Where Is Drinking Water Contaminated by Nitrogen from Agricultural Sources?

Craig Cox, Senior VP Agriculture & Natural Resources

Anne Weir Schechinger, Senior Analyst Economics

Soren Rundquist, Director of Spatial Analysis

Environmental Working Group

Nitrate in Drinking Water

About the Data

- Assembled data from about 50,000 community water systems across the United States.
- Testing of *finished tap* water required under the Safe Drinking Water Act and reported to state agencies.

Two-year average nitrate 2016-2017:

- At or above 5.0 mg/L: 1,738 systems - 5,503,239 people
- At or above 7.5 mg/L: 479 systems - 462,447 people
- At or above 10 mg/L: 129 systems - 116,950 people
- 98 percent of systems at or above 5 mg/L serve 25,000 or fewer people.

EWG'S NATIONAL TAP WATER DATABASE

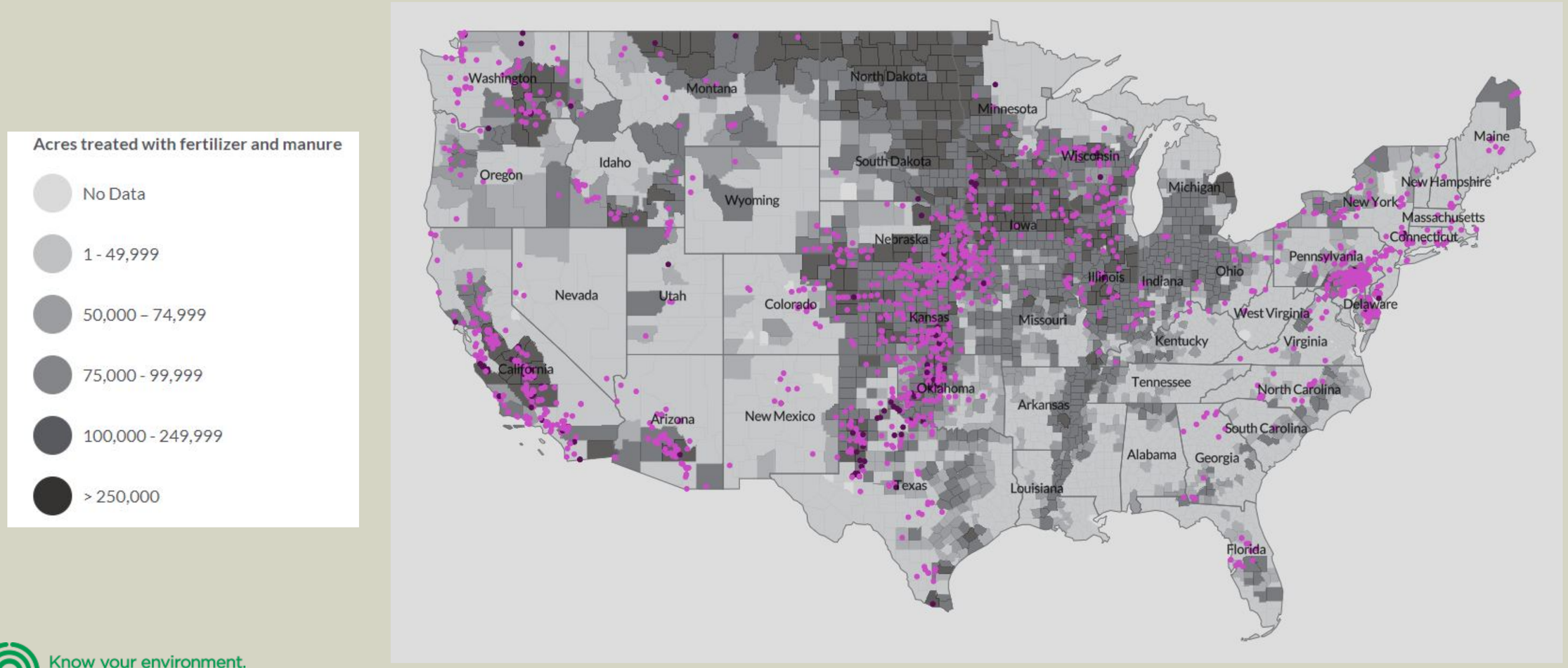
Is Average Contamination the Right Metric?

California Community Water Systems		
	No. Systems	People Served
2016 - 2017 Average >=5mg/L	293	2,657,361
2016 - 2017 Average >=10 mg/L	38	65,959
At least 1 test >=5 mg/L 2003 - 2017	833	24,617,174
At least 1 test >=10 mg/L 2013 - 2017	336	14,300,697

Systems with 2016-2017 Average Nitrate at or Above 5 mg/L

Systems serving 25,000 or fewer people

Most are in areas that are intensively farmed and vulnerable to leaching



Know your environment.
Protect your health.
ewg

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

State	Systems serving less than 25,000 people with average at or above 5 ppm in 2016 -2017	Population of systems
California	273	542,643
Pennsylvania	150	179,021
Kansas	130	115,985
Nebraska	125	117,522
Texas	114	91,265
Washington	105	57,935
Oklahoma	94	130,521
Arizona	71	82,512
Wisconsin	59	88,279
Iowa	48	125,723
TOTAL	1,169	1,531,406

Affected Systems Are Concentrated in Major Agricultural States

- 1,695 systems serving less than 25,000 people had average nitrate levels at or above 5 mg/L
- 69 percent of those communities were in 10 major agricultural states.

