

# Where are neonicotinoids found in WI?



## Results of DATCP's Surface Water and Groundwater monitoring

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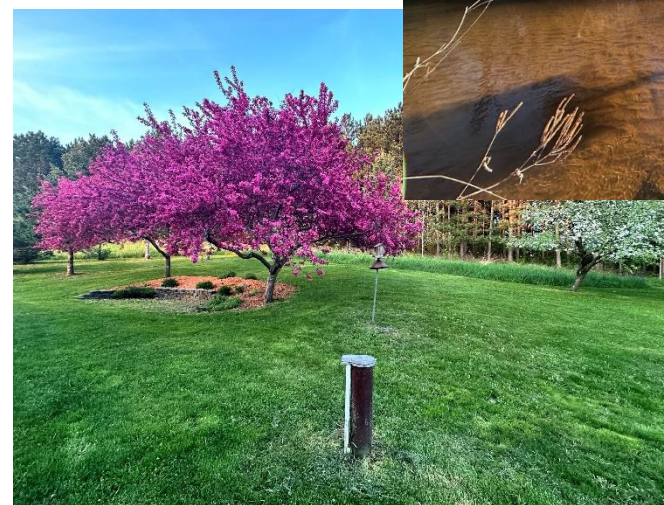
WISCONSIN DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION

10-30-2024

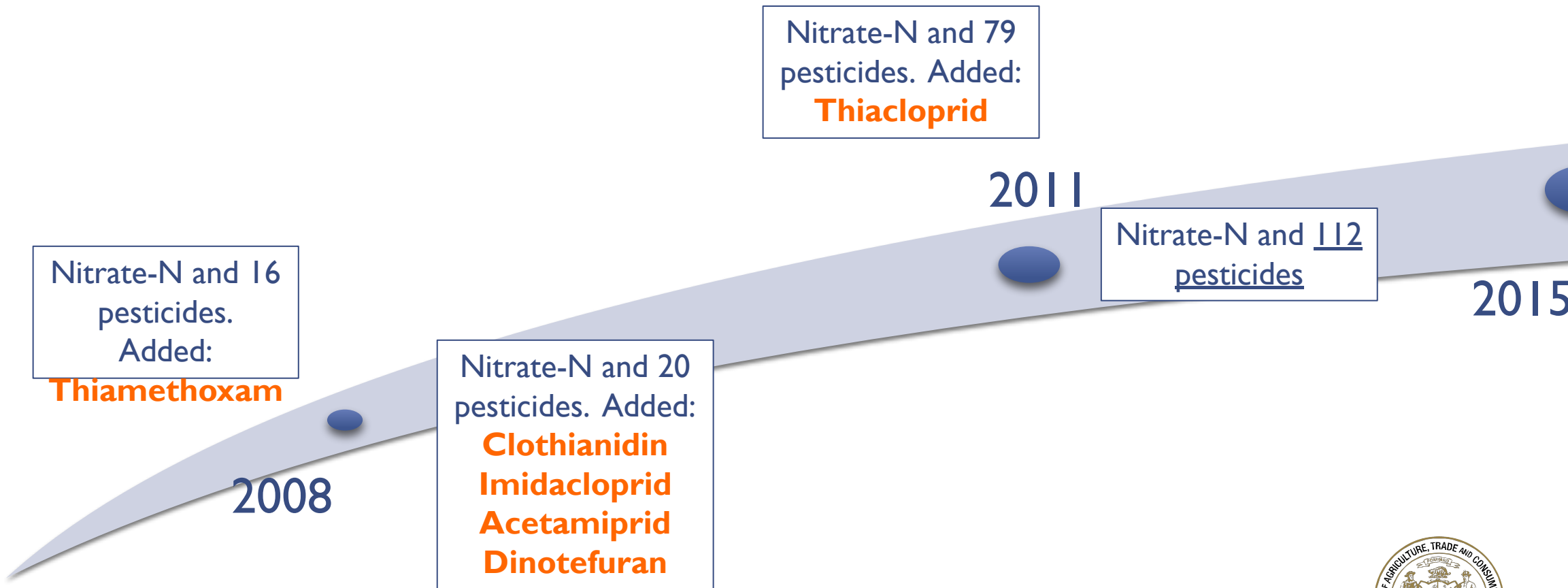
# DATCP GROUNDWATER SAMPLING PROGRAMS

## Our mission: protect human health and the environment

- Determine which pesticides are found in the environment through multiple sampling programs
  - Monitoring wells at edge of agricultural fields
  - Private potable wells (bias sampling)
  - Private potable wells (random sampling)
  - Surface water sampling (bias sampling – monthly)
- Determine whether pesticide concentrations exceed groundwater and surface water benchmarks

