



## Perfluorochemicals (PFCs) in the East Metro

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# Agenda

- What are PFCs (also known as PFAS)?
  - Where do they come from?
  - Why are they important?
- What are MDH's Health-Based Values?
- What about PFCs in Minnesota?
- How have PFCs affected drinking water supplies and what actions have been taken?
- What are future options for community water supplies?

## PFCs (also known as PFAS)

- Human-made chemicals found in everyday items
- Used since 1940s to make products that resist heat, stains, water, oil and grease; production increased rapidly in 1970s
- Many other specialized industrial and commercial uses (operative word: non-stick)

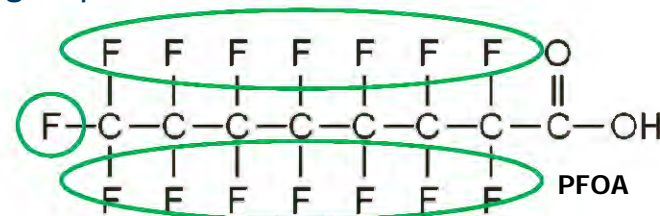
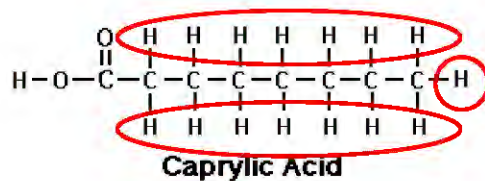


# PFCs in the Environment

- PFCs are persistent in the environment
- PFCs can be found in
  - **Food** packaged or processed with PFAS-containing materials or grown in contaminated soil/water
  - **Commercial household products**, including stain-resistant fabrics, nonstick products, polishes, paints, waxes, and cleaning products
  - **Workplaces** that use PFAS
  - **Drinking water**, typically associated with a specific facility or site
  - **Living organisms**, including fish, animals, and humans

# PFCs in the Environment

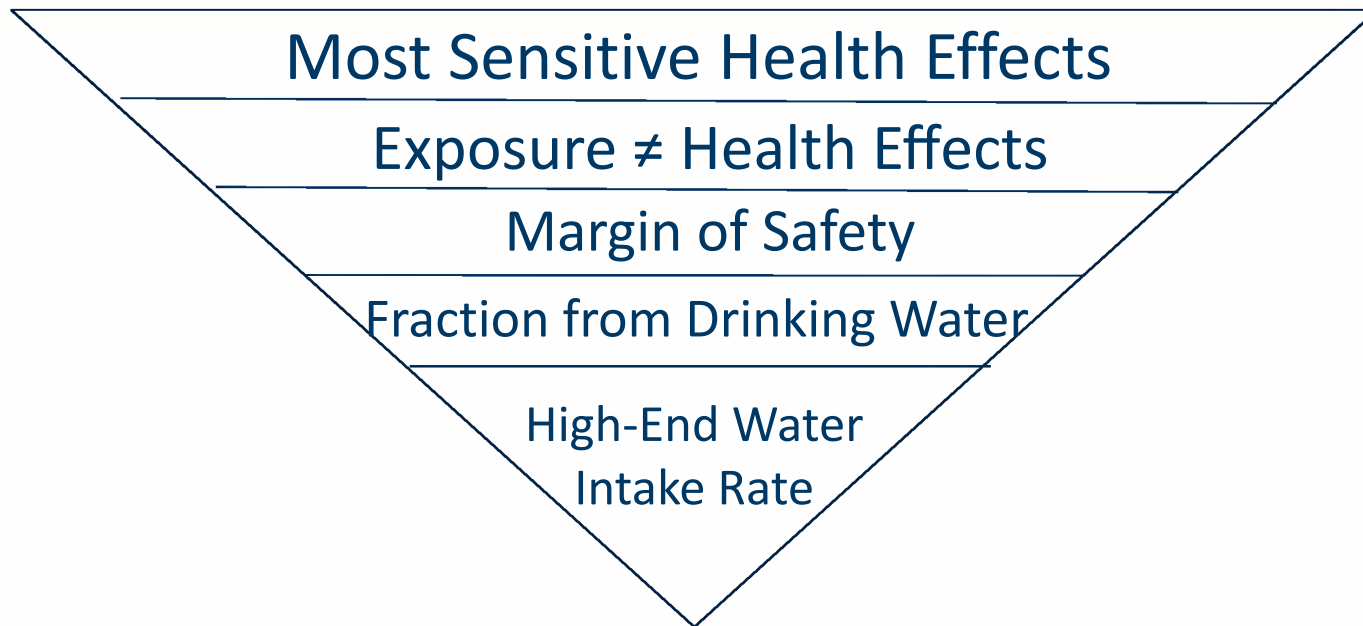
- PFCs do not break down
  - C-F bond strongest covalent bond
  - No hydrolysis, photolysis, or biodegradation
- Do not adsorb readily to aquifer materials
  - Infiltrate rapidly to the groundwater
  - Little or no retardation in aquifers
  - Rates affected by PFC chain length and functional group
- Chemical structure similar to fatty acids
  - “Proteinphiles” - adsorbed into blood serum of living organisms
  - Also controlled by chain length and functional group