Systems with Upward Trend in Contamination Between 2003 and 2017

Focused on 10 states with widespread contamination

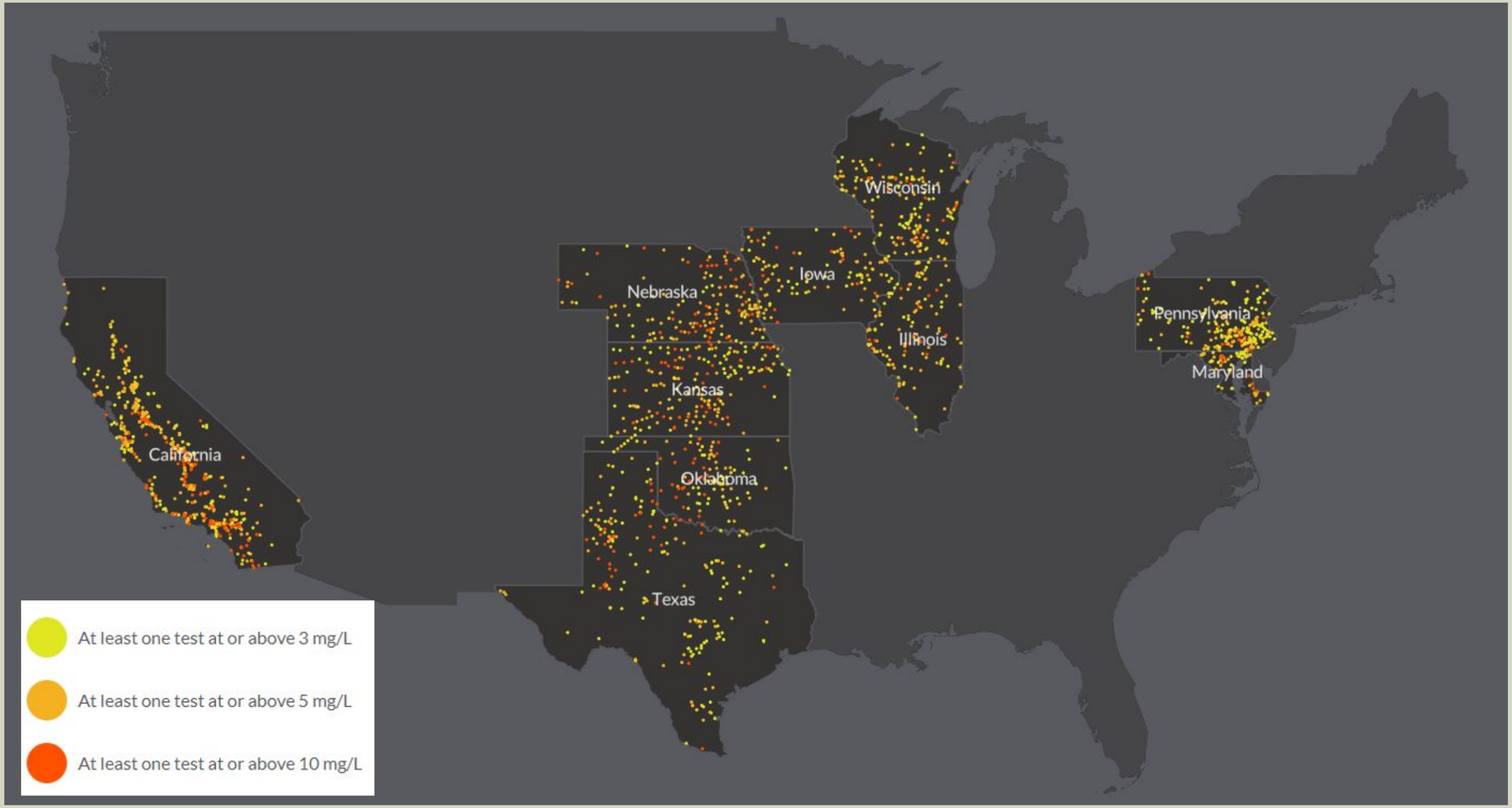
Looked at all systems regardless of size

4,037 communities with at least one test at or above "background level" 3 mg/L – 45.5 million people