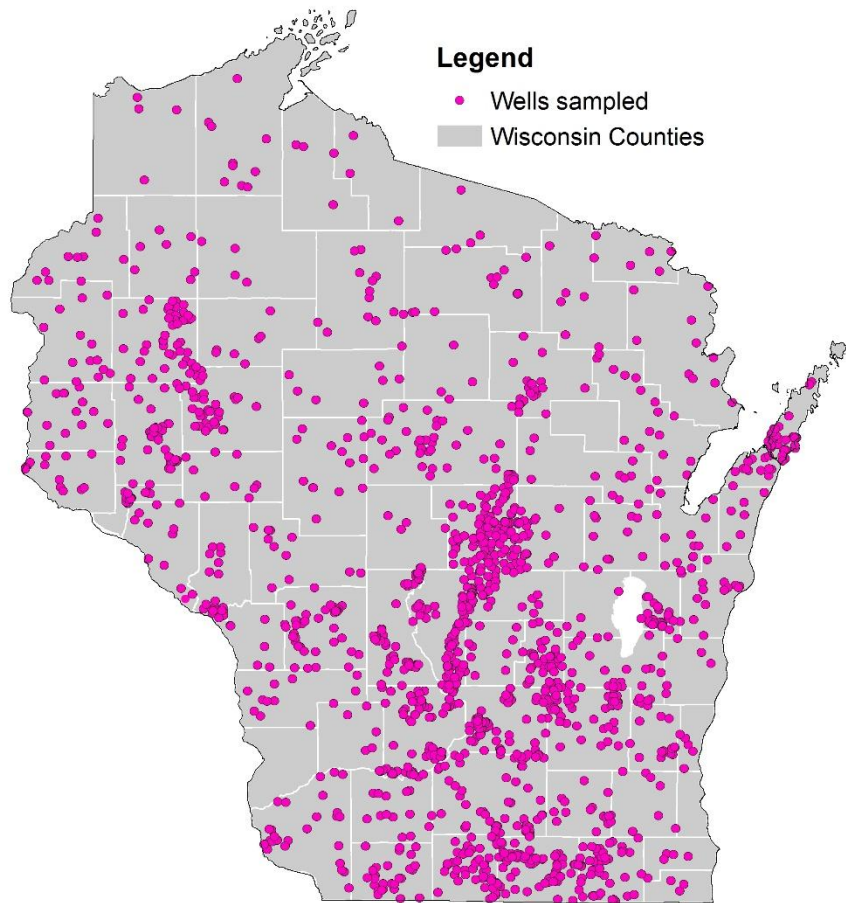


# NEONICOTINOID COMPOUNDS TESTED IN WATER SAMPLES





# GROUNDWATER SAMPLING LOCATIONS

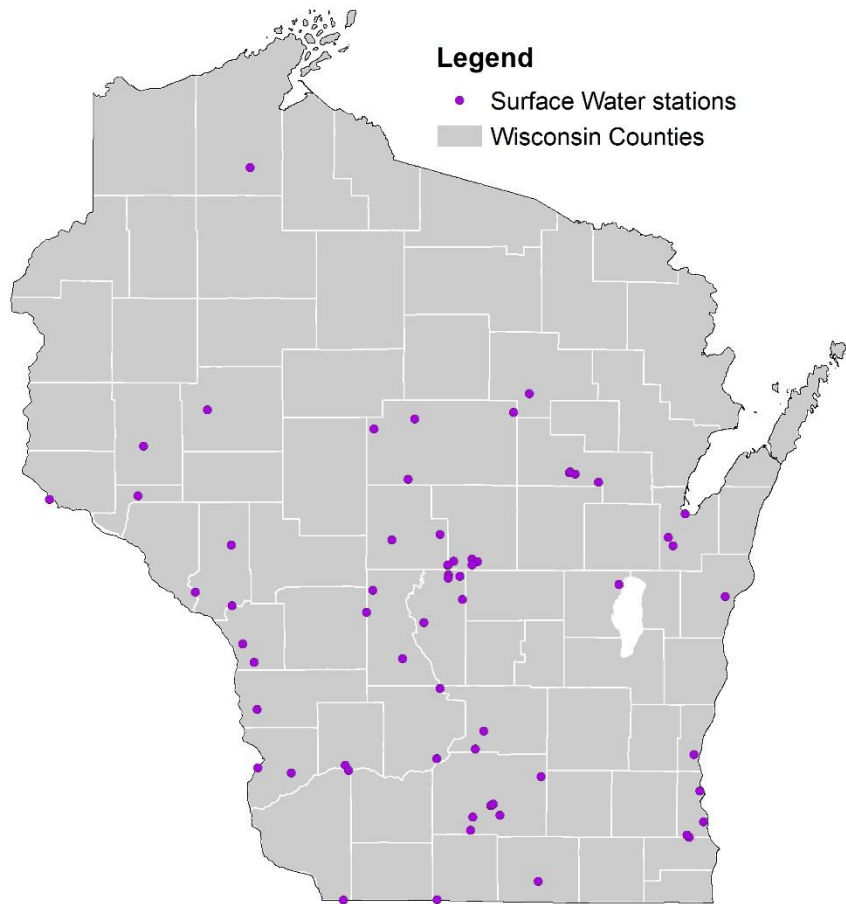


From 2008 to 2023:

- **1,690 monitoring and private potable wells** were tested at least once for one or more neonicotinoid compounds
- A total of **3,486 groundwater samples** were collected



# SURFACE WATER SAMPLING LOCATIONS



From 2011 to 2023:

- **64 surface water sampling stations** were tested at least once for one or more neonicotinoid compounds
- A total of **1,081 surface water samples** were collected. Several samples are collected at individual stations (usually once a month from March to December).







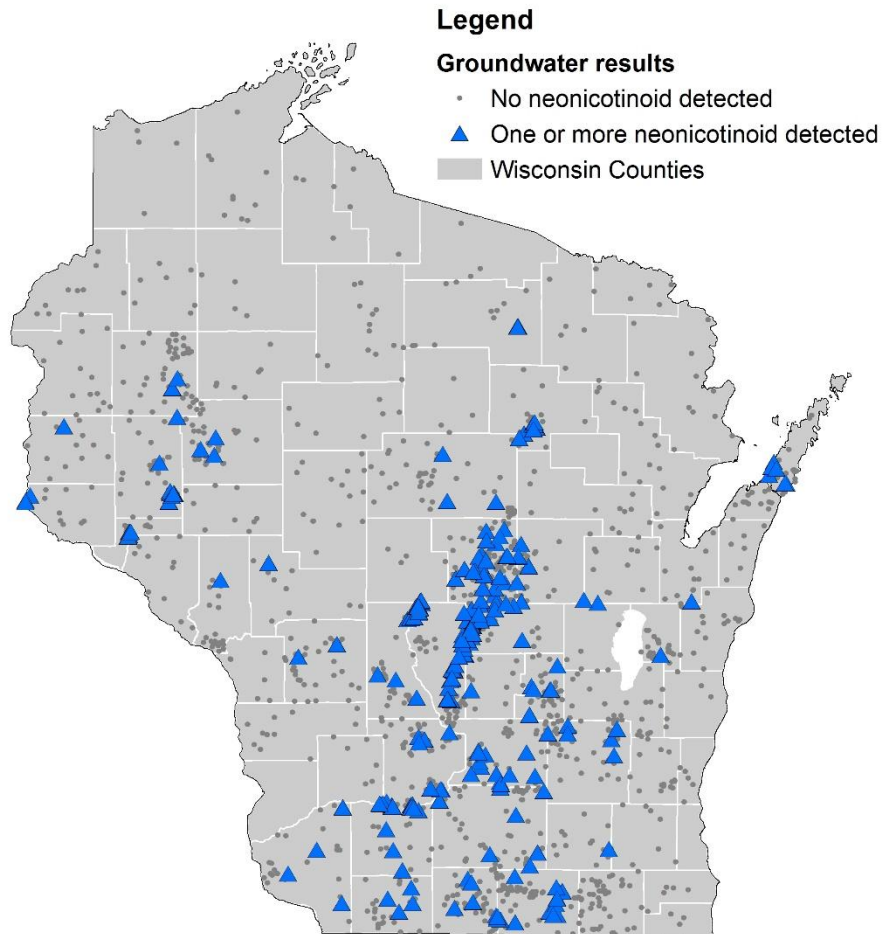
## RESULTS

Where did we detect neonicotinoids in groundwater and surface water?





# NEONICOTINOID DETECTIONS IN GROUNDWATER

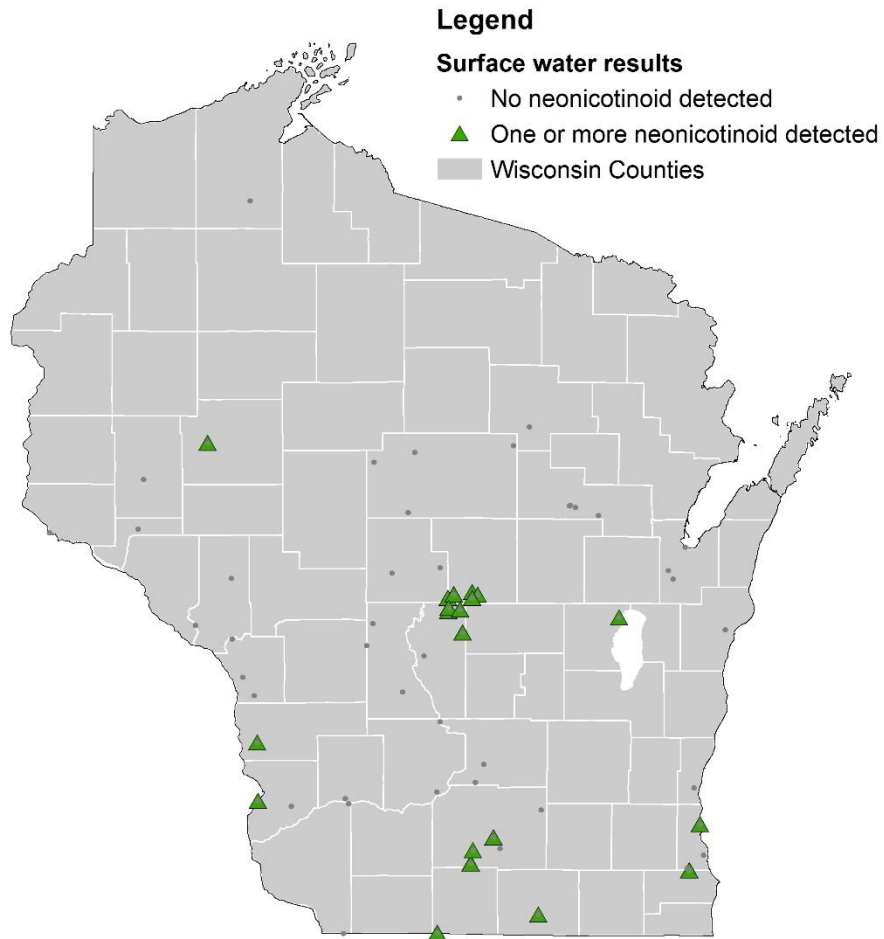


One or more neonicotinoids were detected:

- In **287 wells** (~17%)
- In **1,029 groundwater samples** (~30%)



# NEONICOTINOID DETECTIONS IN SURFACE WATER



One or more neonicotinoids were detected:

- In **21 stations** (~33%)
- In **213 samples** (~20%)