# Why are PFCs important?

- Most people have been exposed to PFCs because they are in so many products
- PFCs can accumulate and stay in the human body for long periods of time
- There is some evidence that exposure to PFCs at high levels is associated with negative health outcomes

# MDH Health-Based Values



***Health-Based Value***

# MDH Health-Based Values

PFOS:  
0.027 ppb

PFOA:  
0.035 ppb

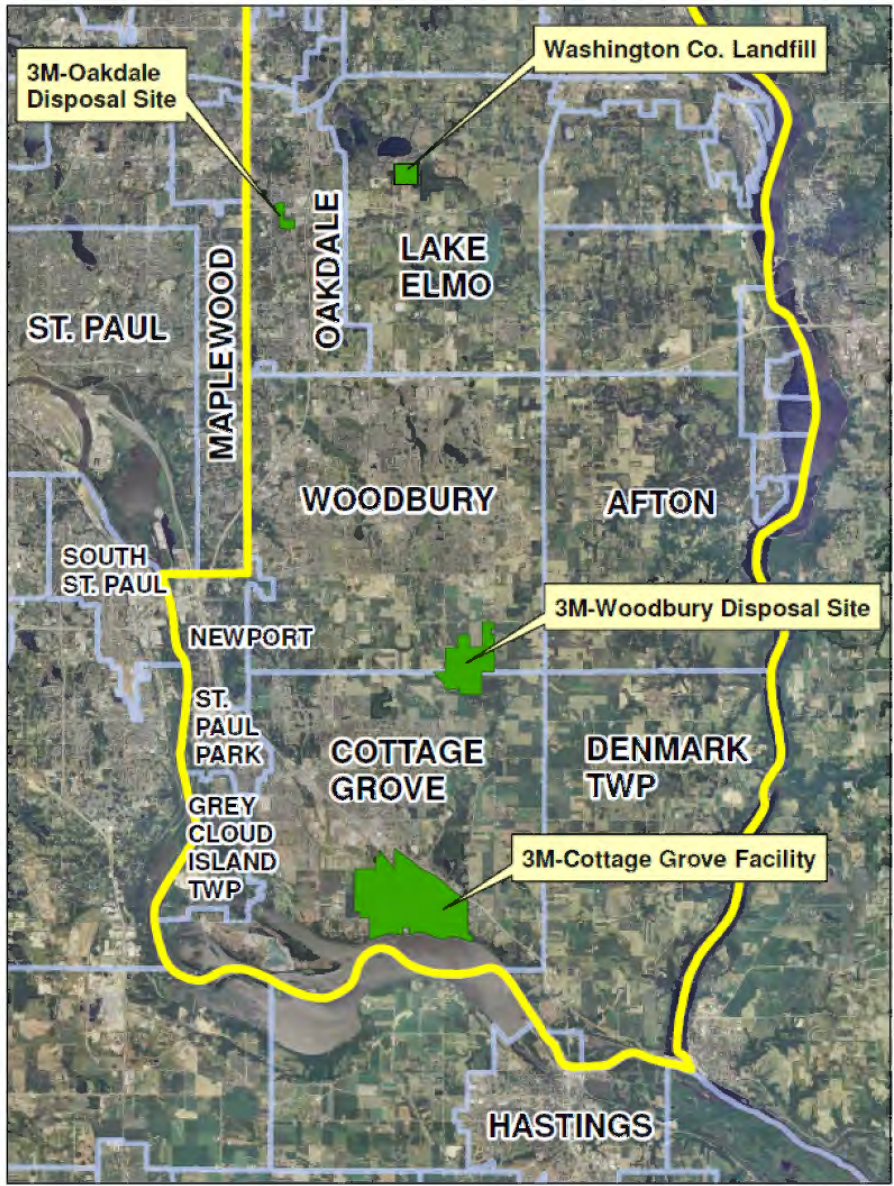
PFBA:  
7.0 ppb

PFBS:  
2.0-3.0 ppb



- MDH evaluates the combined effects of PFCs: Health Risk Index (HRI)
  - Allows us to account for differing levels of toxicity in similar chemicals
- Protective for people who are exposed over their lifetimes
- Protective for fetuses
- Based on animal studies showing slight liver and thyroid effects (adults) and immune system and developmental effects (infants/children)