2,111 systems with upward trend (positive r value) – 20,697,256 people

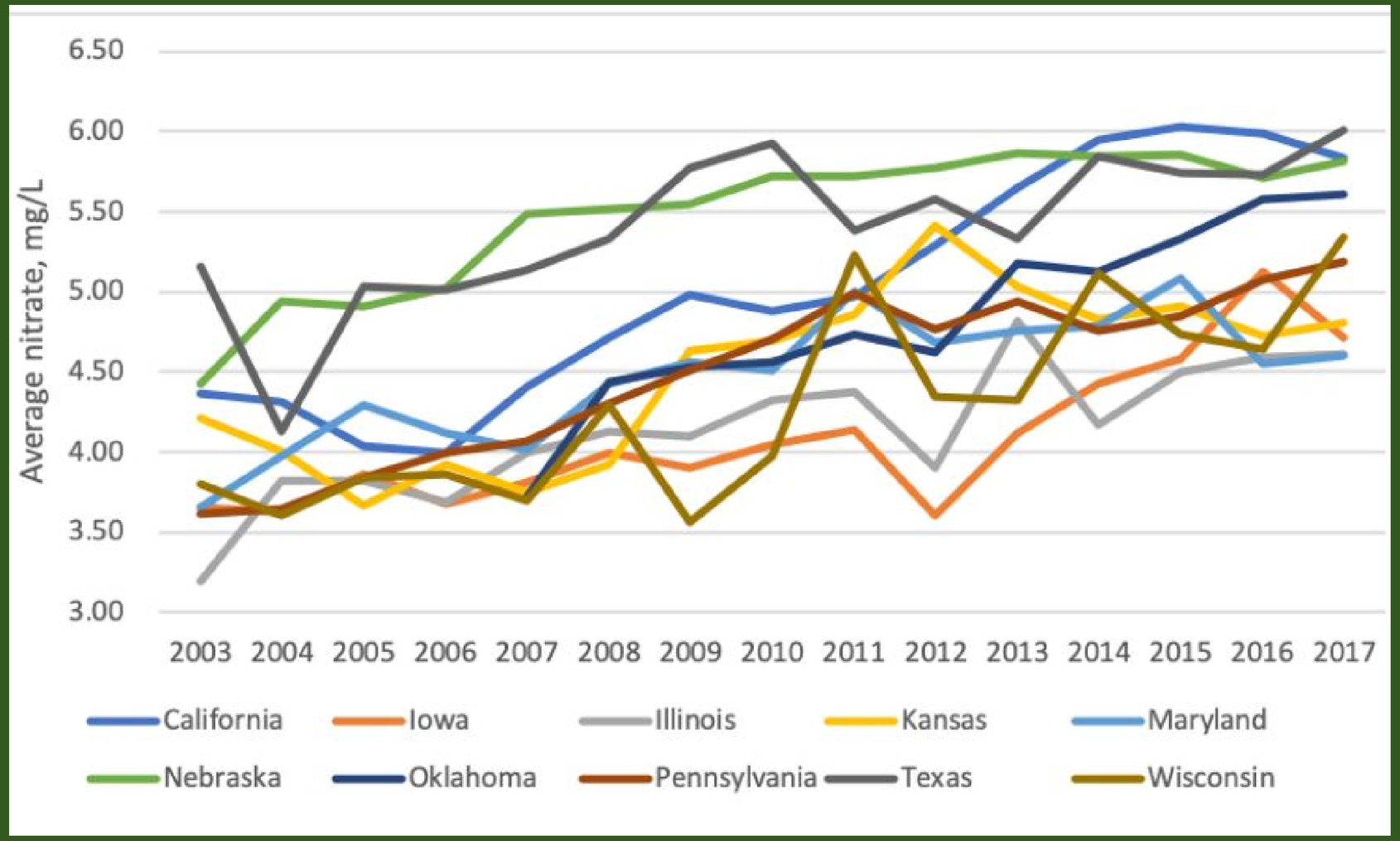
Upward trend was significant ($p <= 0.05$) in 959 systems – 13,267,558 people

Trend analysis using all tests at the system level



Know your environment. Protect your health.
ewg

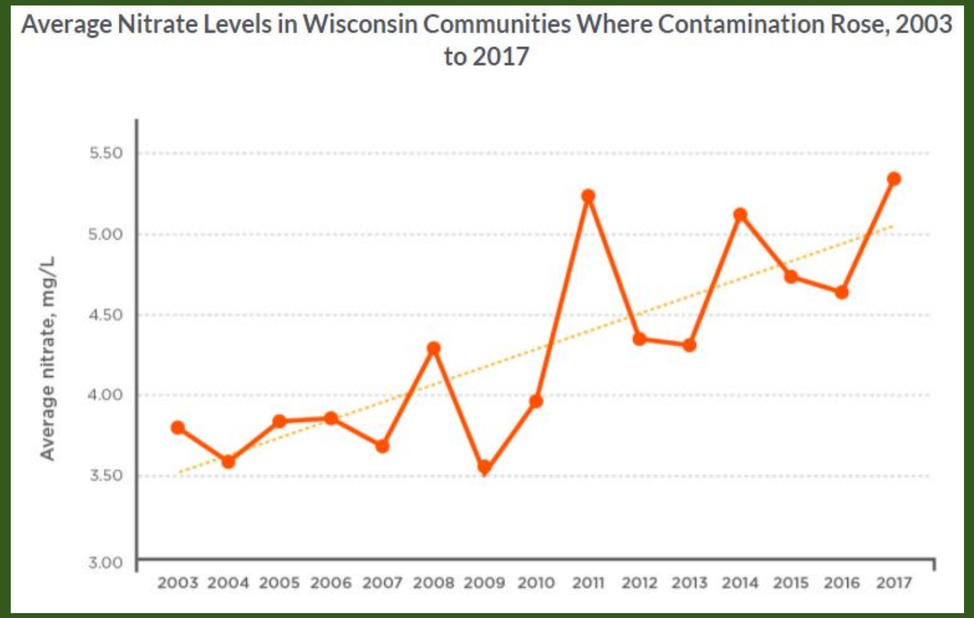
The National Academies of SCIENCES · ENGINEERING · MEDICINE