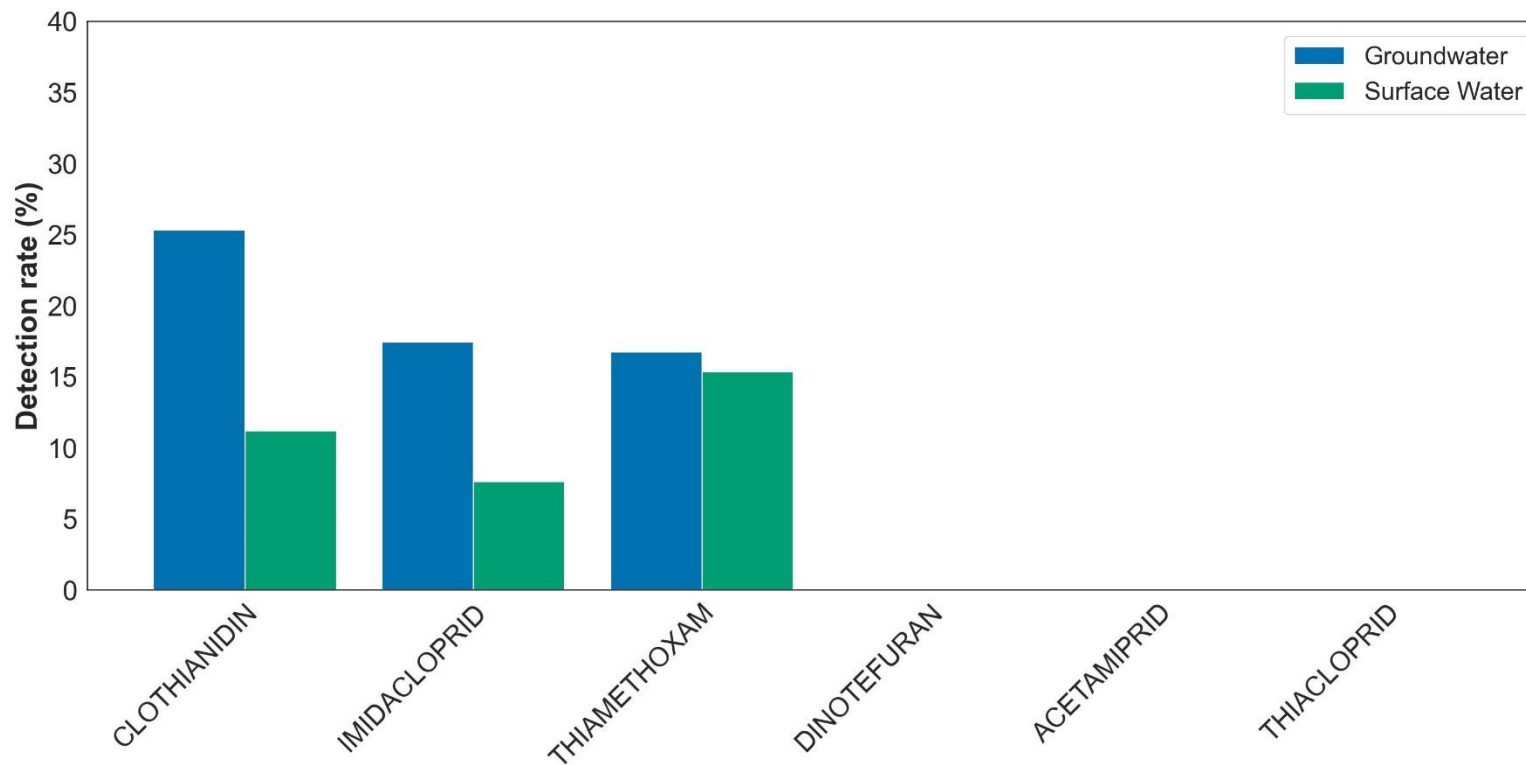
# RESULTS

Which neonicotinoids did we detect?





# DETECTS SURFACE WATER VS GROUNDWATER

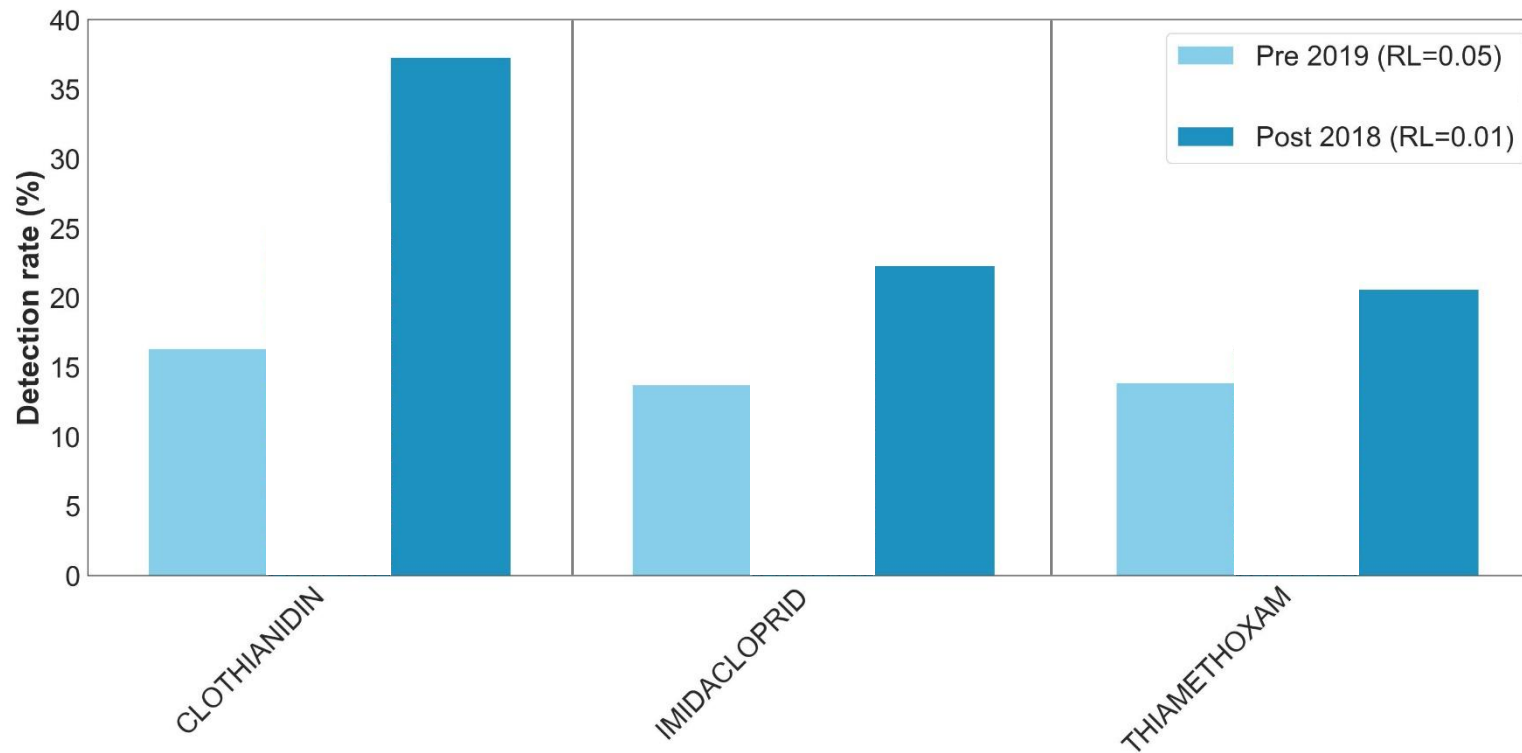


- Thiamethoxam is the most detected compound in surface water. Clothianidin is the most detected compound in groundwater.
- Overall, higher detection rates in groundwater than surface water.
- Acetamiprid and thiacloprid have not been detected in groundwater or surface water.



# DETECTION RATES OVER TIME IN GROUNDWATER

In 2019, our Reporting Limits (RLs) for these compounds decreased from 0.05 µg/L to 0.01 µg/L



