The Intersection of Water-Health Policy: State Action Addressing PFAS Contamination of Drinking Water

Speakers:

- James Kelly, Section Manager, Environmental Health Division Minnesota Department of Health

- Catherine Neuschler, Manager, Water Assessment Section, Minnesota Pollution Control Agency

Moderator:

- Sarah Grace Longsworth, PFAS Project Manager, Environmental Council of the States

DEPARTMENT OF HEALTH

Minnesota's Experience with PFAS

James Kelly, M.S.

NGA Water Policy Institute

PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS

Outline

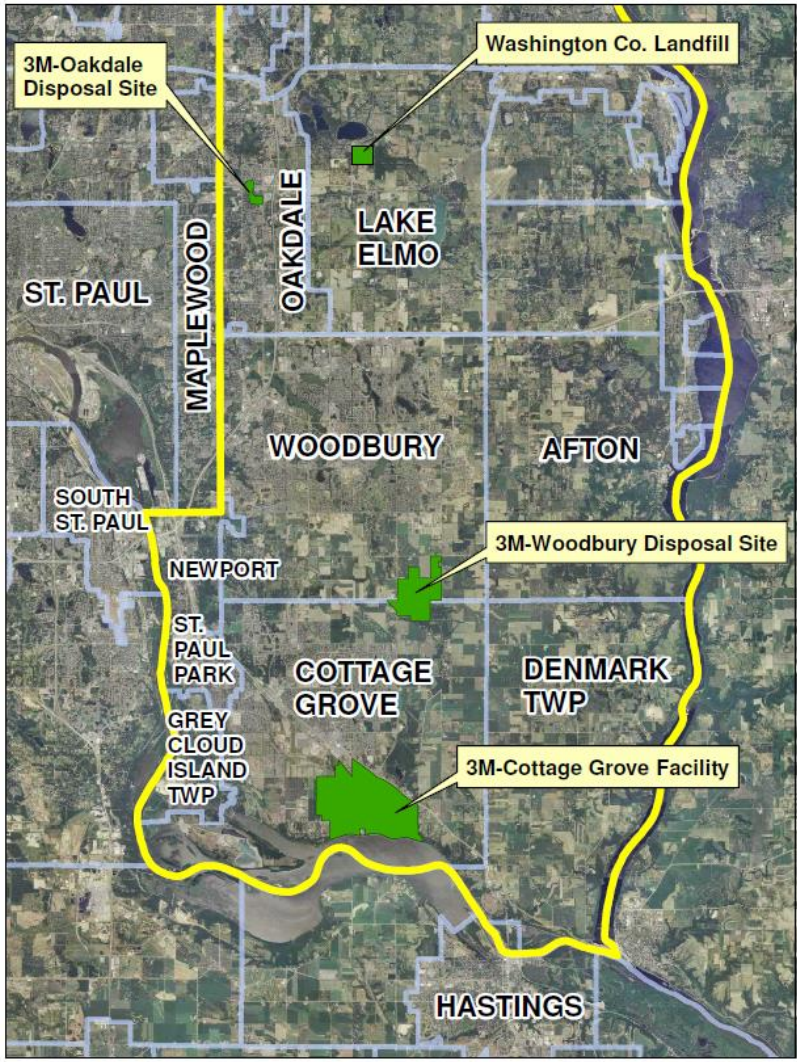
- Why & when were PFAS found in Minnesota?
- Overview of initial response activities
- Water Guidance Derivation Evolution
- Communication challenges
- Lessons learned
- On-going activities

Minnesota Pollution Control Agency (MPCA)
Minnesota Department of Health (MDH)

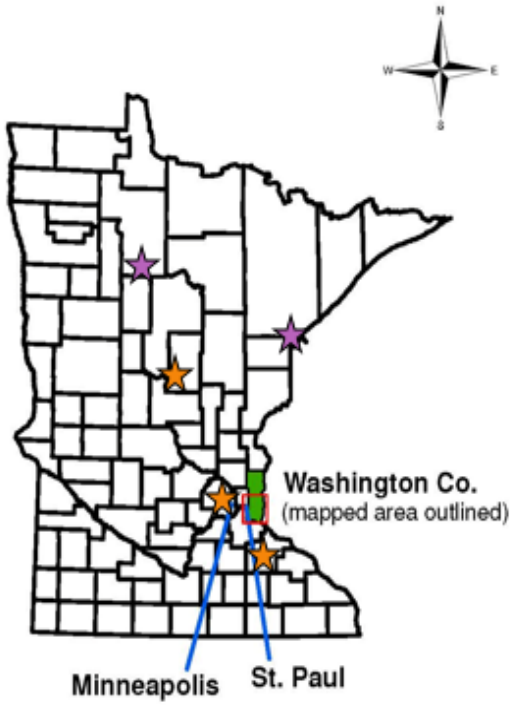
Why Minnesota?

- 3M has a large chemical plant on the banks of the Mississippi River in Cottage Grove, Minnesota. PFAS were manufactured at the plant since the 1940's
- PFAS production wastes and wastewater treatment sludge disposed of on and off site - primary disposal sites located in Washington County, MN
- 2000 - 3M notifies MPCA of PFAS contamination in groundwater at facility.
- 2001/2002 – initiate investigation at areas of interest on the 865 acre site and the adjacent Mississippi River
- 2003 – MPCA and MDH request additional information on and investigation of waste disposal. MDH PHL develops PFOA/PFOS method

Why Minnesota?