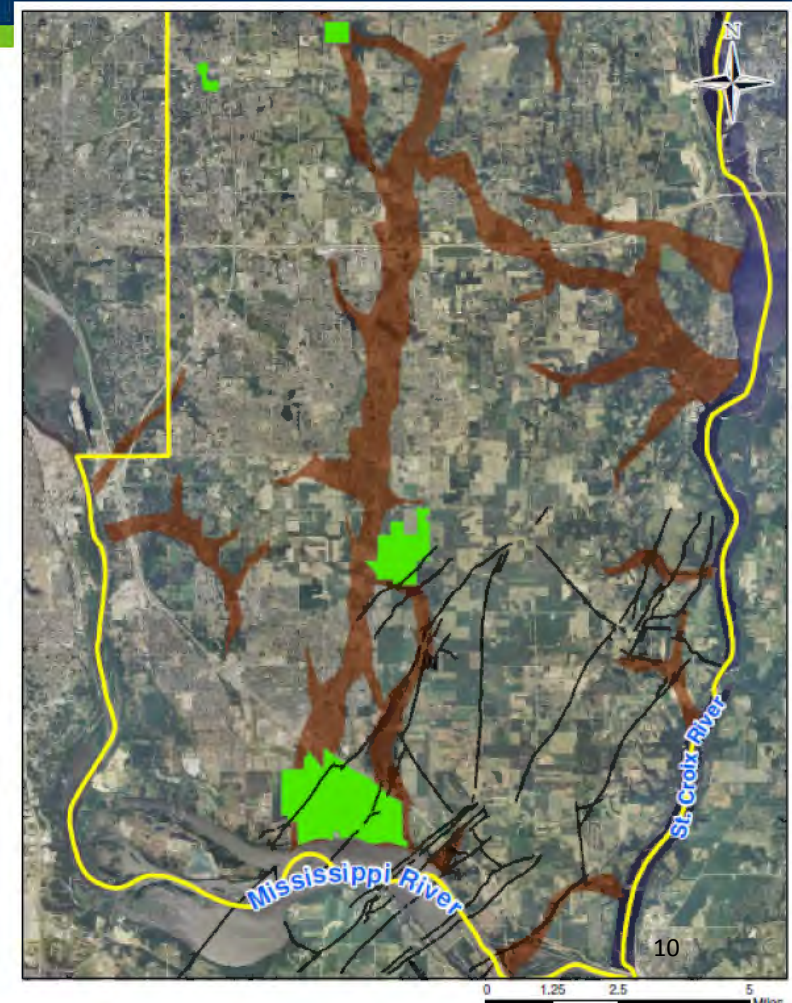


# Location of 3M PFC Sites in Washington Co., Minnesota



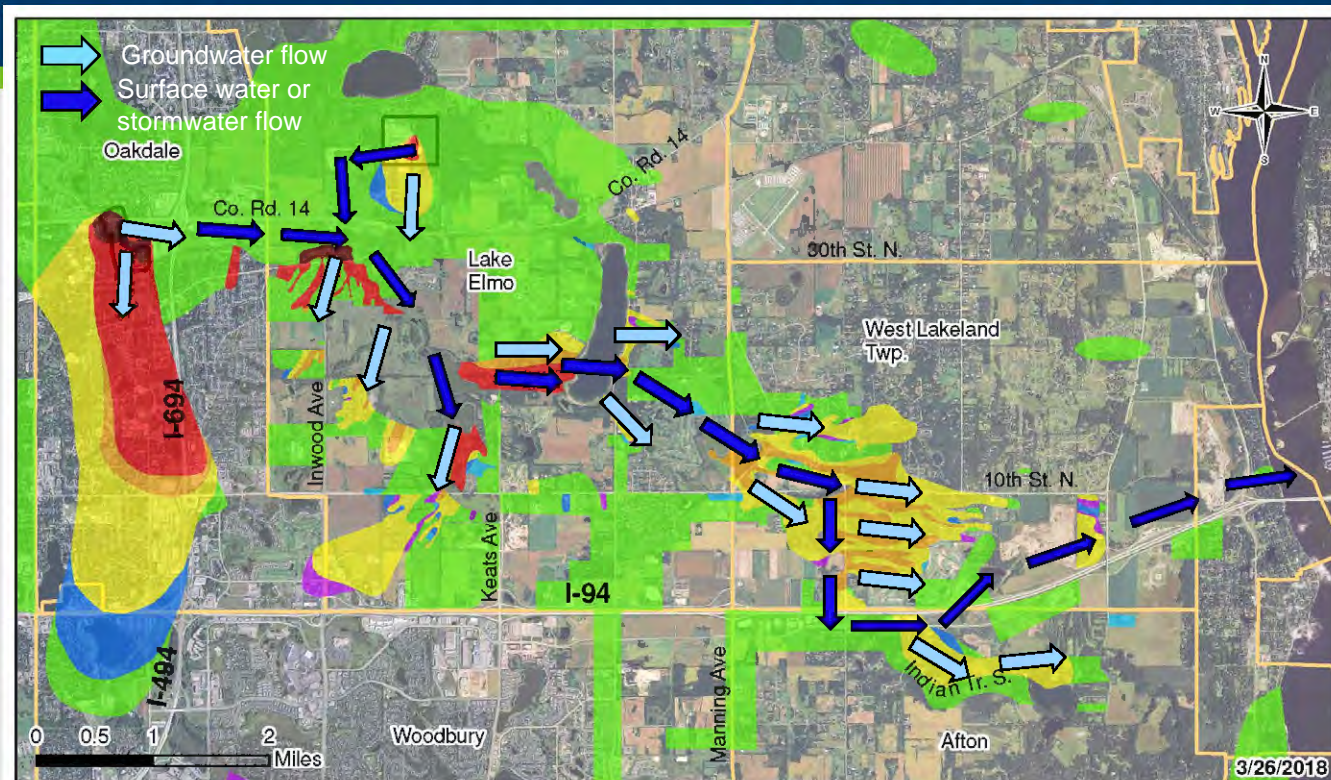
# Groundwater Flow

- In the eastern half of the county, groundwater flows to the St. Croix River
- In the western half of the county, groundwater flows to the Mississippi River
- Locally, groundwater flow may be influenced by pumping wells



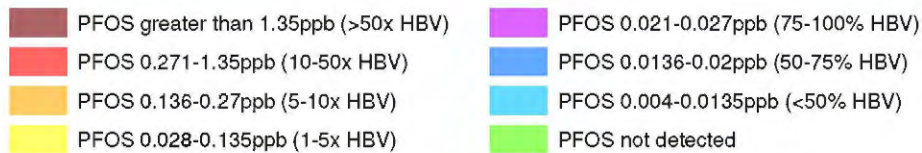