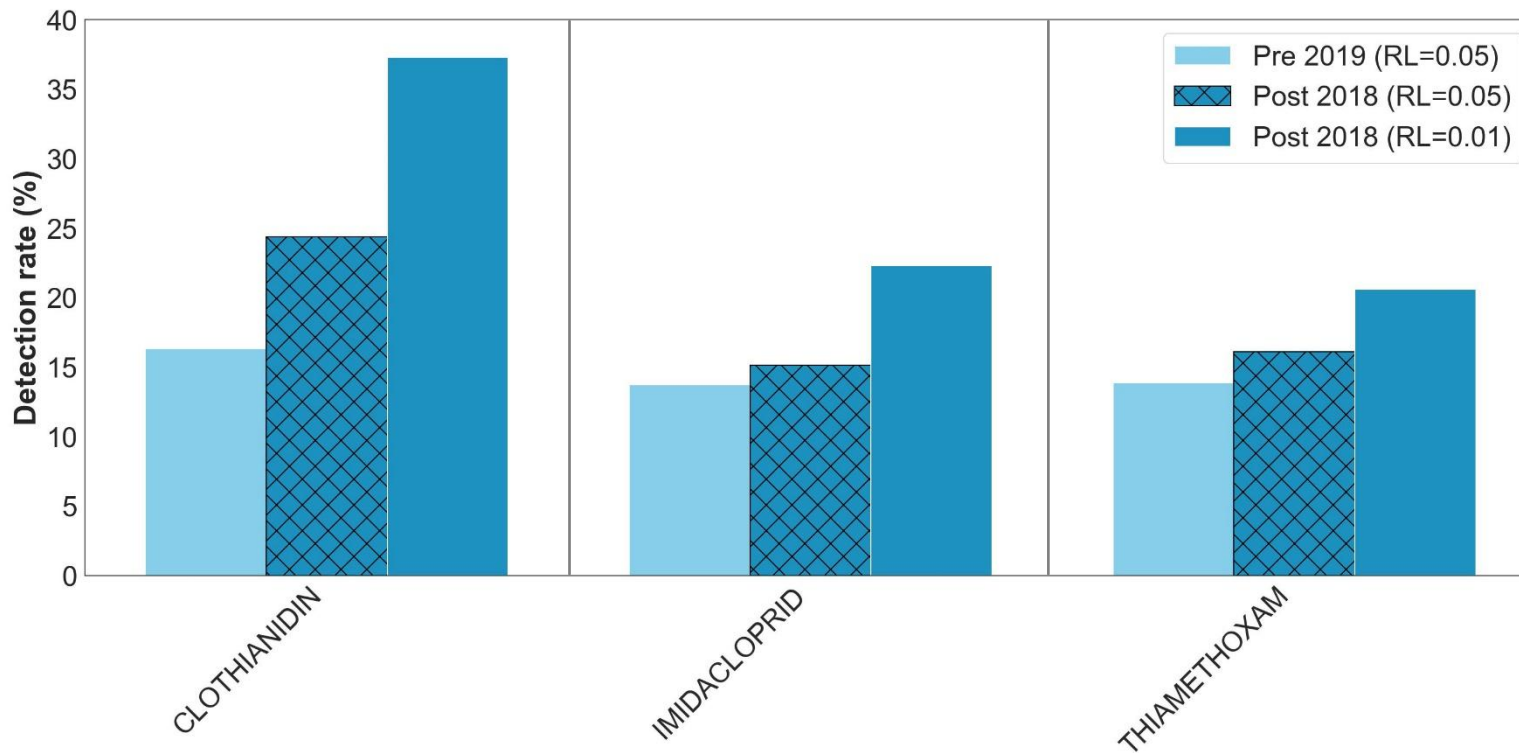
- Detection rates for clothianidin, imidacloprid, and thiamethoxam increased since 2019





# INSIGHTS ON GROUNDWATER DETECTIONS

In 2019, our Reporting Limits (RLs) for these compounds decreased from 0.05 µg/L to 0.01 µg/L

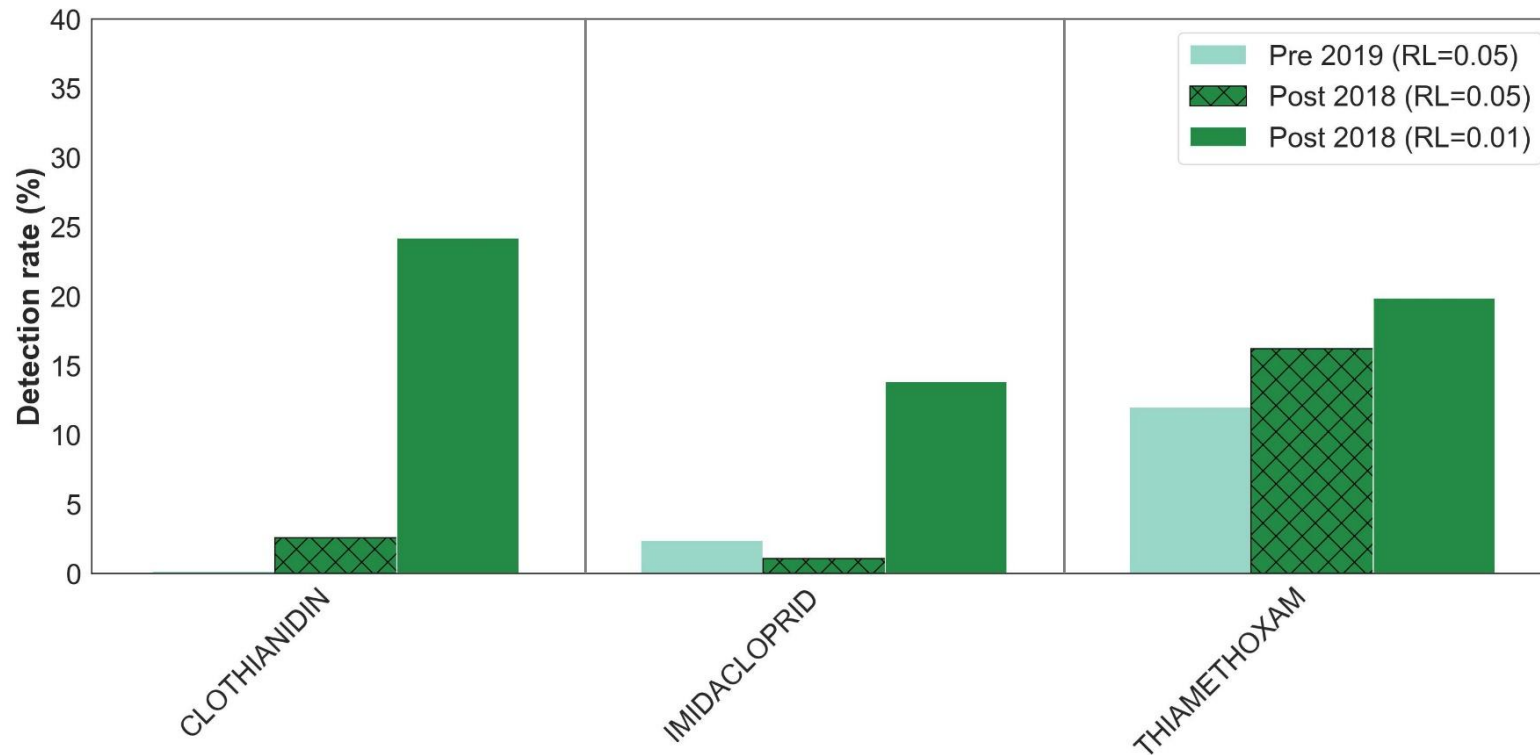


- The increase in detection rates since 2019 is in part due to lowered lab reporting limits.
- Even with pre-2019 reporting limits, detection rates for clothianidin, imidacloprid, and thiamethoxam in groundwater would have still increased.



# INSIGHTS ON SURFACE WATER DETECTIONS

In 2019, our Reporting Limits (RLs) for these compounds decreased from 0.05 µg/L to 0.01 µg/L



- The increase in detection rates since 2019 is largely due to lowered reporting limits, particularly affecting imidacloprid.
- For clothianidin and thiamethoxam, detection rates would have increased even without the reduction in reporting limits.







# RESULTS

Should we be concerned about these compounds?