Location of Legacy PFAS Sites in Washington Co., Minnesota



- 2002 – request for PFOS & PFOA guidance
- 2003 - extensive testing of public and private water supplies in Washington County
- 2004 - PFOA and PFOS detected in Oakdale municipal wells

Initial Response Activities

- Multidisciplinary Expertise Needed
  - Risk assessment: Toxicology, Epidemiology & Exposure Science
  - Chemistry
  - Engineering
  - Hydrogeology
  - Communication
- Think outside the box – these chemicals are unlike any other water contaminant
- Blew up silos - changed the nature of interacts between programs, agencies and jurisdictions (e.g., local units of government)

Initial Response Activities

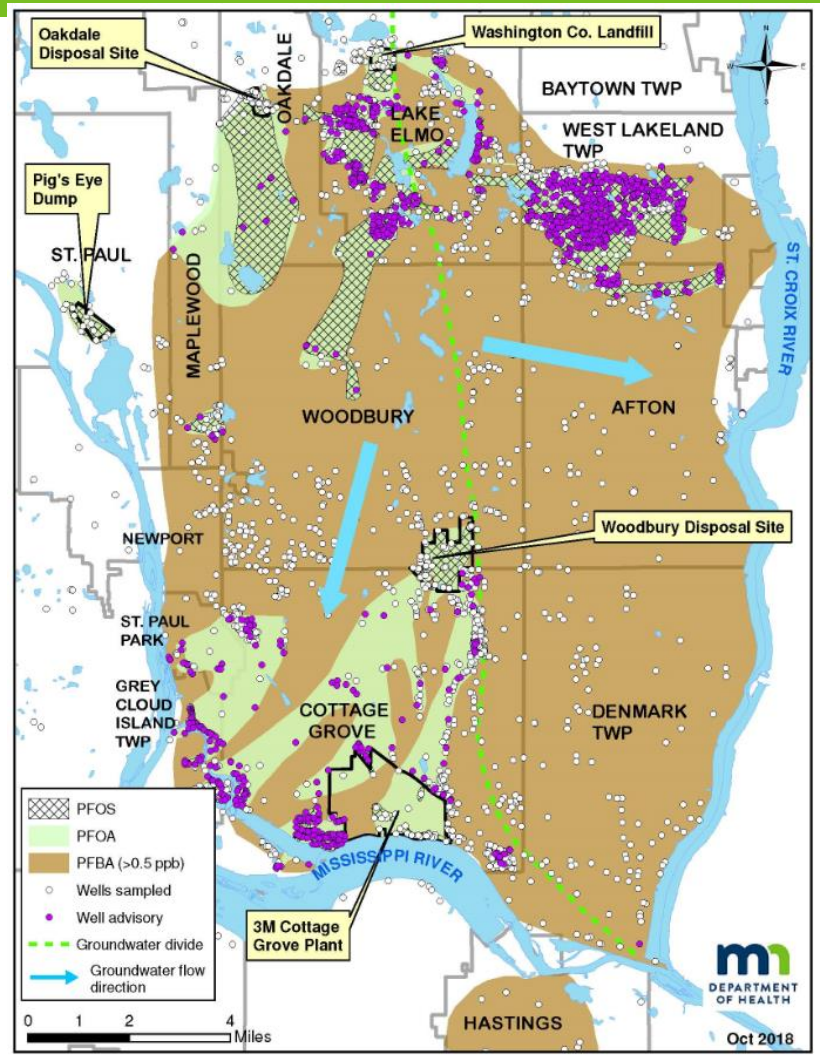
Focused on the extent and magnitude of the problem as well as to address community concerns – PFOA and PFOS only

- Source investigations and plume delineation (by sampling *many* public and private wells)
- Guidance development
- Water filtration study
- Garden produce study
- Biomonitoring study*
- Health outcome reports (e.g. cancer incidence)
- 'Ambient' environmental survey – landfills, WWTP effluent & sludge, fish, sediments, groundwater, surface water, etc.
- Modeling/monitoring of past/current PFAS air emissions from 3M plant

Then Everything Changed…

2006 – a perfect storm!

- Expanded list (PFBA, PFPeA, PFHxA, PFBS, & PFHxS)
- Lower detection limits
- Lowering guidance value
- Area of impact greatly expanded (mainly due to **PFBA**)
- Area of impact was >> models predicted



Setting MDH Health-Based Values for Water

Most Sensitive (subtle) Health Effects in Animals

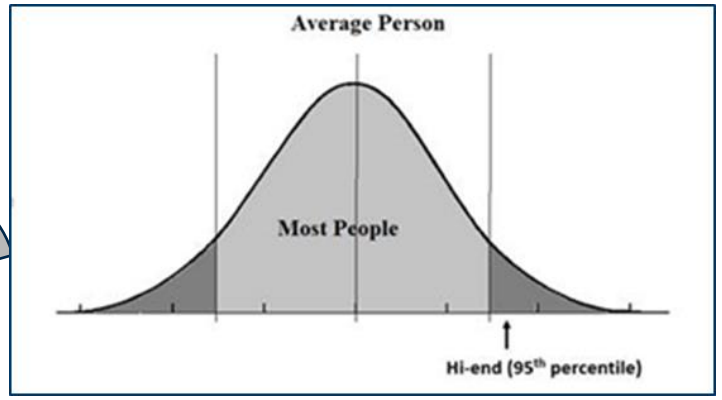
Identify Exposure Level ≠ Health Effects

Add Margins of Safety (100 to 300-fold)

Reference Exposure Level

% allowed to come from drinking water

High-End Water Intake Rate



Health-Based Value for Lifetime Exposure

Additional Exposure Concerns

Impact of Bioaccumulation Potential

- Long half-life results in exposures, even short duration, to stay in body for years beyond period of external exposure
- Repeated exposures lead to accumulation (build-up) within the body
- Water concentrations in ppt result in serum concentrations in ppb
- Accumulated levels can be transferred to offspring

Placental transfer and Breastmilk transfer

- Much higher fluid intake rates in infants & young children

How PFAS Water Guidance has Changed

MDH health-based guidance values evolve over time as additional research becomes available

Surrogate values used when widespread detection of chemical in drinking water, but insufficient toxicological data to set an HBV

Health Risk Index (HI): allows MDH to evaluate mixtures of similar chemicals

- Similar to TEQ approach
- If HI > 1, considered an exceedance

	PFOA µg/L	PFOS µg/L	PFHxS µg/L
2002	7	1	
2006	1	0.6	
2007	0.5	0.3	
2008	0.3		0.3
2009			
2016	0.07 (EPA)	0.07 (EPA)	0.07
2017	0.035	0.027	0.027
2019		0.015	0.047

Blue = Interim; Orange = Surrogate

$$HI = \frac{PFOA_{[conc]}}{0.035} + \frac{PFOS_{[conc]}}{0.015} + \frac{PFBA_{[conc]}}{7} + \frac{PFBS_{[conc]}}{2} + \frac{PFHxS_{[conc]}}{0.047}$$

MDH Guidance Summary

Based on protection of susceptible & highly exposed populations

Protective for tap water used for drinking, cooking, showering, and other uses

Cumulative – additivity assessment of chemicals with similar health endpoints

One of only a few states with guidance for multiple PFAS, multiple durations, and cumulative impact/additivity evaluation

Breastfeeding can be a significant exposure pathway for PFHxS, PFOS, and PFOA.