# PFAS in Surface Water – Important Transport Pathway



## PFOS - All Aquifers

Phone: 651-201-4897  
or 1-800-657-3908

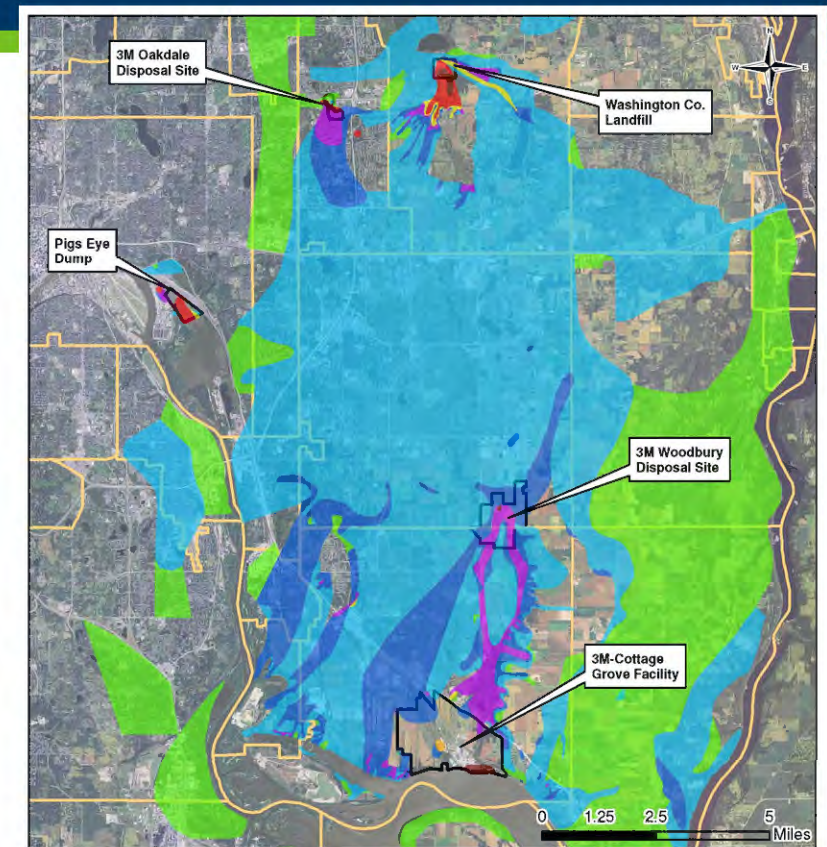


MDH Health Based Value (HBV) for PFOS is 0.027 parts per billion (ppb; or 27 parts per trillion)

NOTES: Map combines data from all aquifers, actual concentrations in any area may vary; blank spaces indicate no sample data