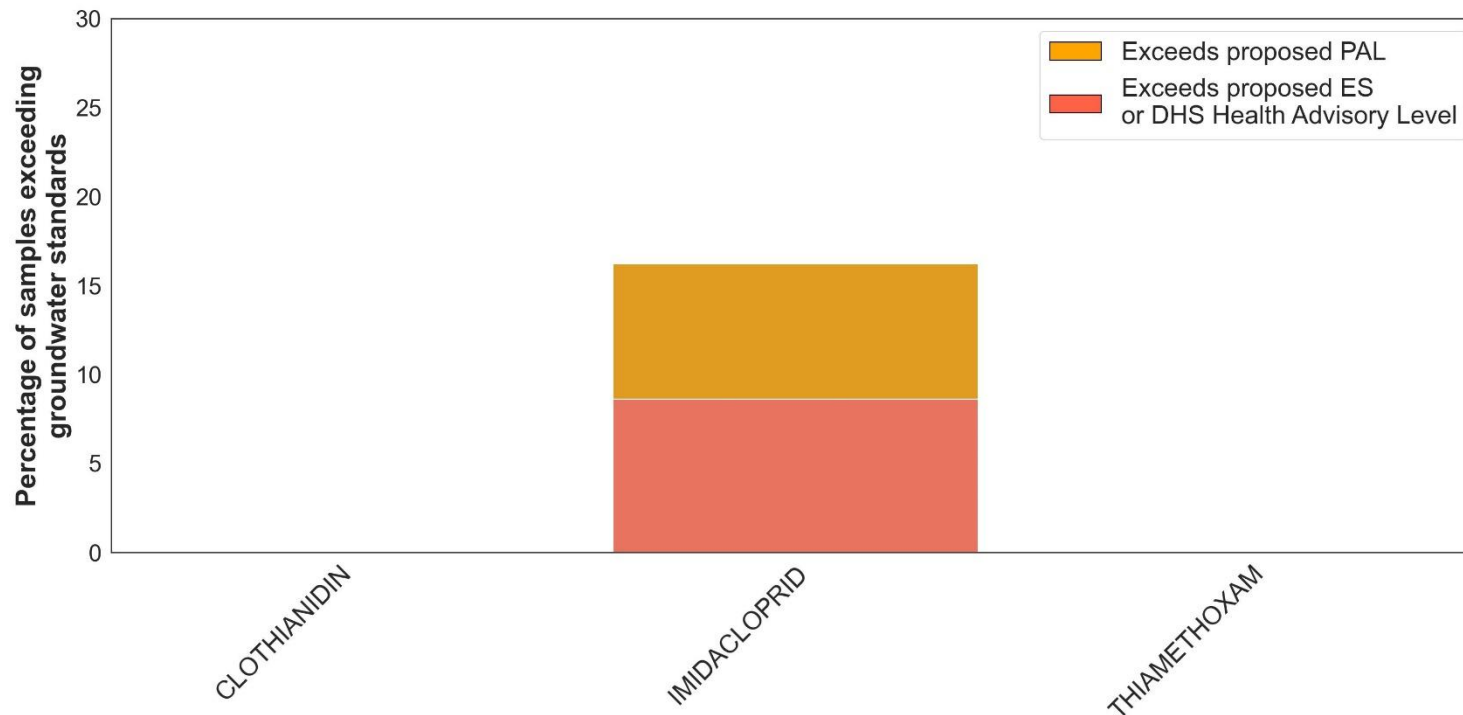
# GROUNDWATER BENCHMARKS

Compound	State-level benchmarks	
	Proposed 2019 Preventive Action Limit (µg/L or ppb)	Proposed 2019 Enforcement Standard or DHS Health Advisory Level (µg/L or ppb)
Clothianidin	200	1,000
Imidacloprid	0.02	0.2
Thiamethoxam	12	120

For more information, visit <https://www.dhs.wisconsin.gov/water/gws.htm>



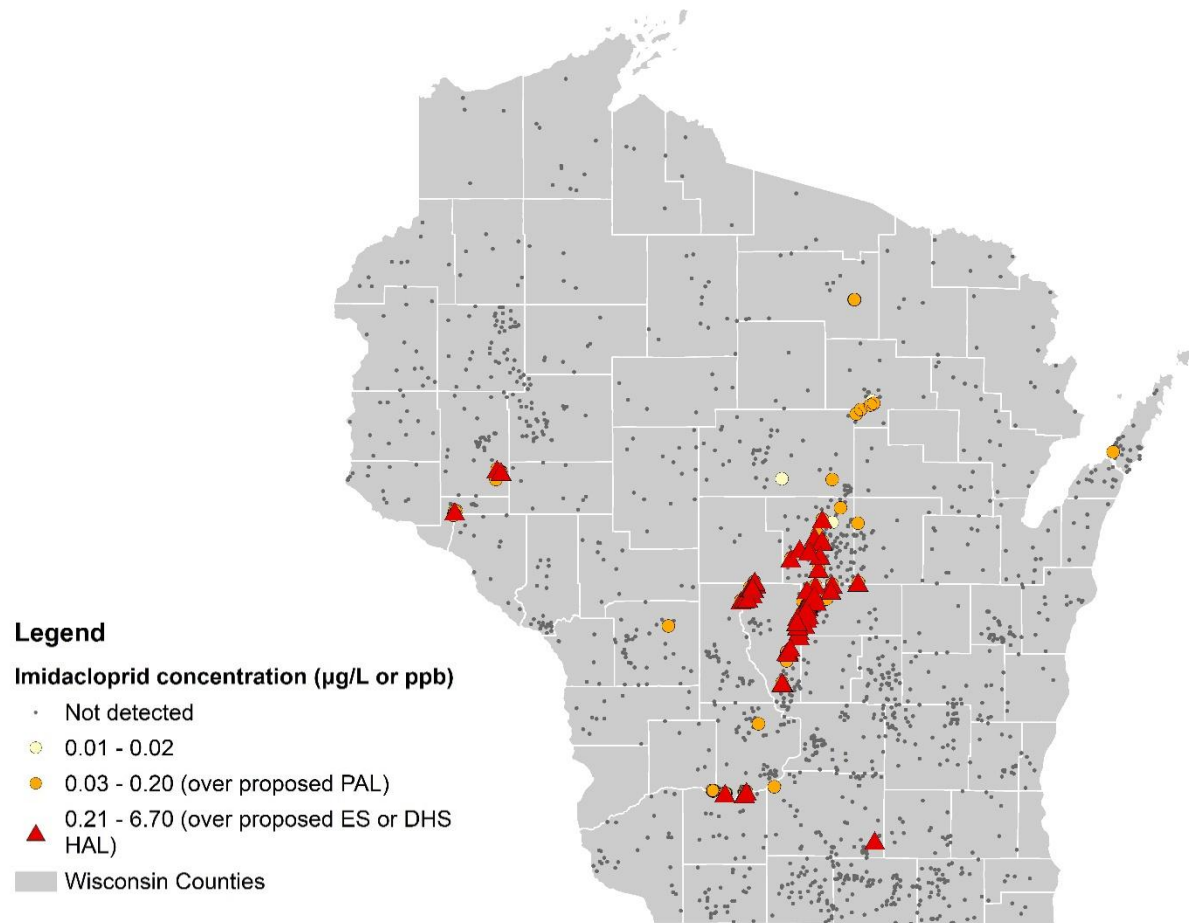
# EXCEEDANCES IN GROUNDWATER



- About 9% of the groundwater samples collected exceeded the imidacloprid DHS Health Advisory level.
- No exceedances of DHS Health Advisory Levels have been recorded for clothianidin and thiamethoxam.



# IMIDACLOPRID EXCEEDANCES IN GROUNDWATER – WHERE?



Imidacloprid concentrations exceeded the DHS Health Advisory Level of  $0.2 \mu\text{g/L}$  (ppb) mostly in the Central Sands Region, Lower Wisconsin River Valley, and parts of western Wisconsin.





# SURFACE WATER BENCHMARKS

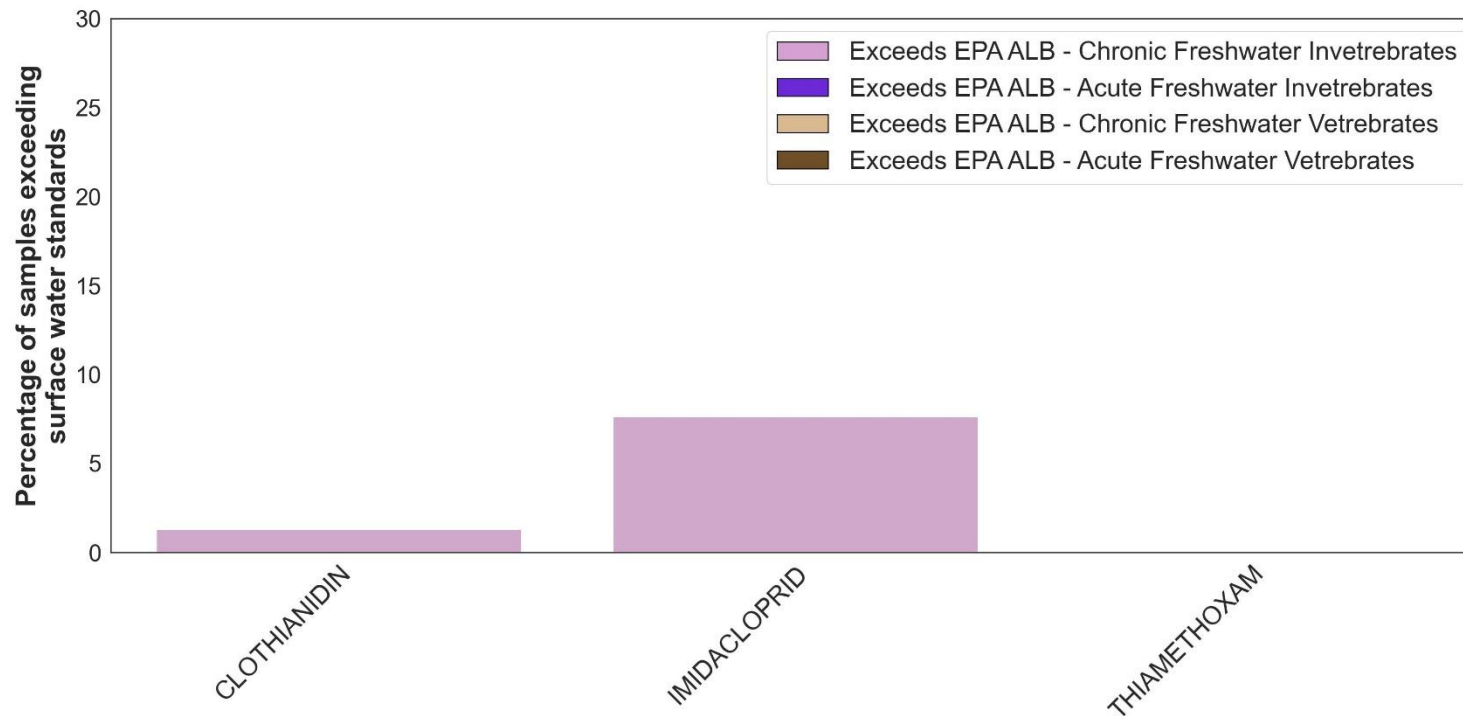
Compound	Environmental Protection Agency (EPA) Aquatic Life Benchmarks (ALBs)			
	Freshwater invertebrates		Freshwater vertebrates	
	Acute (µg/L or ppb)	Chronic (µg/L or ppb)	Acute (µg/L or ppb)	Chronic (µg/L or ppb)
Clothianidin	11	0.05	> 50750	9700
Imidacloprid	0.385	0.01	114500	9000
Thiamethoxam	17.5	0.74	> 57000	20000