However, breastfeeding is important for the short and long term health of both a mother and infant.

MDH recommends that women currently breastfeeding, and pregnant women who plan to breastfeed, continue to do so.

PFAS: A Classic Emerging Contaminant Challenge

Widely present in the environment

Detected in drinking water and biota; other media

Evolving understanding of fate & transport

New pathways and affected areas create sense the problem is "getting worse"

Evolving analytical capabilities

Expanding analyte lists and lower detection limits = "more detections" and sense the problem is "getting worse"

Evolving understanding of sources

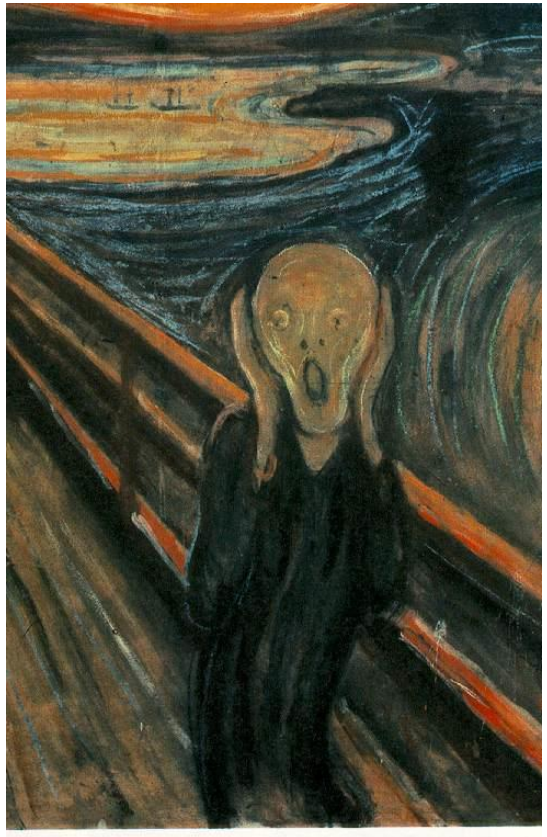
Primary production, industrial & consumer usage, waste disposal, etc.

Limited remedial technology options

Evolving risk assessment

Changing/differing guidance values = public confusion and sense the problem is "getting worse"

Risk Communication



Lessons Learned

- More science does not provide more reassurance
- Need to start where people are – acknowledge their understanding, concerns, etc. first (‘earn’ your right to be heard)
- Gradually move toward your message
  - Anticipate change (new scientific developments may be perceived as past errors)
  - Acknowledge uncertainty (discuss scientific method and active area of research)
  - As new knowledge becomes available we will let you know
- Coordinate across all levels of stakeholders
- Multiple methods of communication

(web, email, water sampling efforts, media, city council meetings & newsletters, etc.)

  - Public meetings : reps from multiple agencies present and format change
    (open house then presentations followed by more open house to maximize face-to-face interaction)

Ongoing Activities

- East Metro ‘mega plume’
  - >150 sq. miles
  - 4 major aquifers
  - 8 municipal systems impacted (140,000+ users)
  - Thousands of private wells (>3,000 sampled & >1,100+ advisories)
  - Several lakes and streams (some with fish advisories); foam found
- Monitoring and mitigation of public systems and private wells continues
- Tracking the science (toxicity/epi, analytical methods, treatment, sources, etc.)
- PFAS Source Inventory using NAICS to identify potential sources as well as evaluating biosolid application sites & compost sites
- Minnesota 3M PFAS Lawsuit Settlement (to be used to restore natural resources in the East Metro)

Acknowledgements

- MDH – Site Assessment, Health Risk Assessment, Drinking Water Protection, and Well Management programs
- MPCA – Superfund, Closed Landfill, Environmental Outcomes, Solid Waste, Air Quality, and Surface Water programs
- Washington and Dakota Counties
- Oakdale, Lake Elmo, Woodbury, Cottage Grove, St. Paul Park, Newport, Hastings, South St. Paul, Afton, and Denmark Township
- Agency for Toxic Substances and Disease Registry
- US EPA

Thank you.

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Slide acknowledgements: Helen Goeden, Ginny Yingling

https://www.health.state.mn.us/communities/environment/hazardous/topics/pfcs.html

https://www.pca.state.mn.us/waste/perfluorochemicals-pfcs

Protecting Human Health from PFAS in Minnesota

Presented by: Catherine Neuschler

Slides by: Bruce Monson, Cathy O'Dell, Angela Preimesberger, Summer Streets, and Pat McCann (MDH)