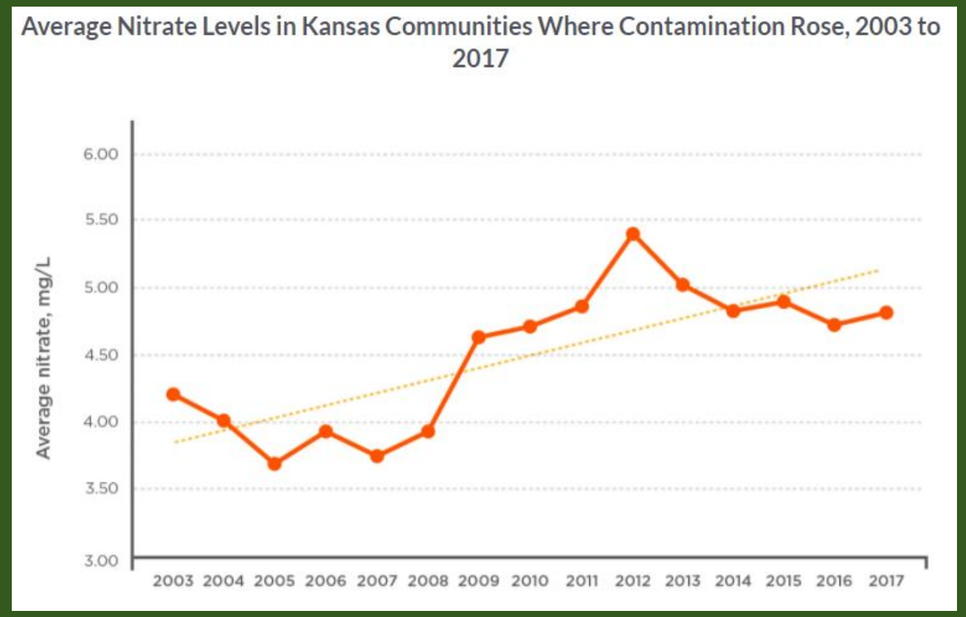


Average annual nitrate for systems with increasing trend 2003 to 2017

- Increase in contamination ranged from 17 percent in Kansas to 46 percent in Wisconsin
- 80 percent of communities with upward trend were small or very small systems.

Average of all systems in each state with positive r value.





Nitrate contamination in tap water testing varies from year to year

- Surface water systems are more susceptible to larger differences from year-to-year.
- Groundwater systems can also vary. All the systems in the Wisconsin graph are groundwater.
- Variability can be much greater for individual systems.

Know your environment.
Protect your health.
ewg

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

System Name	Average Nitrate 2003 - 2017 (mg/L)	Percent Latino in Census Block Group
Rodriguez Labor Camp	27.3	82%
Tony Morris/Morris Dairy	23.5	59%
Sierra Mutual Water Company	21.5	36%
Soults Mutual Water Company	16.7	73%
Beverly Grand Mutual Water	16.7	78%
East Wilson Road Water Company	13.1	79%
Lemon Cove Water Company	12.8	19%
Sierra Vista Association	12.7	60%
Wilson Road Water Community	12.6	74%
San Joaquin Estates Mutual Water Company	12.2	42%
Del Oro River Island Service Territory #2	11.7	50%
Faith Home Teen Ranch	10.5	25%
El Monte Village Mobile Home Park	10.4	21%
Plainview Mutual Water Company, Central Water	10.2	82%

Know your environment.
Protect your health.
ewg

ENVIRONMENTAL JUSTICE

San Joaquin Valley

- Latinos far more likely to be drinking contaminated water in California.
- San Joaquin Valley is epicenter of contamination and disproportionate effect on Latino communities.
- 56 percent of communities with at least 1 nitrate test at or above 10 mg/L are majority Latino.

