



General Membership Meeting Minutes

02/16/2023 01:30 pm – 03:30 pm

Lake County Public Works Conference Room
650 W. Winchester Road Libertyville, 60048

Discussion and Possible Approval of the Following:

1. Introductions, Announcements, and Roll Call

Paul Kendzior called the meeting to order at 1:34 PM. Ashley Strelcheck, DRWW Coordinator, performed roll call. 18 members were in attendance representing 22 DRWW members: Karolina Cho, Gewalt Hamilton Associates for Ela and Fremont Townships and the Villages of Long Grove and Riverwoods; Mike Adam, Lake County Health Department; Nick Huber, Lake County Forest Preserve; Joel Sensenig, Lake County Public Works; Chuck Bodden, North Shore Water Reclamation District; Nick Leach, Village of Gurnee; Michael Talbett, Village of Kildeer; Kevin Lill, Manhard Consulting for the Villages of Lake Zurich and Round Lake Beach; Tom Morthorst, Village of Third Lake; Dave Buckley, Christopher Burke; Brian Joyce, City of Lake Forest; Jesus Alquicira, City of Waukegan; Leonard Dane, Fehr Graham Engineering; Mike Prusila, Lake County Stormwater Management Commission; Paul Kendzior, Village of Libertyville; Wally Dittrich, Village of Lincolnshire; Ben Metzler, Village of Green Oaks; and David Brown, Village of Vernon Hills. A general membership quorum was present via a roll call vote. After agenda item 4.d.ii, Jim Bland, EPS, Inc. was included in the membership votes.

2. Public Comment – Holly Hudson, Chicago Metropolitan Agency for Planning (CMAP) introduced herself to the DRWW attendees (virtually) and wanted to start the process of re-engaging with the local watershed workgroups.

3. Approve 08/18/22 General Membership Meeting Minutes

Motion to approve minutes as presented by Morthorst, Seconded by Sensenig. The motion passed with a unanimous consensus vote.

4. DRWW Business

a. DRWW Financials:

i. FY2022 Revenue & Expenditures

Strelcheck presented the FY2022 year-end revenues and expenditures to the General Membership for review. No questions or comments by the DRWW General Membership.

ii. **FY2023 DRWW Memberships Dues

Strelcheck presented the FY2023 DRWW memberships dues breakdown for general membership approval. The draft membership dues were set by Executive Board recommendation. Motion to approve the FY2023 DRWW memberships due as presented by Brown, seconded by Bodden. The motion passed 21-0-1 via roll call vote.

iii. **FY2023 DRWW Budget

Strelcheck presented the FY2023 DRWW budget for general membership approval. The draft budget was set by Executive Board recommendation. Motion to approve the FY2023 DRWW budget as presented by Dittrich, seconded by Leach. The motion passed 21-0-1 via roll call vote.

b. Committee Updates

i. Executive Board

Paul Kendzior provided an update on Executive Board actions. The DRWW continues to make progress on Nutrient Assessment & Reduction Plan (NARP) and the workgroup is on-track to meet that deadline at this time. The Executive Board created a balanced FY2023 Budget and set by recommendation FY2023 Membership dues. DRWW gained two new members in 2022, Illinois DOT (awaiting their payment as of today but should have it soon) and the City of Waukegan. Looking into 2023, the Executive Board will be looking at the DRWW Workplan with the other committees to see what updates should be made.

ii. Monitoring/Water Quality Improvements Committee

Steve Waters, Committee Chair, gave an update on the DRWW Monitoring Committee. The Committee has continued to support the development of the NARP. The NARP will determine the DRWW sampling plan moving

forward. NSWRD is preparing the annual DRWW monitoring report for the Illinois EPA on behalf of all DRWW members for their NPDES monitoring program requirement.

iii. Lakes Committee

Mike Adam, Lakes Committee Chair, updated the general membership on the Lake County Health Department's carp removal project (nutrient reduction) that was very successful and has been completed. The Lakes Committee is created Lake Recommendations that were approved by the DRWW Executive Board and posted on DRWW's website.

iv. Des Plaines River Watershed Workgroup Nutrient Assessment and Reduction Plan (NARP) Update - Karoline Qasem, Water Resources Engineer, Geosyntec Consultants, Inc.