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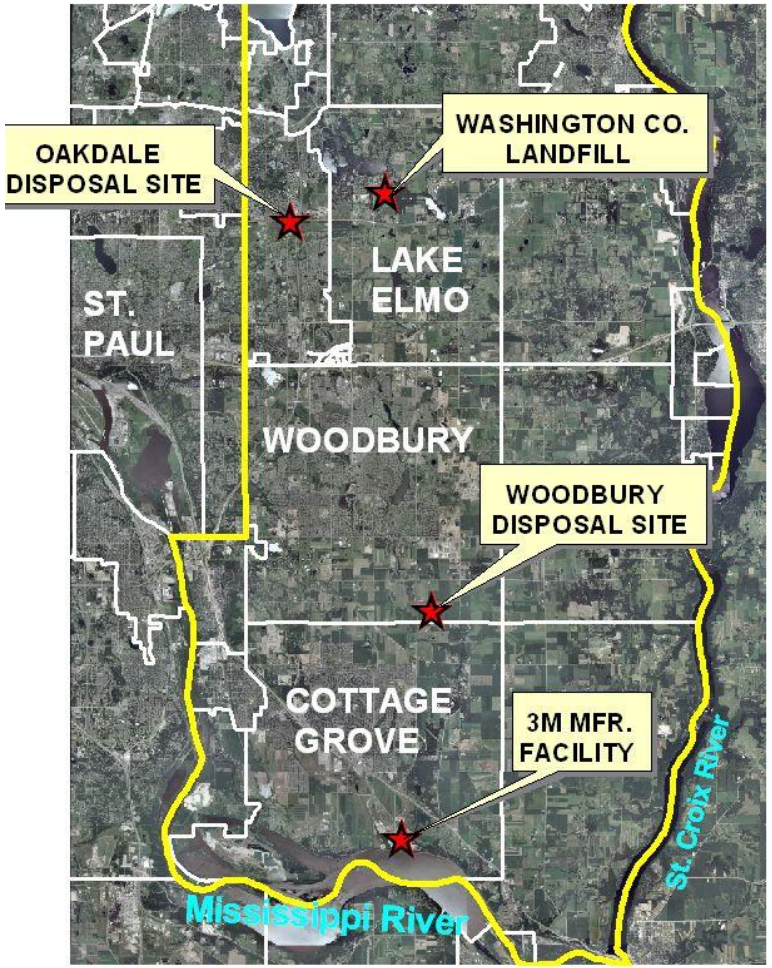
December 3, 2019

PFAS in the Twin Cities – East Metro Area



LOCATION OF 3M SITES IN WASHINGTON CO. MINNESOTA

- PFOA/PFOS reported in 3M production wells in 2002
- Investigation of groundwater, nearby disposal areas, drinking water
- Consent order negotiated with 3M in May 2007 provided funds to MPCA/MDH for investigation
  - Led to lots of information gathering

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Responding to PFAS in Drinking Water

Using MDH Guidance Values

- MPCA uses MDH developed HRL and HBV guidance values in our remediation programs
- HRLs and HBVs are used as benchmark and cleanup values
  - To protect human health from pollutants in groundwater/drinking water
    - (In Minnesota, all groundwater is to be protected as a source of drinking water)
  - (Water quality standards are also used for surface waters and ecological risk)
  - Water is sampled; MDH does analysis and issues drinking water well advisories for those that exceed the health index

East Metro Area Sampling Priorities

- Higher Priority:
  - Wells in or down-gradient of the PFOS and PFOA plumes that have not been sampled previously
  - Wells near the PFOS and PFOA plumes (to define edges)
  - Re-sample wells with Health Risk Index > 0.75
- Medium Priority:
  - Resample wells with Health Risk Index (HI) > 0.5
  - Resample wells with PFOS and/or PFOA detections
- Lower Priority:
  - Testing filtered water (on request)
  - Sample wells in lower priority areas (on request)

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Well Advisory Response Actions

- MPCA provides response action for wells that receive a drinking water well advisory
  - City wells
    - GAC filers, flow control (blending), new well
  - Residential wells
    - Bottled water (interim)
    - GAC filter system (whole-house) or connection to city water

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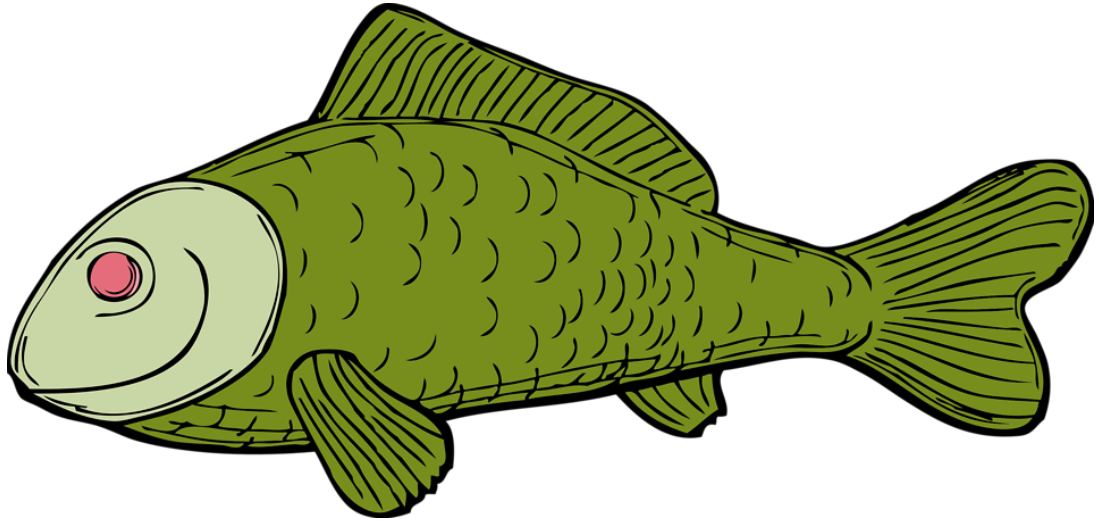
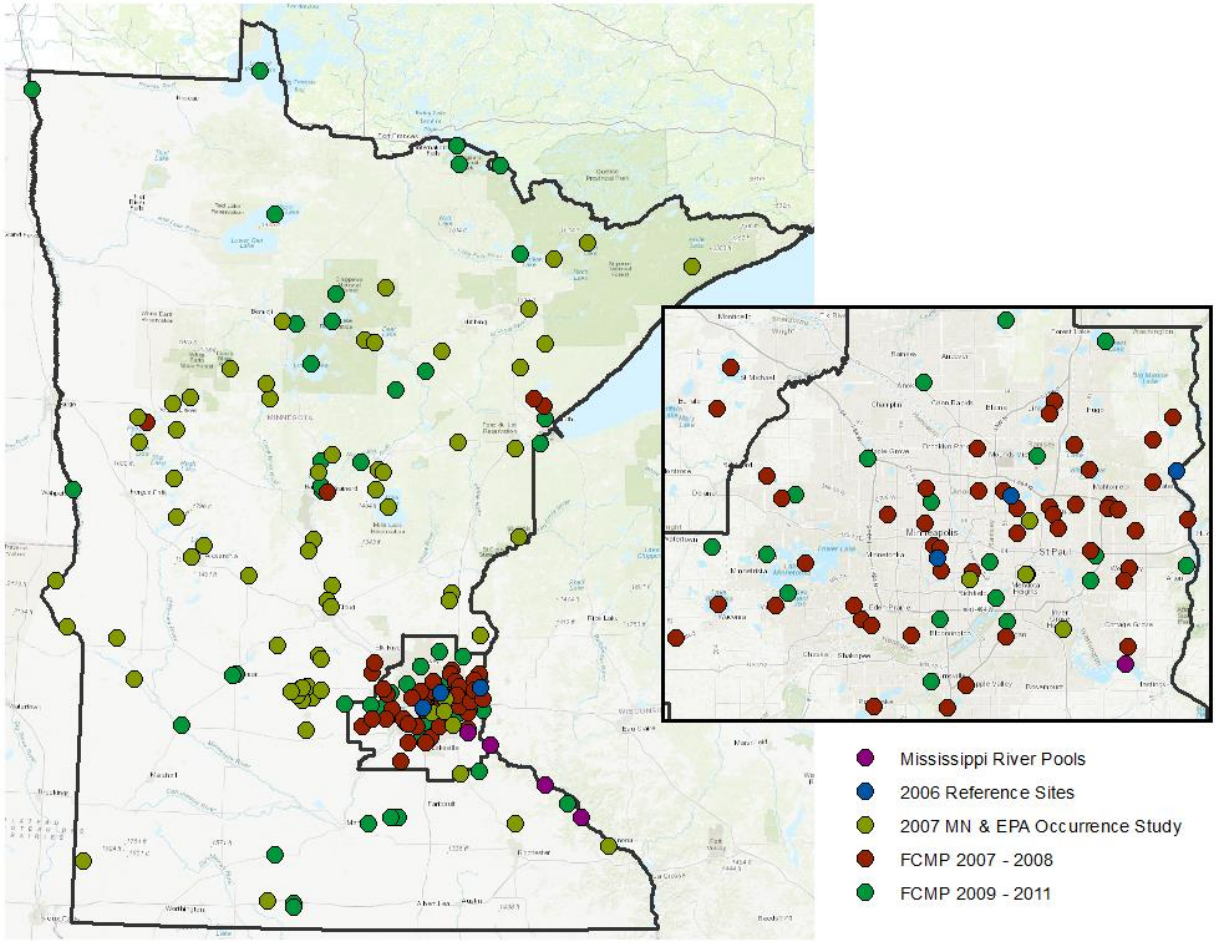