# Result: Extremely Large “Co-Mingled” Plumes

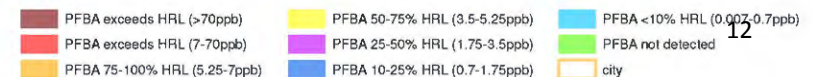
- Over 130 sq. mi.
  - 4 major aquifers
  - 8 municipal systems & >1,800 private wells
  - Much larger than predicted by models
- PFBA most widespread
  - More PFBA in source areas
  - More mobile
- Movement of PFAS affected by several factors



DEPARTMENT OF HEALTH

## PFBA - All Aquifers

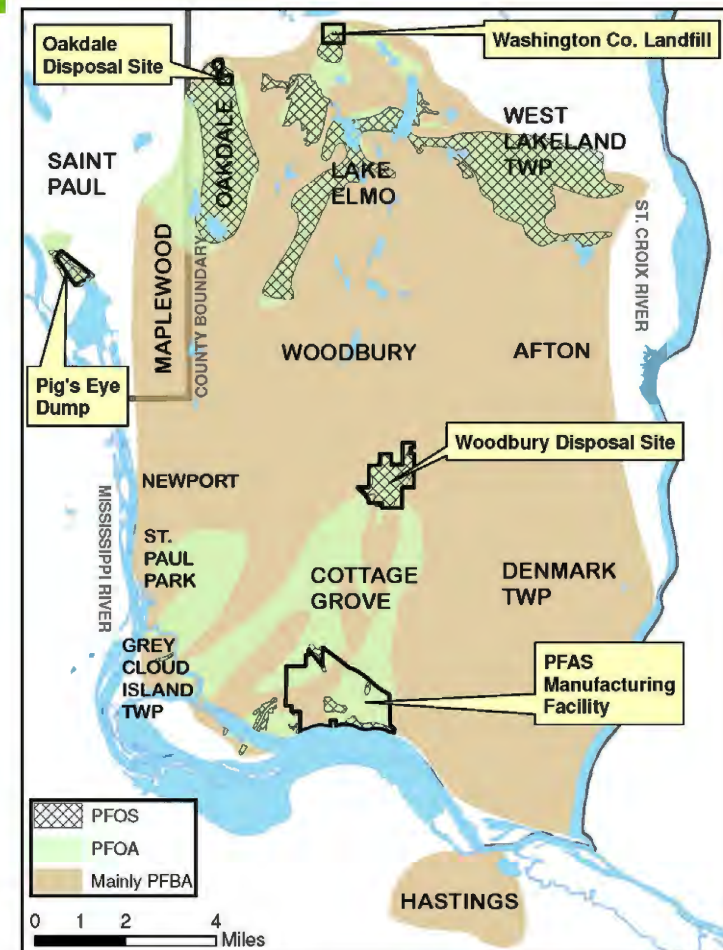
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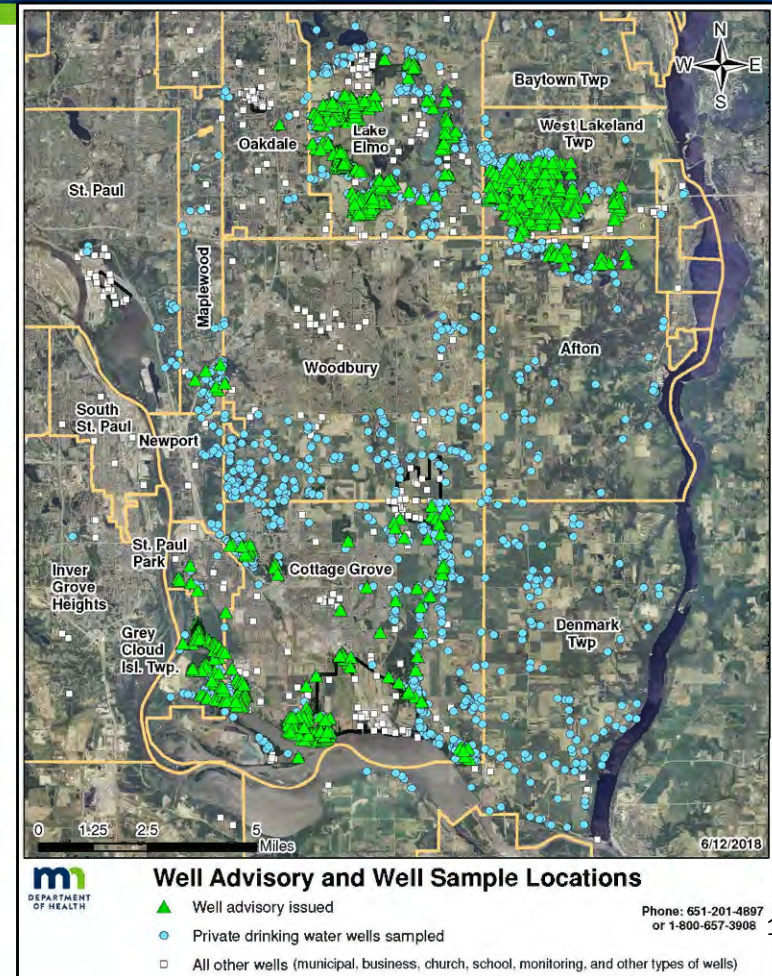
# PFOS and PFOA Less Widespread