For more information, visit

<https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/aquatic-life-benchmarks-and-ecological-risk>



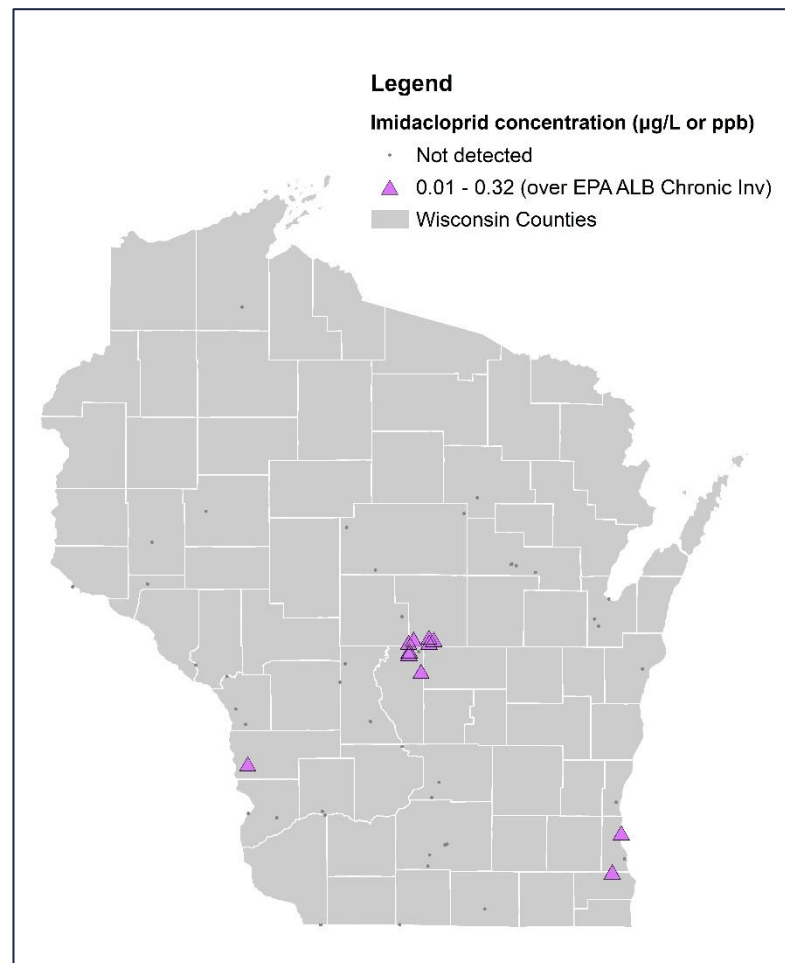
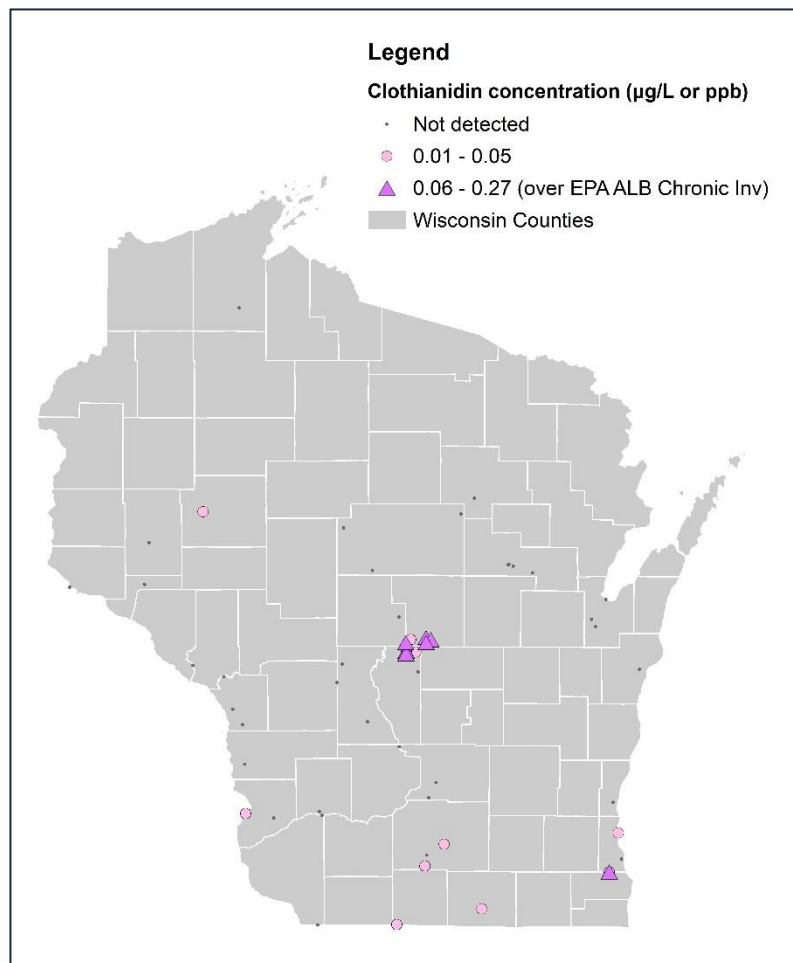
# EXCEEDANCES IN SURFACE WATER



- Clothianidin (~1%) and imidacloprid (~8%) were detected in surface water samples at concentrations exceeding the EPA Chronic Aquatic Life Benchmarks for invertebrates
- No exceedances of Acute EPA Benchmarks for invertebrates or Benchmarks for freshwater vertebrates have been recorded.



# CLO AND IMI EXCEEDANCES IN SURFACE WATER – WHERE?



Exceedances of the EPA's Chronic Aquatic Life Benchmark for invertebrates for clothianidin and imidacloprid were primarily observed in the Central Sands, Southeastern, and Southwestern Wisconsin.





# CONCLUSIONS

- Neonicotinoids have been detected in both surface water and groundwater across various regions of the state.
- Clothianidin, imidacloprid, and thiamethoxam are the most frequently detected neonicotinoids, with a higher incidence in groundwater compared to surface water. The rate of detection increased notably in 2019. This increase is observed in groundwater regardless of the reduced reporting limit and in surface water specifically for thiamethoxam and clothianidin.
- Imidacloprid is the sole compound exceeding the DHS health advisory level in groundwater, with exceedances primarily in the Central Sands, Lower WI River Valley, and Western Wisconsin.
- Both clothianidin and imidacloprid exceed EPA's chronic aquatic life benchmarks for invertebrates, with exceedances found in Central Sands, Western, and Southeastern Wisconsin.