Responding to PFAS in Fish Tissue

“First Round” of Fish Tissue Data: 2004 - 2012

- Earliest collections in Miss. River Pool 2 where 3M Cottage Grove Plant discharges wastewater
- EPA RTP analyzed samples throughout the state in 2007
- Some targeted sampling sites (AFFF, WWTP effluent, plating)
- By 2012, data from 155 lakes + 8 rivers



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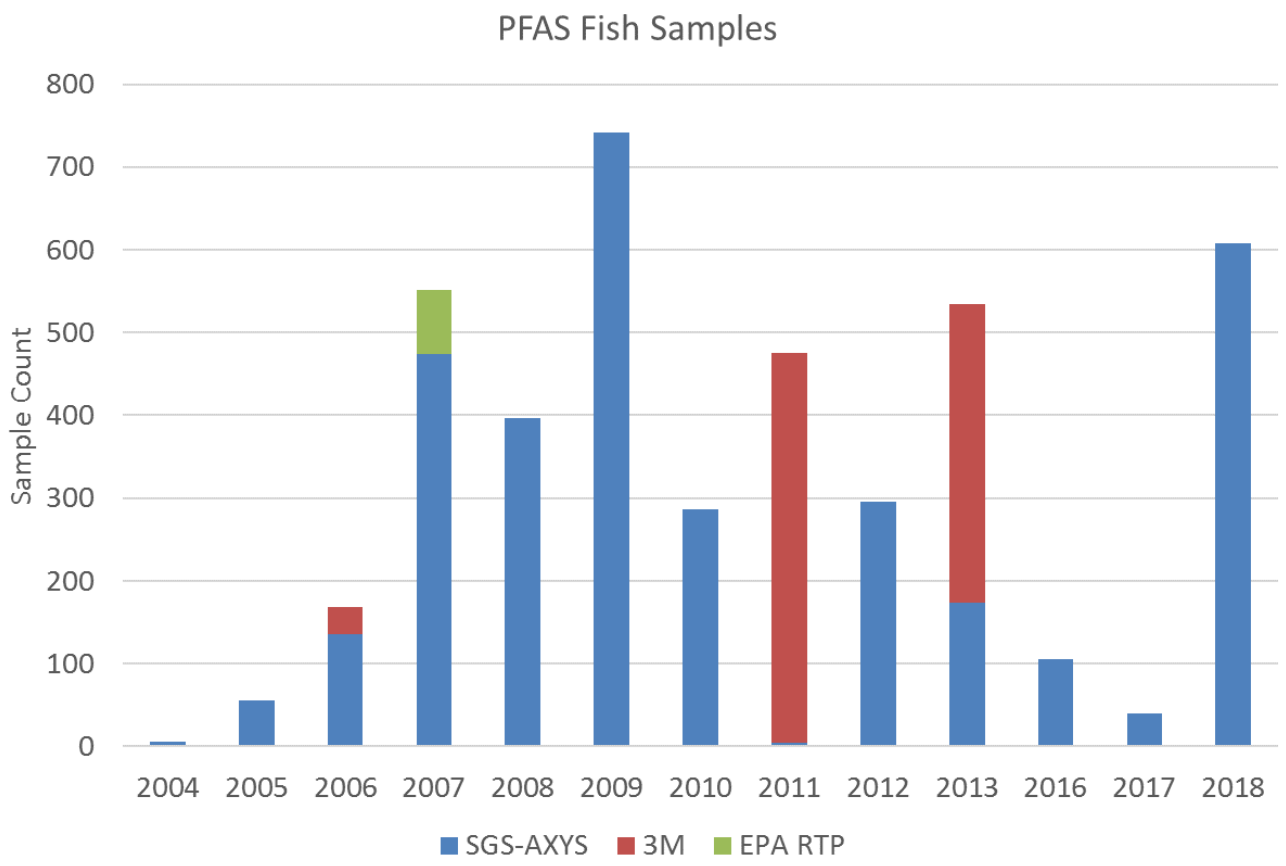
Total Data Collection