- PFOS and PFOA present at high concentrations in source areas
- Groundwater concentrations decrease rapidly with distance from source
- Surface water concentrations
- Different PFAS “signatures” in each site based on chemistry at time of disposal
  - Washington Co. landfill & Woodbury Disposal Sites dominated by PFCAs
  - Helped to identify transport pathways



# Well Sampling Effort & Private Well Drinking Water Advisories

- **~2,500 wells sampled since 2003**
  - **Frequent, intensive monitoring of private wells:**
    - Near source areas
    - Areas with high or changing PFAS concentrations
    - Areas with complex geology
  - **Less frequent monitoring of “sentry” private wells:**
    - Distal portions of plumes
    - Areas with low and stable PFAS concentrations
    - Areas with relatively simple geology
- **>800 drinking water advisories issued**



# Community Water Supply Impacts

- Everything in a drinking water system is interdependent and very complex
  - Trade-offs: choice of technology, design, and operations can have unintended consequences
- Communication must include the public, regulators/regulatees, and elected officials
- Water systems do not have the luxury of waiting; people drink water every day



# Health Risk and Regulation

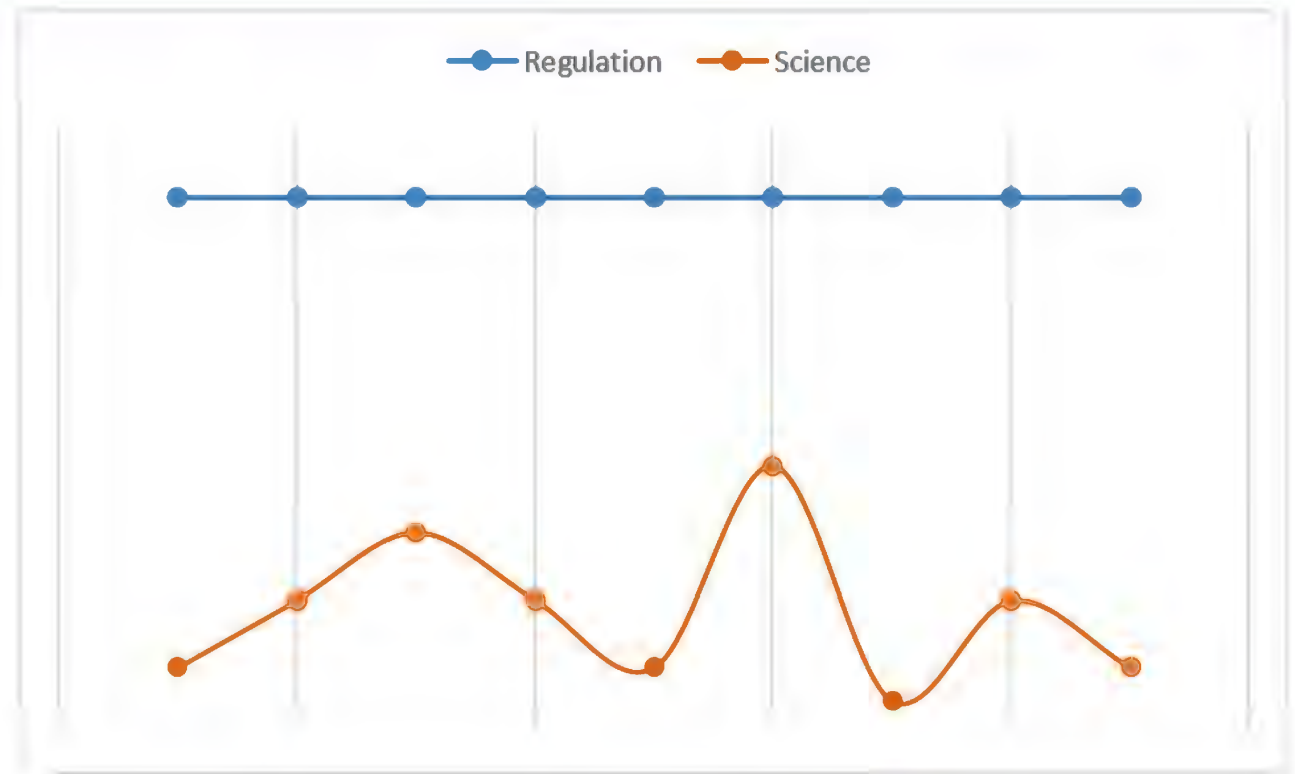
- Health risks are incremental
- Standards are discreet segments
- Public perception varies





