) highlights the [Wells Creek Watershed Partnership](#)
 - Six From 2009-2019, the SWCD helped landowners install 35 grade stabilization structures and WASCObS.



Whitewater Watershed project attendees learning about nitrate leaching to groundwater at Bear Spring

Wisconsin Nonpoint Source Efforts

- 2017-2019 [Wisconsin Nutrient Reduction Strategy Progress Report](#)
Focus is mainly phosphorus reduction, but reducing nitrate loss to groundwater has become a more common “high priority issue” in several counties.
- 2017 [Northeast Wisconsin Karst & Shallow Soils Initiative](#) to address nonpoint source pollution in karst and shallow soil
 - Depth to bedrock and ground water quality studies
 - WI DNR coordinator for nutrient management plan and manure hauling audits
- Wisconsin Groundwater Coordinating Council (GCC)
 - [2023 Groundwater Priorities Report Executive Summary](#)
 - [Producer-Led Watershed Groups](#): ~ 6 groups include focus on groundwater
 - Bear Creek, Pepin County Land Conservation



Nitrate contamination continues to increase. GCC member agencies continue to work on multiple initiatives related to reducing the risk of high nitrate levels in groundwater.

References

Papers

- “Trends in drinking water nitrate violations across the U.S.,” Pennino et al., ES&T 2017
- “Patterns and predictions of drinking water nitrate violations across the conterminous U.S.,” Pennino et al., STOTEN 2020

Links

- Section 319 Project Mapper
- Section 319 NPS State Contacts
- NPS Success Stories
- Leveraging 319 funds and State Revolving Funds
- Local Source Water Collaborative Map