- Data has been collected by various parties – state, EPA, 3M
- Most of the state data, until last year, was from 2004 - 2012

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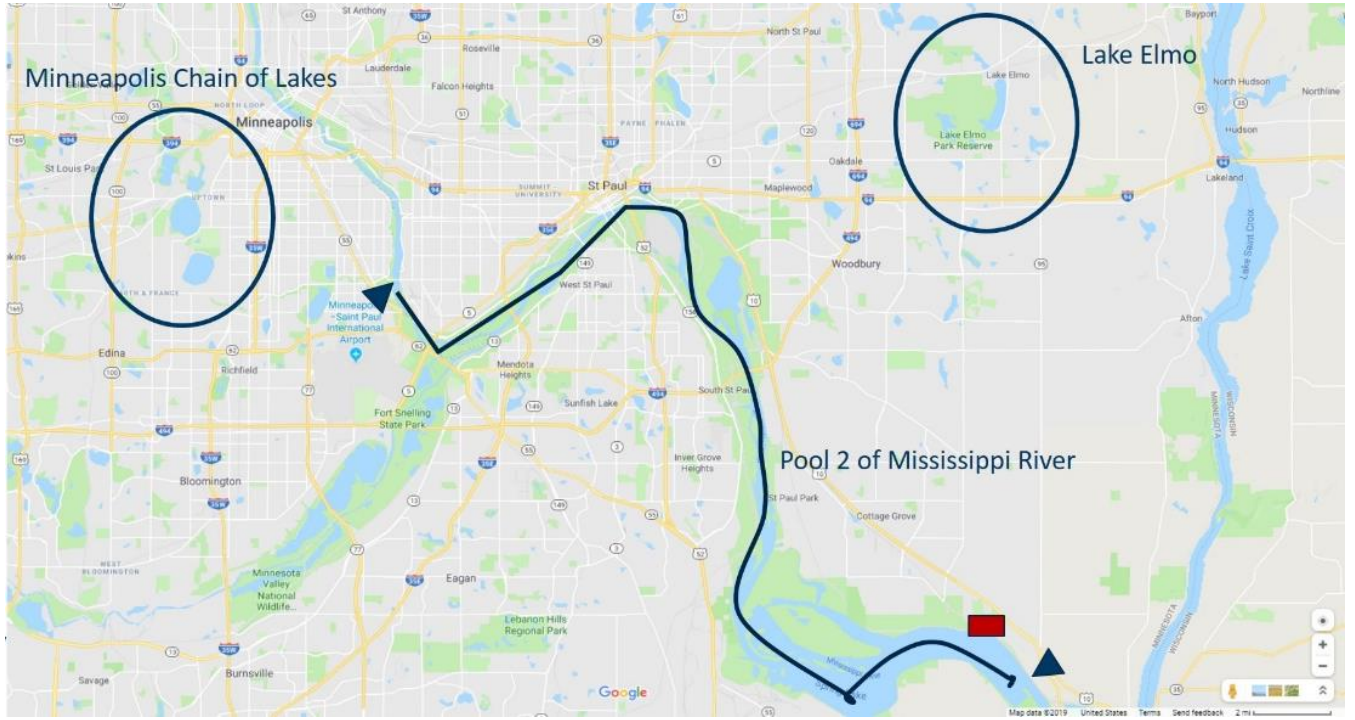
Early Site Specific Criteria and Impairments

- We had waterbody impairments based on MDH fish consumption advice
  - 1 meal/month or less frequent
- We had set site-specific criteria for human health for two waterbodies
  - Bde Maka Ska (Lake Calhoun)
  - Mississippi R. Pool 2