# Regulatory Consistency vs. Scientific Discovery

- Implementation of regulations requires consistency
- Science is always learning new facts
- Need space between the two
- Four-quarter average concentration used



# Response Actions – East Metro

- Removal & proper disposal of contaminated soil
- Treatment of groundwater
- Treatment of drinking water where Health-Based Values exceeded



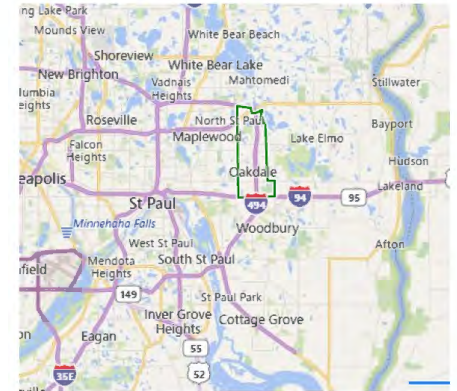
# Parties Involved in Response



Public  
water  
systems

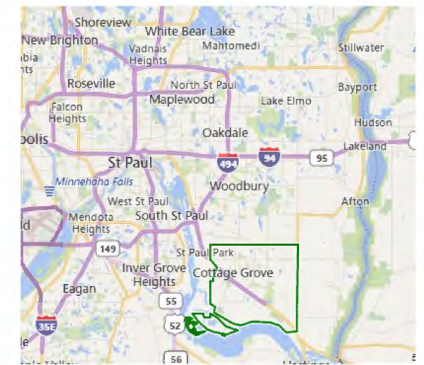
# Oakdale (27,973)

- Has 9 wells; PFAS exceeds MDH health-based guidance value in 7
- PFAS concentrations highest in the state for community systems; peak of 440 ppt PFOA and 610 ppt PFOS
- Treatment (GAC) installed in 2006 for 2 wells; change carbon annually
- Primarily rely on 2 treated wells and 2 “clean” wells for water supply
- Video: <http://bit.ly/2rWs9z5>



# Cottage Grove (36,492)

- Has 12 wells; 8 with PFAS exceeding MDH health-based guidance values
- PFAS concentrations: no PFOS, 66 ppt PFOA
- Impacted when health-based guidance values lowered
- Installed GAC treatment on 2 wells in 2017
- Have a direct blending point for 7 wells that can manage concentrations
- Temporary watering ban in 2017 after receiving health advisory letter from MDH and prior to treatment



# Woodbury (69,245)

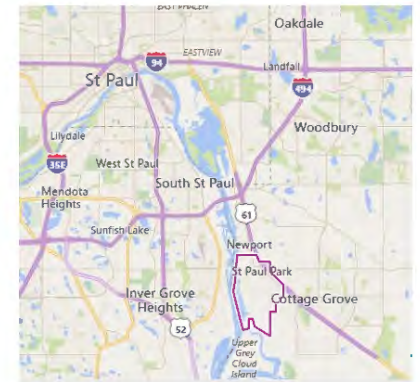
- 19 wells; PFAS exceeds MDH health-based guidance values in 5 wells
- PFAS concentrations
  - PFBA: 0.1-0.41 ppb (all wells)
  - PFHxS: 0.07 ppb (Well 13 only)
  - PFOA: 0.014-0.049 ppb (8 wells)
  - PFOS: 0.023-0.026 ppb (3 wells)
- Primarily rely on wells that meet MDH health-based values for water supply. Others are used only seasonally to meet peak demand.





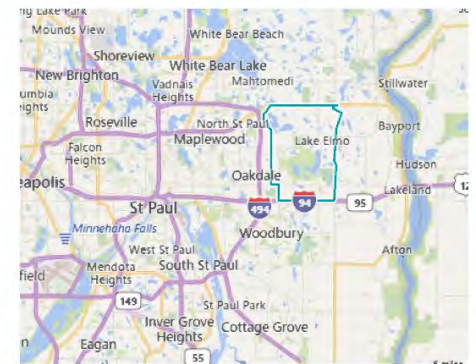
# Saint Paul Park (5,519)

- Has 3 wells, with 2 exceeding MDH health-based guidance values
- PFAS concentrations: no PFOS, 43 ppt PFOA
- Impacted when health-based guidance values lowered
- Want to install treatment on wells
- Managing pumping so clean well is used the most, and enforcing watering restrictions