# OUR CURRENT EFFORTS

- In the last 5 year we have allocated over \$500,000 towards research studies focused on neonicotinoids
- We continue sampling for neonicotinoids in WI groundwater and surface water
- You can also find some of our data on the EPA water quality portal (filter by Organization ID: “WIDATCP\_WQX”): <https://www.waterqualitydata.us/>

## Environmental Toxicology and Chemistry

Environmental Toxicology

**Chronic Exposure to Environmentally Relevant Concentrations of Imidacloprid Impact Survival and Ecologically Relevant Behaviors of Fathead Minnow Larvae**

Anya J. Jeninga, Zion Wallace, Shayla Victoria, Elisabeth Harrahy, Tisha C. King-Heiden ✉

First published: 04 July 2023 | <https://doi.org/10.1002/etc.5710>



*Check our  
groundwater and  
surface water reports*





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10-30-2024





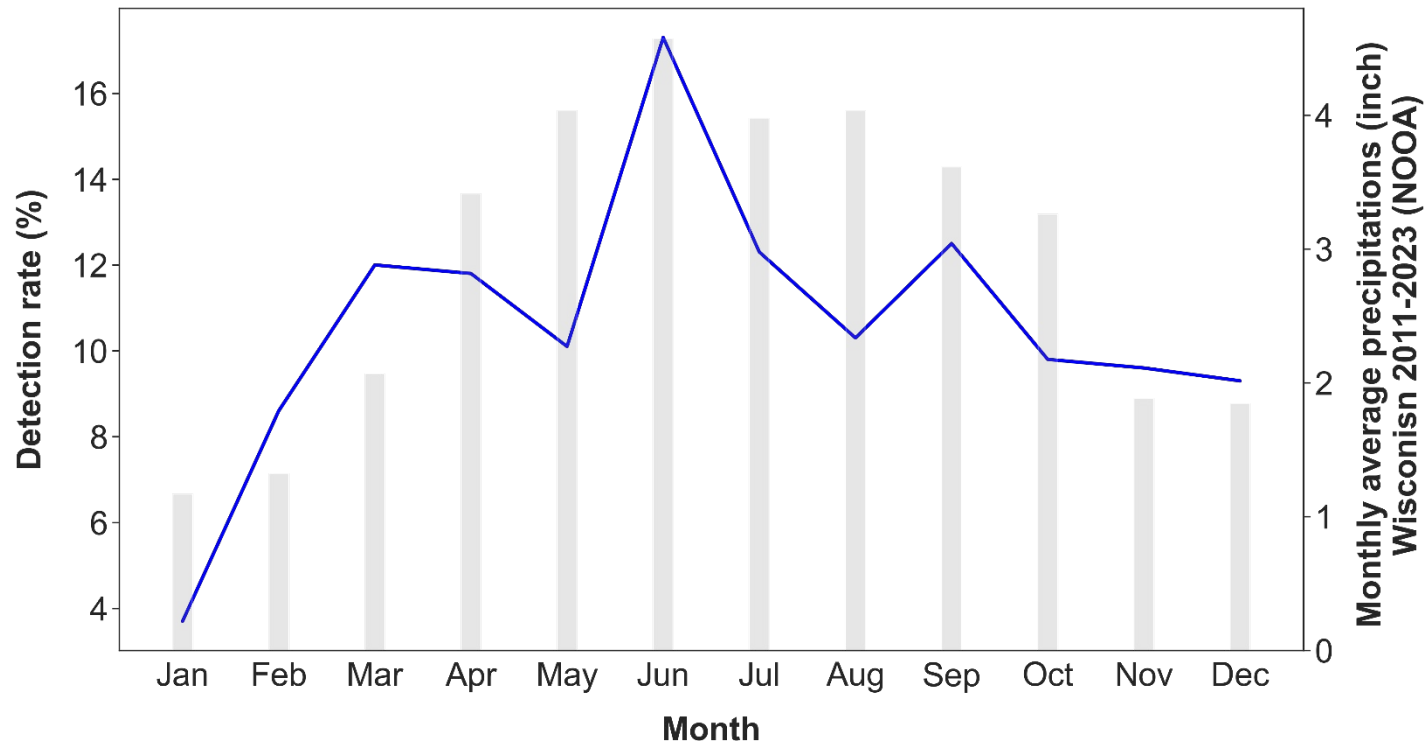
# RESULTS

When do we detect these compounds the most?





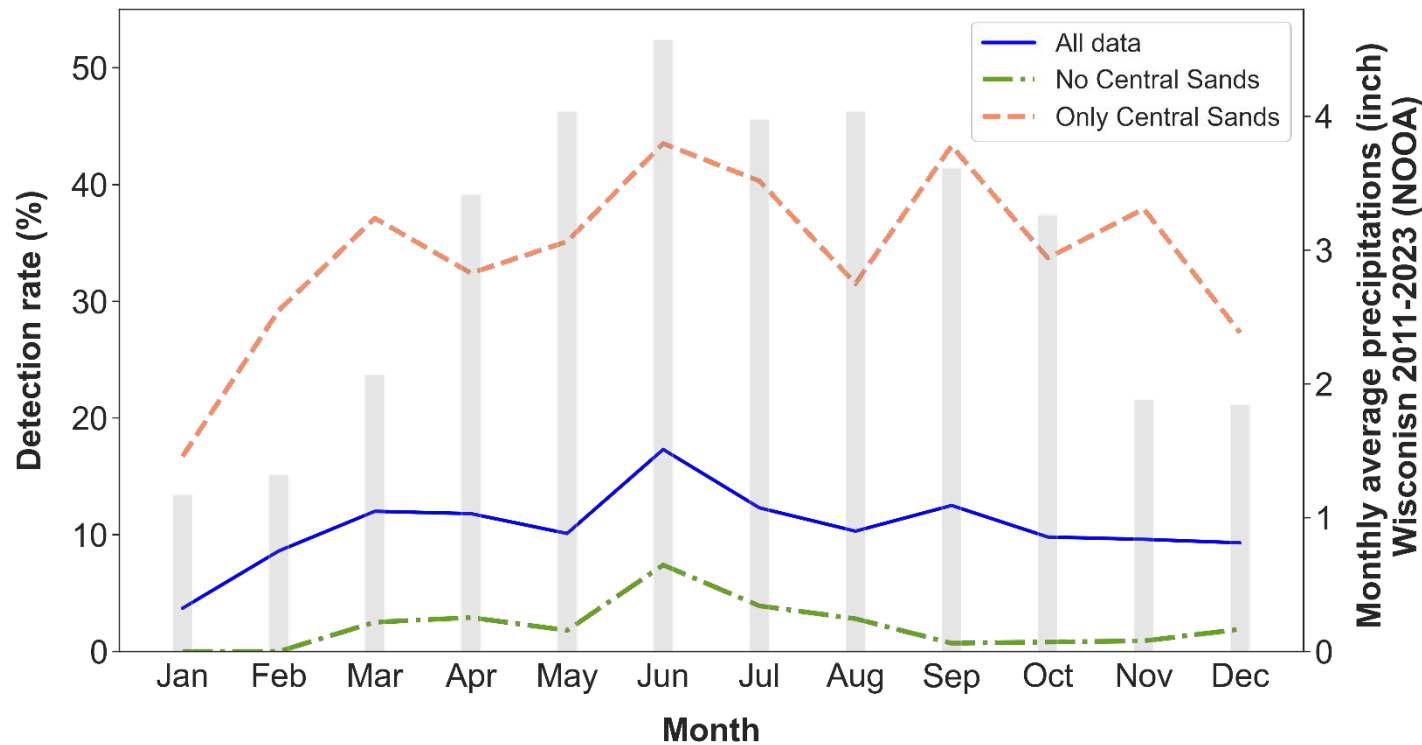
# TIMING OF DETECTION IN SURFACE WATER



- Higher detection rate in June - coincides with peak in precipitation
- Secondary peaks in March and September



# TIMING OF DETECTION VARIES BASED ON SW STATION LOCATION



- March and September peaks are mostly recorded in the Central Sands
- Detection peaks in March and the Fall in the Central Sands – possibly explanations:
  1. Groundwater discharge
  2. Higher leachate in groundwater after vine-killing (Groves et al. 2014)