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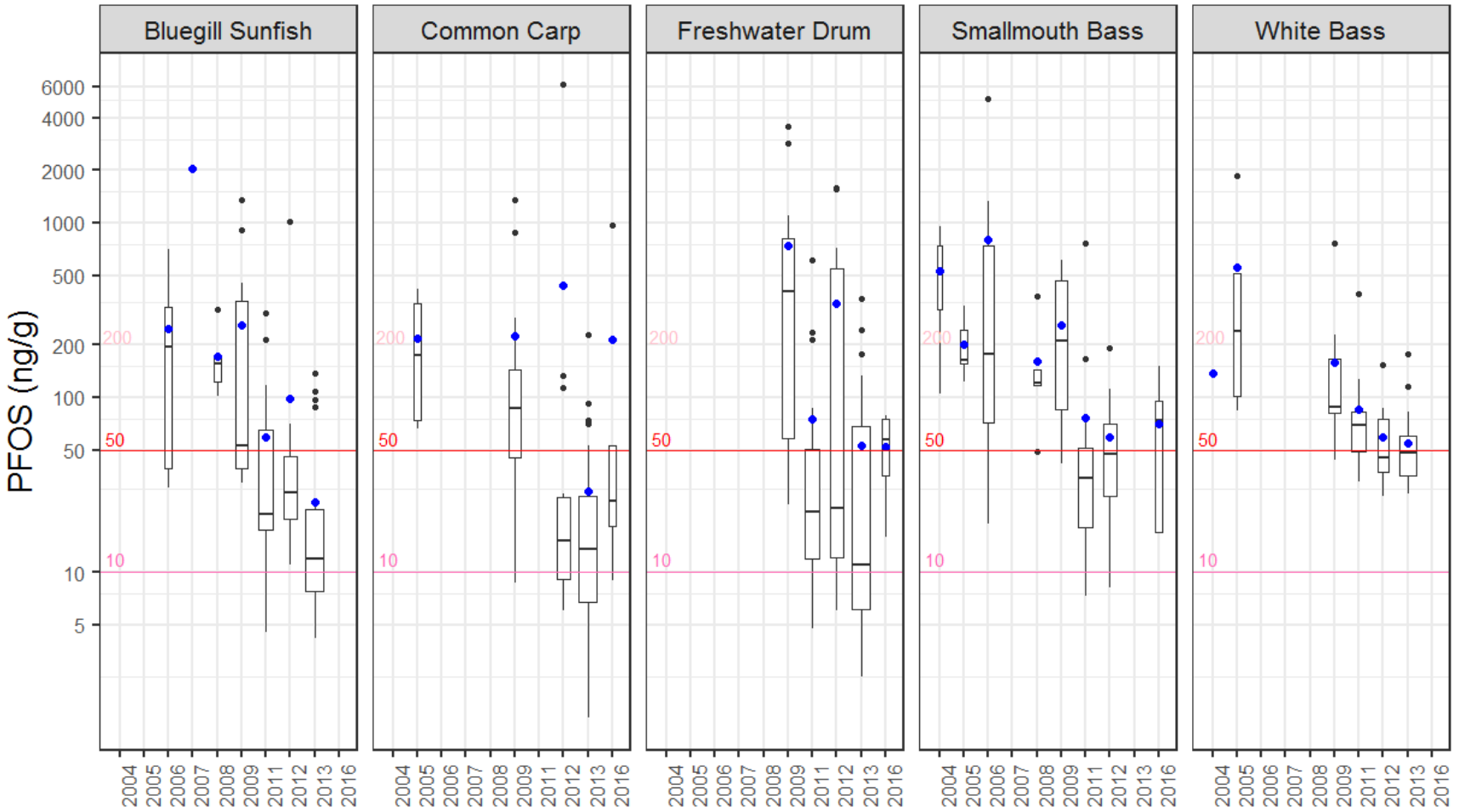
Fish Tissue PFOS Concentrations: Mississippi River Pool 2



- Blue dot: annual mean PFOS concentration
- Fish consumption advice
  - 10 ng/g - unrestricted
  - 50 ng/g – 1 meal/month
  - 200 ng/g – do not eat
- Extensive studies:
  - MPCA 2009 & 2012
  - 3M 2011 & 2013

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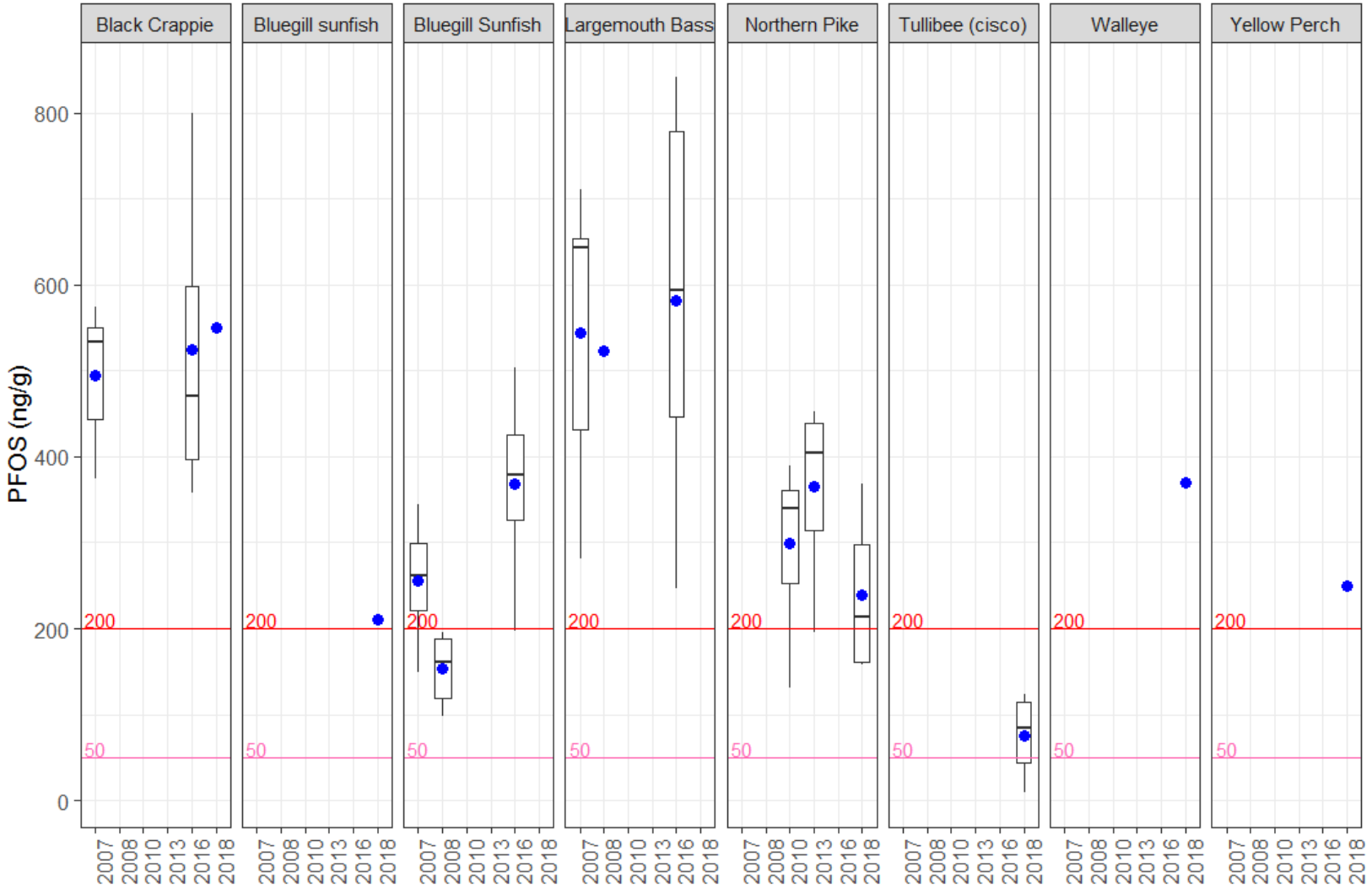
Fish Tissue PFOS Concentrations: Lake Elmo