Karoline Qasem gave an update on the DRWW Nutrient Assessment and Reduction Plan (NARP), starting the overview of a NARP, types of discharges in the watershed and its relationship to National Pollutant Discharge Elimination Systems (NPDES) permits. Geosyntec is on the third year of the NARP development; 2021-2022 consisted of data review and analysis and data monitoring that were used to start developing modeling tools. This year, Geosyntec is working on completion of the modeling tools and writing the NARP plan. The two types of models that will be utilized are the watershed model (simulates the response of water quantity and quality to hydrologic processes) and the instream model (simulates hydraulics and water quality condition within a stream or river). The modeling process consists of data analysis and review, model development, calibration and sensitivity analysis. Geosyntec is running four different watershed management scenarios. The key takeaways are upstream total phosphorus (TP) reduction reduces sestonic chlorophyll-a (Chl-a) and improves dissolved oxygen (DO) following large flow events, tributary TP reductions reduce sestonic Chl-a but has minimal impact on DO and Publicly owned treatment works (POTW) TP reductions have minimal impact on water quality.

Questions/Answers:

1. If POTWs are struggling to get to the 0.5 mg/L load reduction limit, would it be helpful to present this information to the Illinois EPA to affect the NPDES permit limits?

It's possible but POTWs would likely need to propose a different limit (example 0.6 mg/L) and make the case that there is not a significant different from 0.5 mg/L.

2. Is the Fox River watershed seeing similar (to the DRWW & Wisconsin upstream impacts) upstream issues?

The Wisconsin upstream impacts (loads) have a limited impact in the Fox River watershed. The watershed characteristics are different than the Des Plaines River watershed; the upstream areas have less POTWs, as you travel downstream there are more POTWs and the downstream areas have more agriculture loading that are becoming more prevalent.

c. Old Business - None

d. New Business

i. **DRWW Biennial Executive Board Elections

Motion to approve the Executive Board elections as presented by Brown, seconded by Metzler. The motion passed with a unanimous consensus vote.

ii. **New DRWW Membership: Environmental Products and Services Inc. (Jim Bland, Alternate: Patricia Bland)

Motion to approve EPS, Inc as a new DRWW member by Bodden, seconded by Adam. The motion passed with a unanimous consensus vote.

5. Guest Speakers

- a. Illinois River Watershed Study Group Presentation - Brian Johnson, Executive Director, Greater Peoria Sanitary District
Brian Johnson gave a brief history on the formation of the Illinois River Watershed Study Group (IRSG). The Illinois River NPDES permit holders were initially assigned a NARP and a group of partners felt that a NARP was not appropriate or reasonable for that river system and requested a monitor-only group (approach). The IRSG was formed from these discussions with Illinois EPA with other partners and environmental groups. The monitoring only approach would allow for data to be collected and allow time to review how the river is being impacted by upstream NARPs, the watersheds, and determine if/what additional steps are needed. Right now, the IRSG is very early stages (under the guidance of a steering committee) and are trying to determine what to monitor based on other workgroup's experiences. This group is also reviewing upstream NARPs as they are being completed to see what the results of the NARPs are and what was learned in the process.

- b. Per-and polyfluoroalkyl substances (PFAS) Presentation - Adrienne Nemura, Principal Water Resources Engineer, Geosyntec Consultants, Inc.

Adrienne Nemura provided a brief history and background (and chemical makeup) of Per-and polyfluoroalkyl substances (PFAS). PFAS is a manufactured chemical that is used in industry & consumer products since 1940s as polymers, surfactants, lubricants, etc. It's widespread use and mass distribution make it hard to trace the source of PFAS, but the is now known to have harmful animal and human health impacts. Several states are trying to develop health-based values for PFAS (PFOA, PFOS, etc...), but the PFAS science is full of uncertainties and inconsistent interpretations by scientists. Nemura provides many examples of states, studies, articles and films related to PFAS and its negative impacts to human health and the environment. Sampling for PFAS is very difficult, with even the smallest cross-contamination contributing to a false positive sample and the treatment for PFAS has several cons given it's persistent in the environment and high expense. For POTWs, the NPDES permitting is considering PFAS effluent, influent and biosolids monitoring, updating industrial user inventories, use of BMPs and pollution prevention and notifying potentially affected public water systems of draft permits with PFAS-monitoring, BMPs, or other conditions.

6. Watershed Updates & Announcements

North Shore is undergoing about a four-million-dollar project for chemical Phosphorus removal systems to supplement the biological Phosphorus process at two of its wastewater treatment plants. Construction is expected to be completed in the next few months.

7. Member Remarks

Paul Kendzior wanted to acknowledge that Dave Brown, Village of Vernon Hills, is retiring and this would be his last DRWW meeting representing the Village. Dave Brown was thanked for his years of service, all of water quality improvement projects he has been involved with and he will be missed! Congratulations Dave! Dave commended all the good work that the DRWW has accomplished since it's formation and all the local partnerships that have led to water quality improvements in the watershed.

8. Next General Membership Meeting: August 17, 2023

9. Adjournment: 3:26 pm

Motion to adjourn made by Sensenig, second by Brown. The motion passed with a unanimous consensus vote.