# Lake Elmo (4,878 / 8,069)

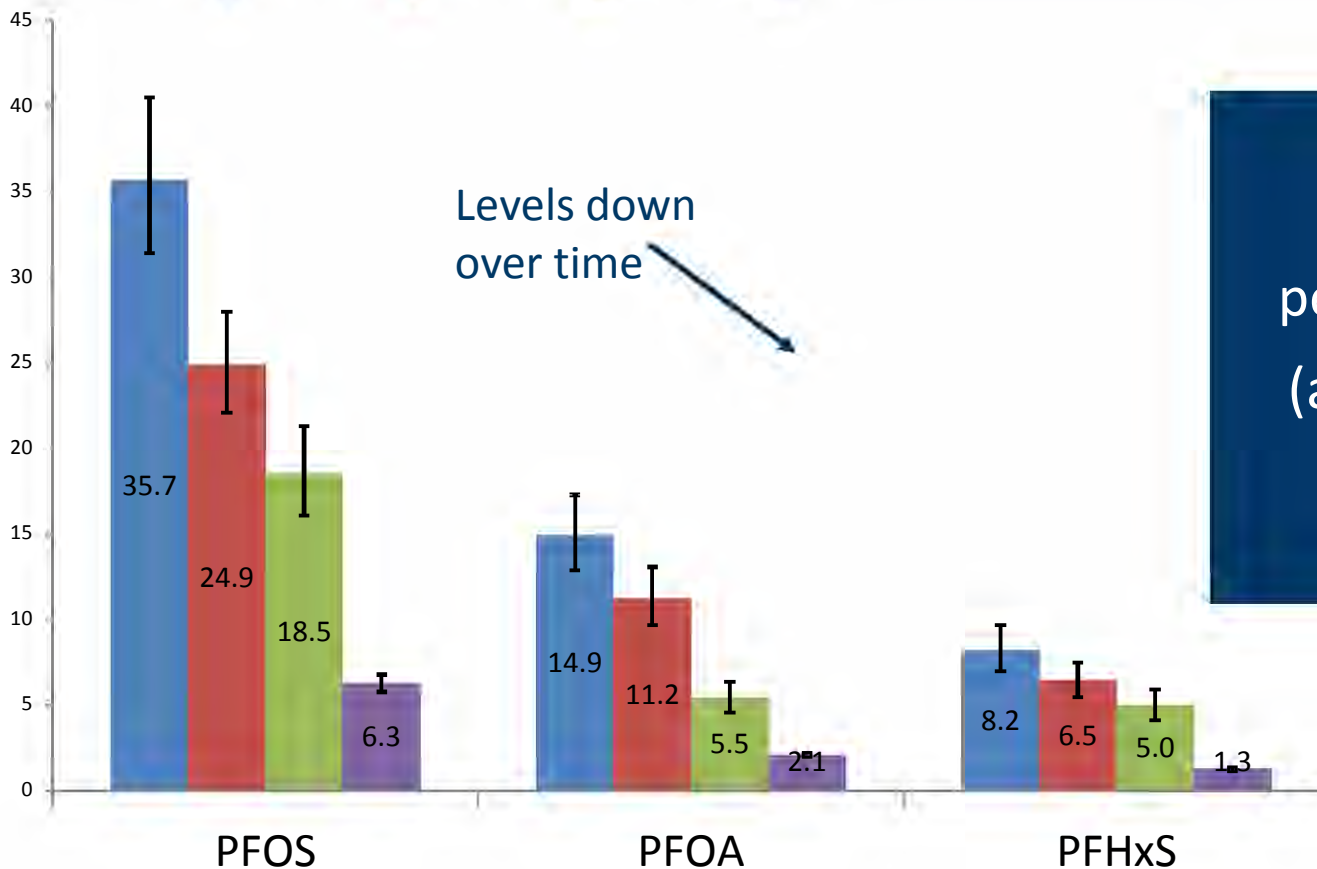
- Has 3 wells with 1 exceeding MDH health-based guidance values
- PFAS concentrations: no PFOS, 46 ppt PFOA
- Impacted when health-based guidance values lowered
- Many private wells in the city
- Options for new well limited by water quantity issues





# Biomonitoring Shows Effectiveness of Response

2008 2010 2014 NHANES 2011-12



PFCs decreased in blood of people drinking treated water (average concentrations still above national averages)

# Future Response Options

- Regional interconnect
- New treatment facilities
- New wells
- Water conservation; limit use of contaminated wells
- Adapted blending scheme
- Others?



## More Information

- **MDH General PFAS Information:**  
<http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html>
- **ITRC Factsheets:** <https://pfas-1.itrcweb.org>
- **US EPA information:** <https://www.epa.gov/pfas>
- **MDH Health Risk Limits:**  
<http://www.health.state.mn.us/divs/eh/risk/guidance/gw/table.html>
- **MPCA PFC Investigations:**  
<https://www.pca.state.mn.us/waste/perfluorochemicals-pfcs>

# Questions?

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