- Fish consumption advice
  - 10 ng/g - unrestricted
  - 50 ng/g – 1 meal/month
  - 200 ng/g – do not eat
- Spring 2018, MDH issued the first and only “Do not eat” advice for any lake for general population
- Blue dot: annual mean PFOS concentration

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PFAS Science and Data Changes

- By the late 2010s, the science was clearly evolving to show that PFAS was harmful at lower concentrations that previously thought
  - RfD – the amount that could be consumed without harm – was decreasing
  - MDH fish consumption advice changed
  - MDH drinking water guidance values changed
- Our data was aging

	PFOA	PFOS	PFBA	PFBS	PFHxS
2002	7	1			
2006	1	0.6	1		
2007	0.5	0.3	7		
2009	0.3	0.3	7	7	
2013	0.3	0.3	7	7	0.3
2016	0.07	0.07	7	7	0.07
2017	0.035	0.027	7	2	0.027
2018	0.035	0.027	7	2	0.027
2019	0.035	0.015	7	2	0.047

All values in micrograms per liter (parts per billion)
Blue = HRL; Red = HBV; Green = Surrogate

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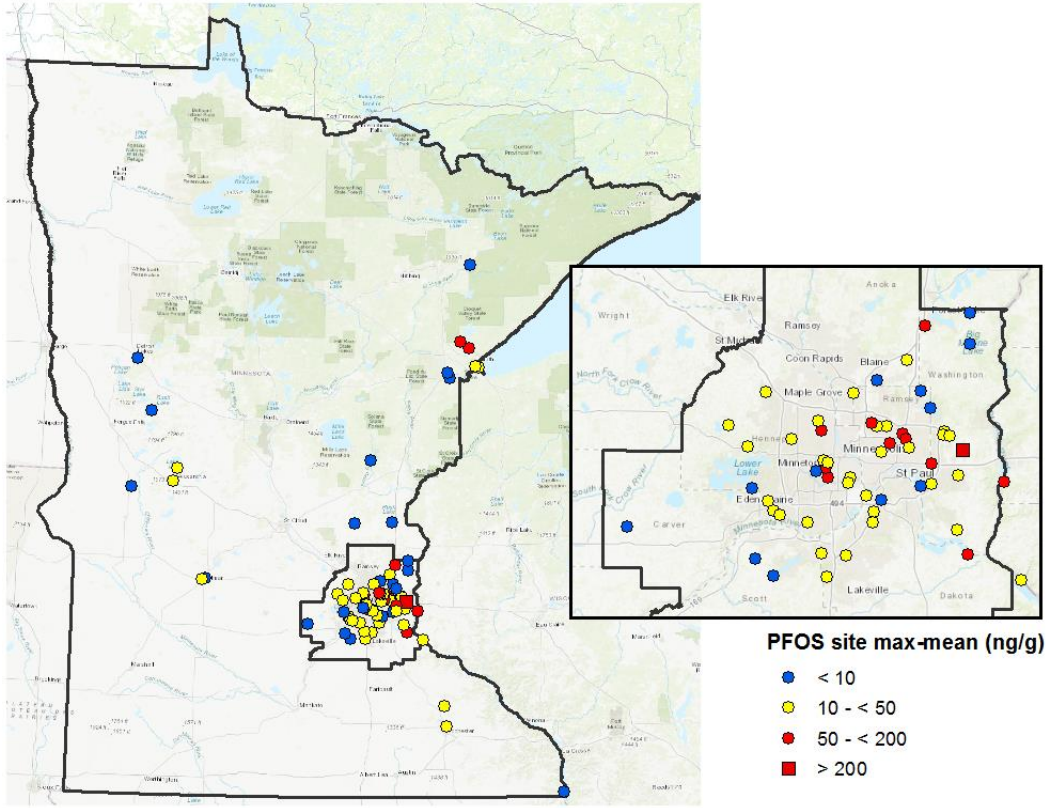
Regulatory and Programmatic Changes

- Revised human health methods water quality standards (2015)
  - Methods allow both fish tissue and water column criteria for bioaccumulative pollutants
  - No longer link impairment to fish consumption advice
  - Protect susceptible and highly exposed populations
- Settled lawsuit with 3M – increased focus on East Metro area
  - Requests for additional site-specific criteria to set water column values
    - These values can be used as clean-up values for surface waters that are not drinking waters

Gathering Data: 2018 Survey of PFAS in Fish and Water

- Targeted at
  - All waters that currently have PFOS based one meal/week advice and old data
  - Untested metro waters important for harvest
- Collected paired fish and water samples at 70 water bodies for 13 PFAS chemicals
- Results
  - 95% of waterways had at least one fish with detectable PFOS
  - 26% of the water samples (19 of 70) had detectable PFOS
  - At least one PFAS chemical detected in every water sample



Dots show maximum mean concentrations for any species from the waterbody
Blue dots = no restrictions under MDH FCA

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Next Steps for PFOS SSC

- Come up with protective fish tissue concentration (SSC fish tissue)
- Come up with bioaccumulation factors to translate to water concentrations
- Update existing PFOS SSC water column values that are based on old WQS methods
  - Mississippi River Pool 2: Last revised January 2013 for PFOS; August 2007 for PFOA
  - Bde Maka Ska (Lake Calhoun): Last revised May 2010 for PFOS; August 2007 for PFOA
- Extend water column values to other sites in east metro
  - Use as clean-up values
- Consider other uses for these criteria
  - MPCA forming lateral team to discuss

Thank you!

- Contact Information
  - Catherine.Neuschler@state.mn.us
  - 651-757-2607
- More information at: https://www.pca.state.mn.us/waste/pfc-investigation-and-clean#pfos
  - Report and summary of existing SSC
- MPCA WQS Team:
  - Bill Cole (Supervisor)
  - Bruce Monson, Cathy O'Dell, Angela Preimesberger, Laura Solem, Summer Streets
- Interagency Fish Contaminant Monitoring Program (MNDNR, MDH, & MPCA)

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