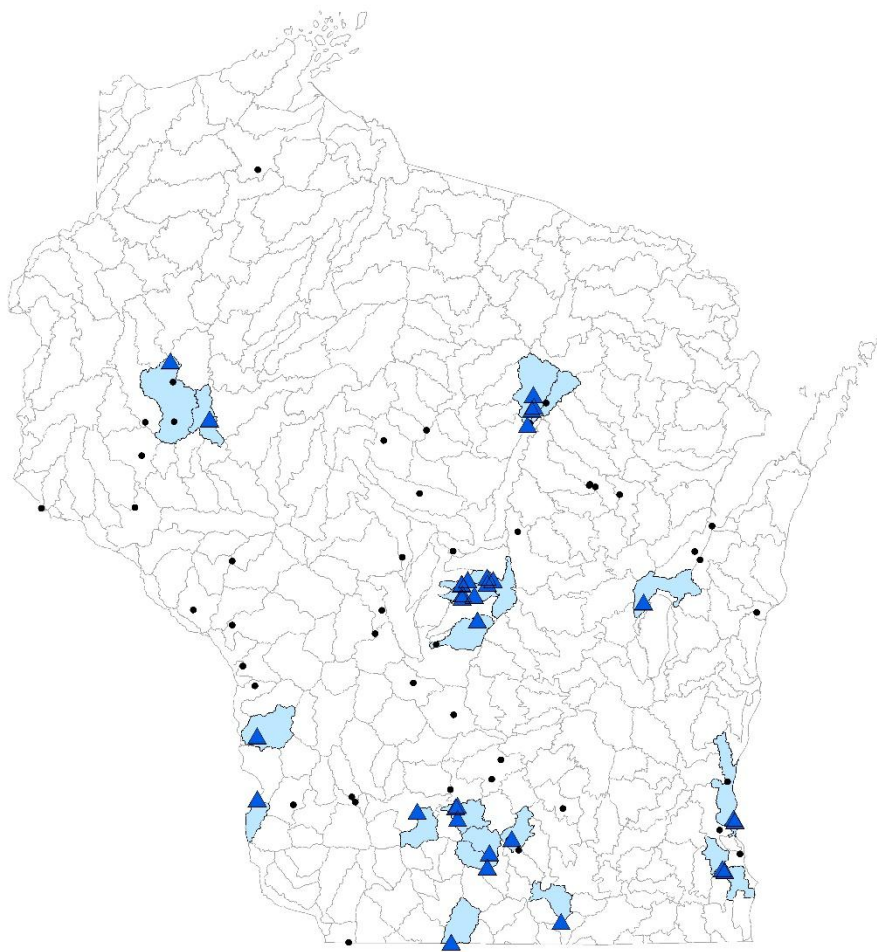
# RESULTS

More recent data in surface water





# MORE RECENT DETECTIONS IN SURFACE WATER



## Legend

### Neonicotinoid detections (one or more)\*

- ▲ Detected
- None detected
- Watersheds with neonicotinoid detections\*
- HUC10

\* The dataset includes data collected from 2008 through June 2024 and is subject to revision.







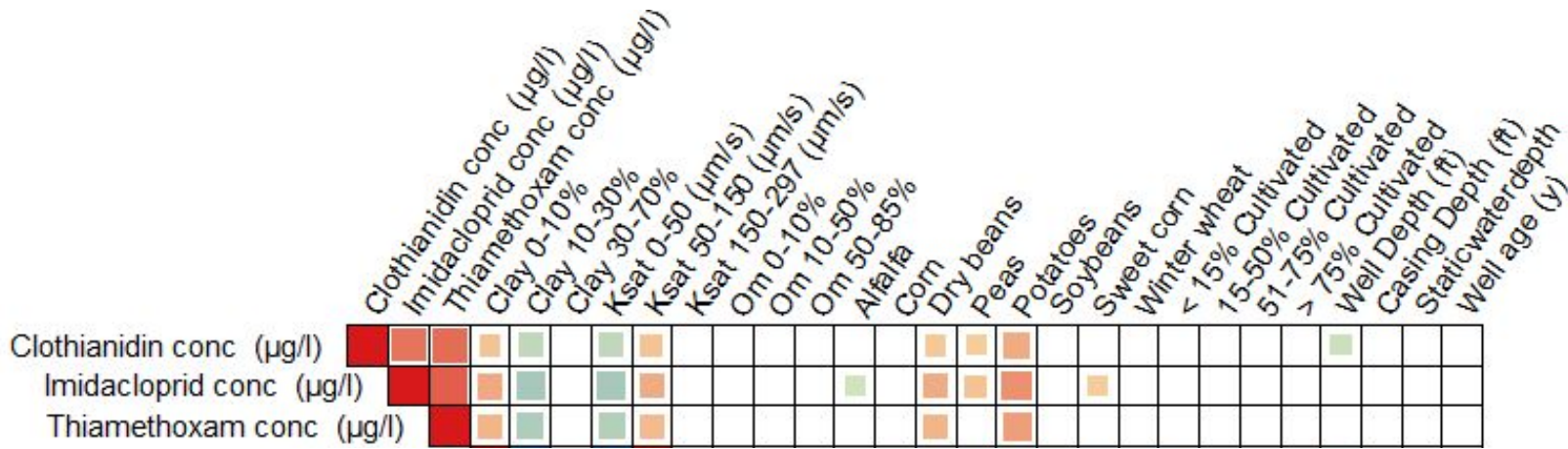
# RESULTS

## Correlation analysis

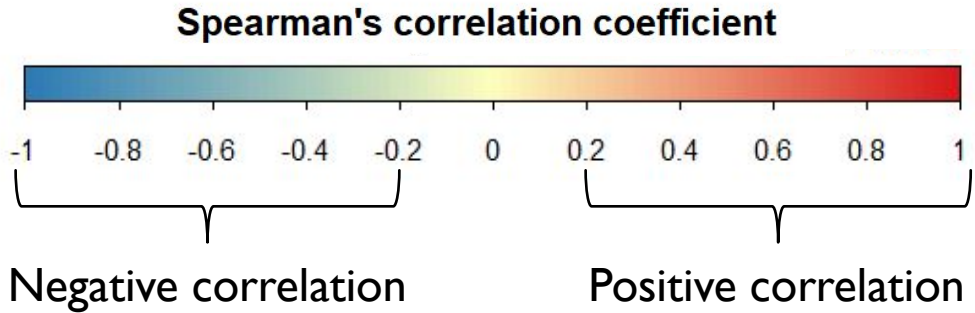




# CORRELATION GW DATA WITH INFLUENCING FACTORS



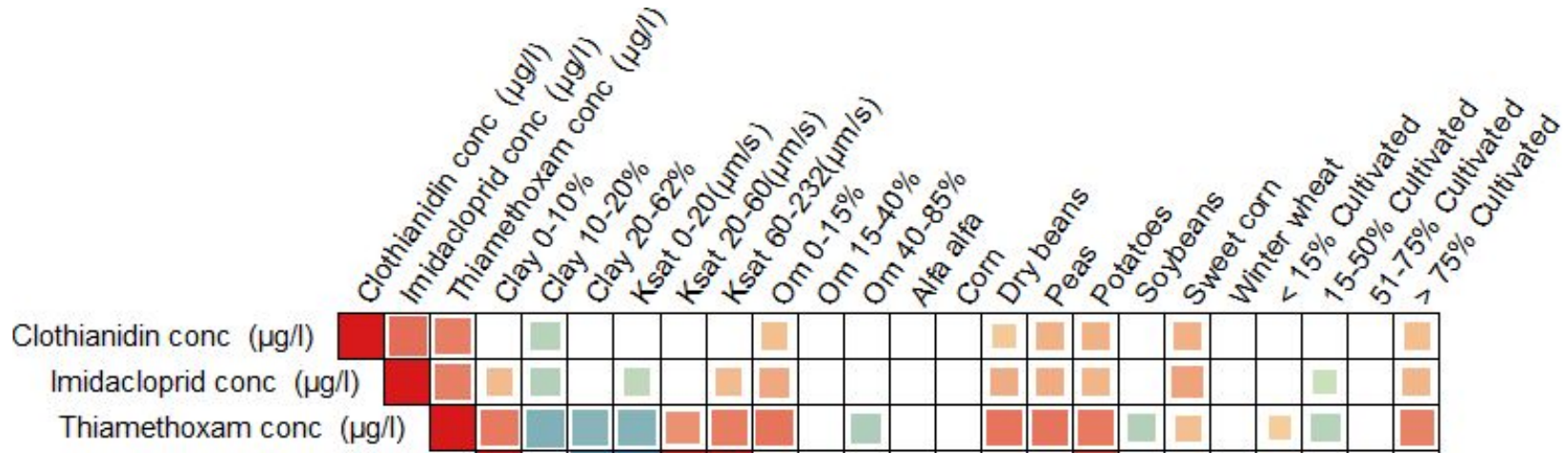
Disclaimer: The data provided is subject to revision and may change over time.



Units are in acres, unless specified  
 Correlation with  $p < 0.05$  and a Spearman's correlation  $< 0.2$  are not shown



# CORRELATION SW DATA WITH INFLUENCING FACTORS



Disclaimer: The data provided is subject to revision and may change over time.