Minnesota

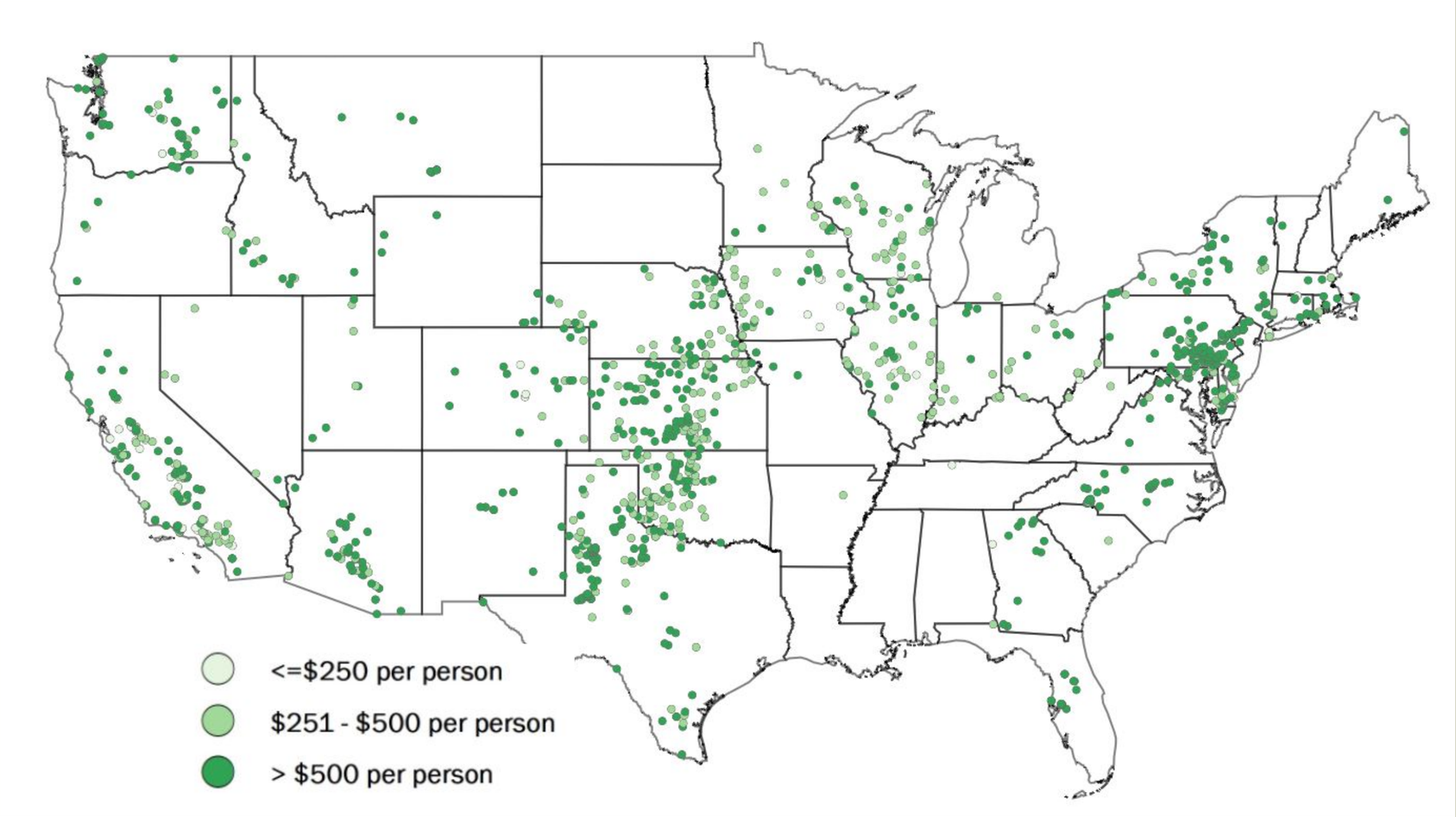
- Preliminary analysis highlights the intersection of income and race.

	All Communities			10 Percent or More "Not White Alone"		
	>=3 mg/L	>=5 mg/L	>=10 mg/L	>=3 mg/L	>=5 mg/L	>=10 mg/L
Percent with poverty rate above state rate	57%	55%	50%	72%	70%	67%

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Potential Annualized Treatment Cost

- Systems with average nitrate contamination at or above 5 mg/L between 2016 - 2017.
- Two - thirds of these 1,155 systems serving more than 3 million people have no treatment systems.



Know your environment.
Protect your health.
ewg

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

Community Size	Ion Exchange	
	Low Cost	High Cost
Very Small (<501)	$90	$666
Small (501-3,300)	$47	$378
Medium (3,301-10,000)	$48	$273
Large (10,001-100,000)	$28	$229

Source: EWG, from Environmental Protection Agency, SDWIS Data, and University of California, Davis, Technical Report 6: Drinking Water Treatment for Nitrate

POTENTIAL COST OF TREATMENT

Additional Cost Per Person Per Year

- Range in estimates of potential costs is very large.
- Burden will fall more heavily on people in small communities.
- More than six out of ten potentially affected communities are very small
- Total additional cost could range from about $102 million to $765 million per year for ion exchange treatment.
- Additional cost per year could be as high as $1.47 billion if reverse osmosis treatment is required.

Household Wells

Limited Data, Highly Contaminated and Little, or No Protection

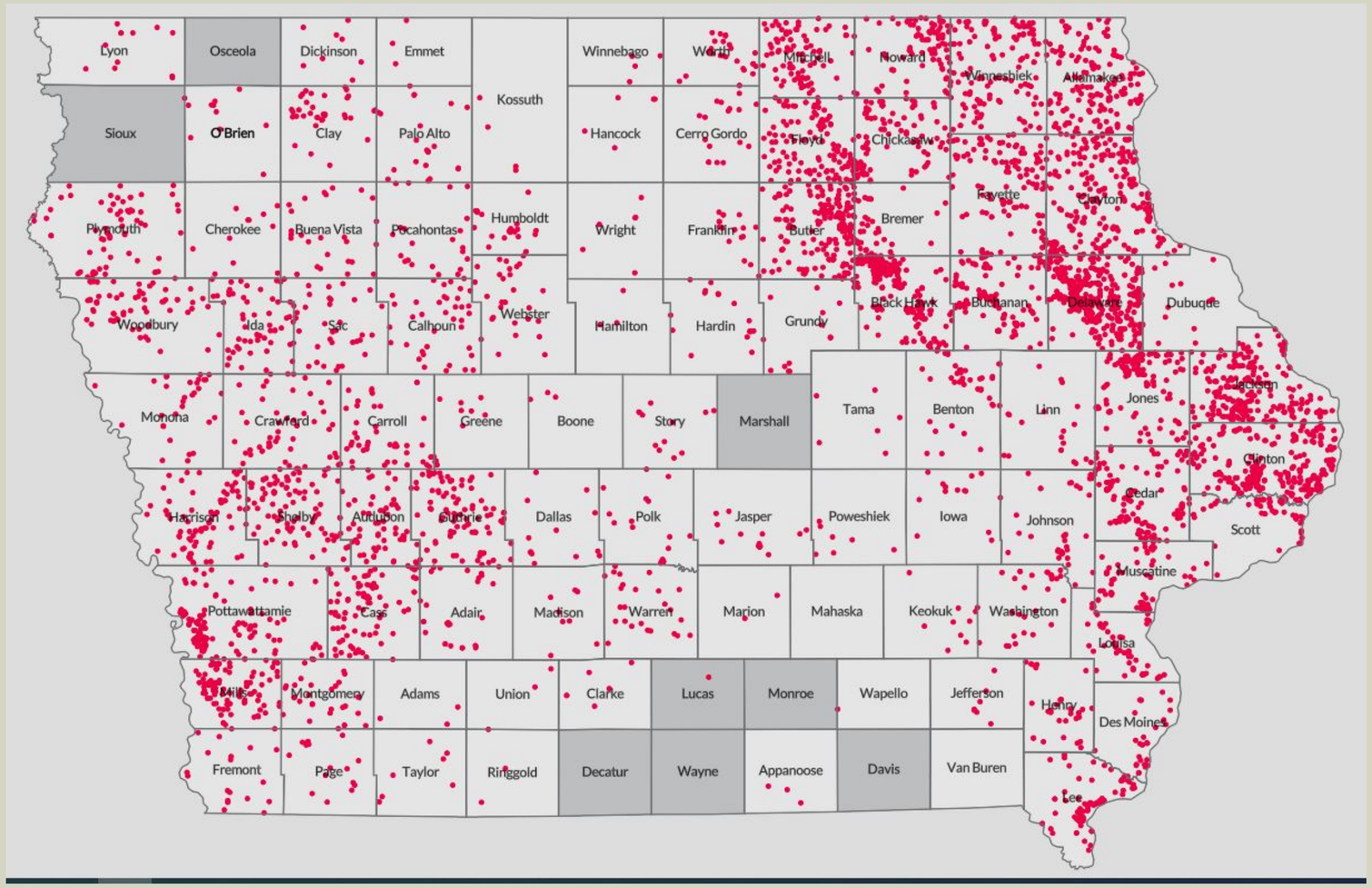
Map shows wells testing at or above 5 mg/L 2002-2017

Iowa Private Well Tracking System

- Data primarily from Iowa's Grants to Counties program that funds testing
- Not all counties participate.
- Two-third of wells tested only once between 2002 and 2017
- No complete inventory of household wells in Iowa

Results

- 54,994 wells tested
- 12,316 wells at or above 5 mg/L
- 6,637 wells at or above 10 mg/L
- More than 1,000 wells at or above 30 mg/L.
- 499 wells at or above 50 mg/L
- Almost 75 percent of very high tests occurred more recently (2010 to 2017)



Know your environment.
Protect your health.
ewg

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

Toxic Algae

Phosphorus and temperature get the most attention for triggering outbreaks.
Emerging research indicates nitrogen plays a role in shaping important characteristics of triggered blooms.

Cyanotoxins are not currently regulated under the Safe Drinking Water Act-- no testing required. Various cyanotoxins are included in the Fourth Unregulated Contaminant Monitoring Rule.

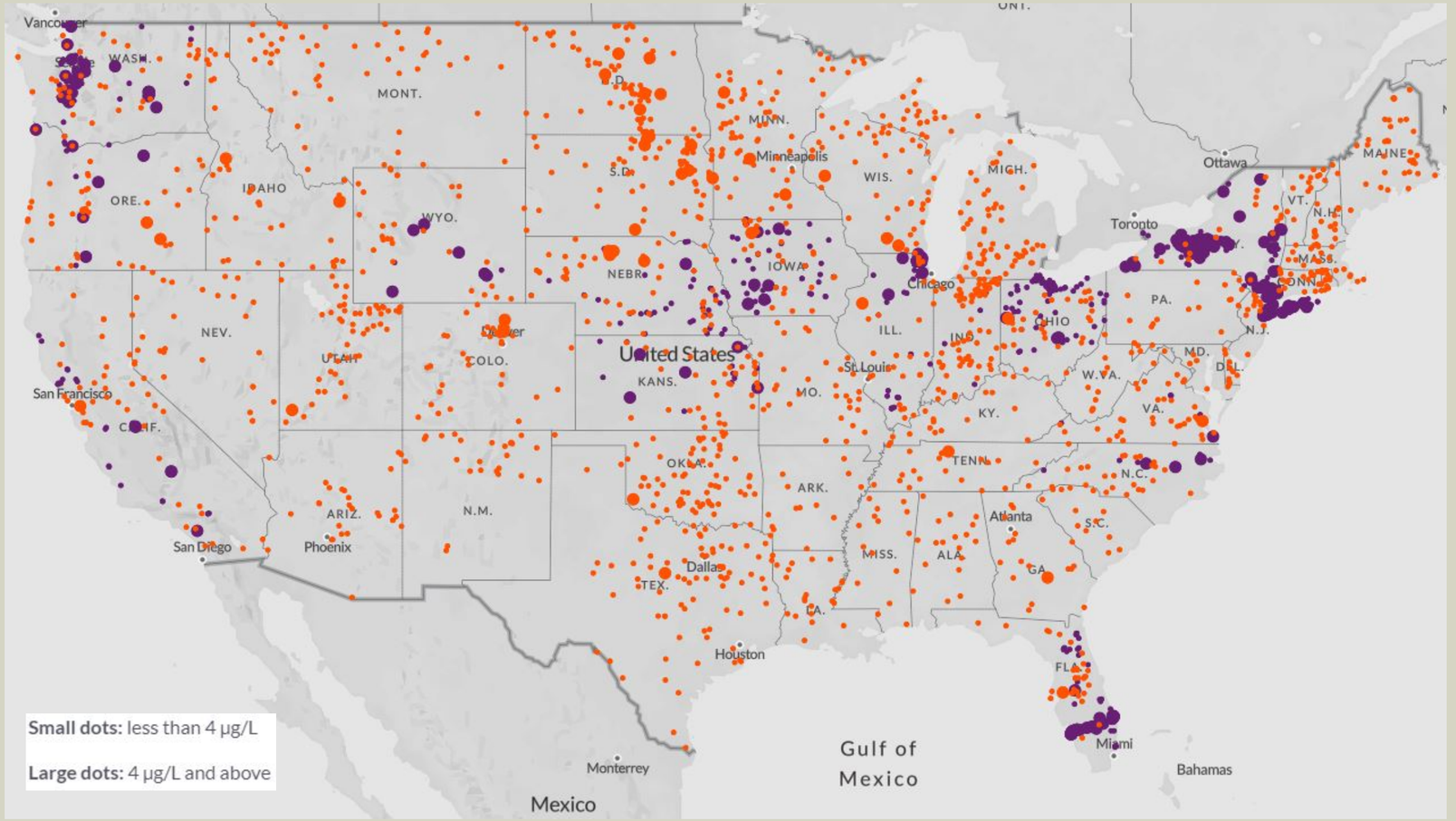
Health Advisories: 1.6 ug/L in drinking water for schoolage children and adults - 0.3 for younger children; 4 ug/l for recreational exposure (recently increased to 8 ug/l)

National Lakes Assessment included microcystin tests along with many other indicators of lake condition.

- In 2012, 39 percent [43,995] of sampled lakes detected microcystin – up from 9.5 percent [33,278] in 2007.
- 2017 data are not yet available.

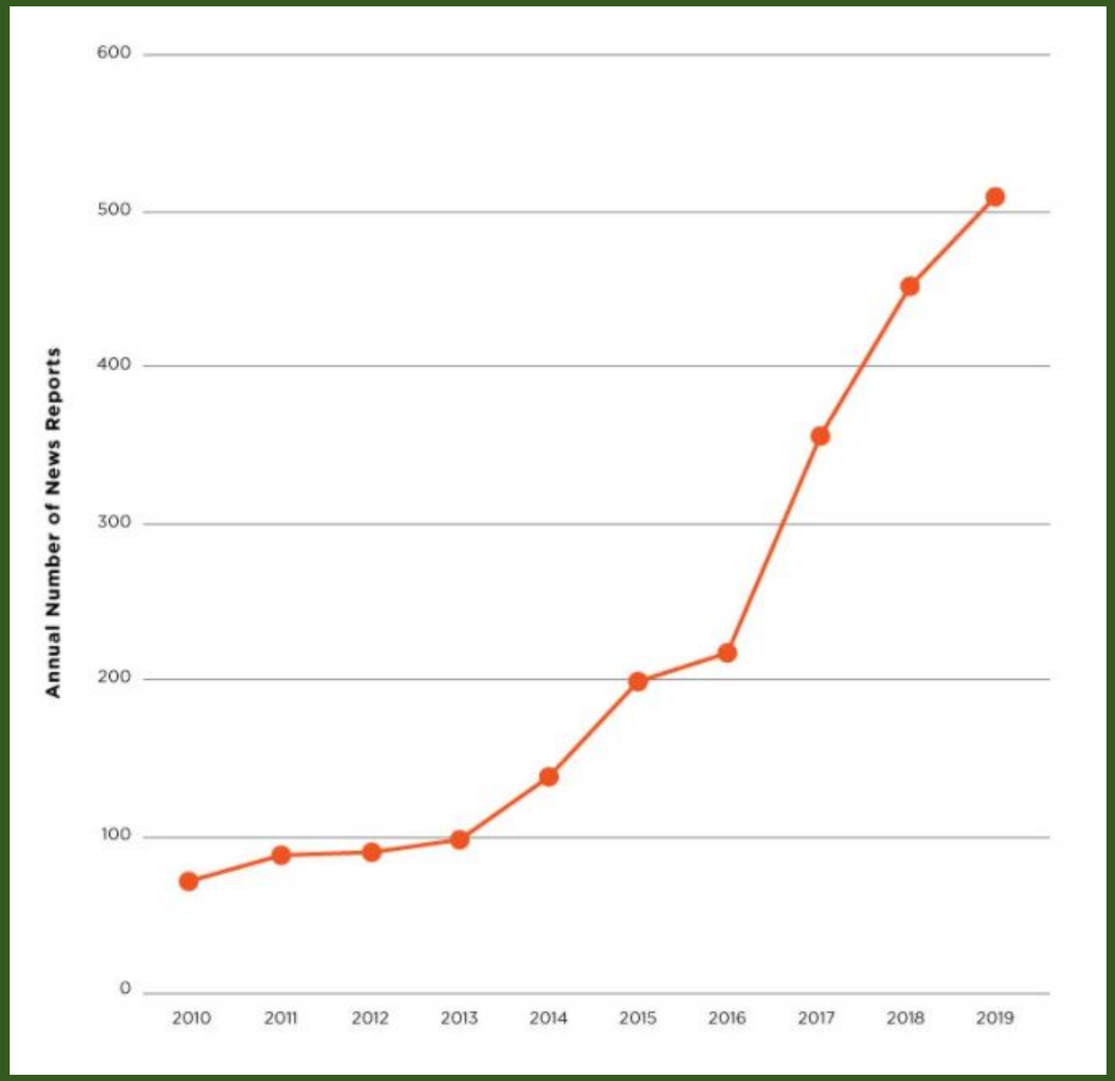
Data from 14 states:

- 10,400 samples - 9 percent (over 900) exceeded 4 µg/L.



Know your environment.
Protect your health.
ewg

The National Academies of
SCIENCES · ENGINEERING · MEDICINE



TOXIC ALGAE GETTING MORE ATTENTION

71 news reports in 2010 – 508 in 2019

Know your environment.
Protect your health.
ewg

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

THANK YOU

REPORTS

TROUBLE IN FARM COUNTRY - August 2017, Craig Cox

TROUBLE IN FARM COUNTRY REVISITED - October 2019, Anne Weir Schechinger

ACROSS FARM COUNTRY, NITRATE POLLUTION IS GETTING WORSE - June 2020, Anne Weir Schechinger

IN CALIFORNIA, LATINOS MORE LIKELY TO BE DRINKING NITRATE POLLUTED WATER - October 2020, Anne Weir Schechinger

IMPACTS OF NUTRIENT POLLUTION ON MARGINALIZED COMMUNITIES IN THE UPPER MIDWEST - November 2020 (unpublished), Anne Weir Schechinger and Craig Cox

AMERICA'S NITRATE HABIT IS COSTLY AND DANGEROUS - October 2018, Anne Weir Schechinger and Craig Cox

IOWA'S PRIVATE WELLS CONTAMINATED BY NITRATE AND BACTERIA - August 2019, Anne Weir Schechinger

ACROSS U.S. ERUPTIONS OF TOXIC ALGAE PLAGUE LAKES - August 2019, Soren Rundquist