Des Plaines River Watershed Workgroup Meeting Attendees

Name	Organization
Alana Bartolai	Lake County Health Department
Ashley Strelcheck	Lake County Stormwater Management Commission
Ben Metzler	Clark Dietz, Inc.
Brian Kuebker	Village of Libertyville
Chuck Bodden	North Shore Water Reclamation District
Dave Buckley	Christopher Burke Engineering
David Brown	Village of Vernon Hills
James Kim	Vernon Hills Park District
Jesus Alquicira	City of Waukegan
Jim Bland	EPS, Inc.
Joel Sensenig	Lake County Public Works
Karolina Cho	Gewalt Hamilton Associates
Kevin Lill	Manhard Consulting
Leonard Dane	Fehr Graham Engineering
Michael Talbett	Village of Kildeer
Mike Adam	Lake County Health Department
Mike Prusila	Lake County Stormwater Management Commission
Mike Warner	Gewalt Hamilton Associates
Nicholas Leach	Village of Gurnee
Nick Huber	Lake County Forest Preserve District

Name	Organization
Paul Kendzior	Village of Libertyville
Rob Flood	North Shore Water Reclamation District
Ron Werchek	Lake County Division of Transportation
Steve Waters	North Shore Water Reclamation District
Tom Morthorst	Village of Third Lake
Wally Dittrich	Village of Lincolnshire

DRWW February 16, 2023 Roll Call Sheet

Organization	Voting Member	Number of Votes	Roll Call Attendance	Vote Count	Roll Call: FY2023 Membership Dues	Vote Count	Roll Call: FY2023 Budget	Vote Count
Applied Technologies, Inc.		2		0		0		0
Christopher Burke	Dave Bradley	2	Y	2	Y	2	Y	2
City of Lake Forest	Brian Joyce	4	Y	4	Y	4	Y	4
City of Park City		4		0		0		0
City of Waukegan	Jesus Alquicira	4	Y	4	Y	4	Y	4
City of Zion		4		0		0		0
Ela Township	Representative: Karolina Cho - Gewalt Hamilton	4	Y	4	Y	4	Y	4
EPS, Inc.	Jim Bland - no voting until after agenda item 4.d.ii	2		0		0		0
Fehr Graham Engineering	Leonard Dane	2	Y	2	Y	2	Y	2
Fremont Township	Representative: Karolina Cho - Gewalt Hamilton	4	Y	4	Y	4	Y	4
Geosyntec		2		0		0		0
Hey & Associates		2		0		0		0
Lake County & Lake County DOT (1 member)	Mike Adam, LCHD	8	Y	8	Y	8	Y	8
Lake County Forest Preserve	Nick Huber	6	Y	6	Y	6	Y	6
Lake County Public Works	Joel Sensenig	16	Y	16	Y	16	Y	16
Lake County SMC	Mike Prusila	2	Y	2	Y	2	Y	2
Libertyville Township		4		0		0		0
North Shore Water Reclamation District	Chuck Bodden	22	Y	22	Y	22	Y	22
Sierra Club		2		0		0		0
Vernon Hills Park District		2		0		0		0
Vernon Township		4		0		0		0
Village of Buffalo Grove		4		0		0		0
Village of Deer Park		4		0		0		0
Village of Deerfield		4		0		0		0
Village of Grayslake		4		0		0		0
Village of Green Oaks	Ben Metzler	4	Y	4	Y	4	Y	4
Village of Gurnee	Nick Leach	4	Y	4	Y	4	Y	4
Village of Hawthorn Woods		4		0		0		0
Village of Kildeer	Michael Talbett	4	Y	4	Y	4	Y	4
Village of Lake Zurich	Representative: Kevin Lill - Manhard	4	Y	4	Y	4	Y	4
Village of Libertyville	Paul Kendzior	6	Y	6	Y	6	Y	6
Village of Lincolnshire	Wally Dittrich	4	Y	4	Y	4	Y	4
Village of Lindenhurst		4		0		0		0
Village of Long Grove	Representative: Karolina Cho - Gewalt Hamilton	4	Y	4	Abstain	0	Abstain	0
Village of Riverwoods	Representative: Karolina Cho - Gewalt Hamilton	4	Y	4	Y	4	Y	4
Village of Round Lake Beach	Representative: Kevin Lill - Manhard	4	Y	4	Y	4	Y	4
Village of Round Lake Park		4		0		0		0
Village of Third Lake	Tom Morthorst	4	Y	4	Y	4	Y	4
Village of Vernon Hills	Dave Brown	4	Y	4	Y	4	Y	4
Village of Old Mill Creek		2		0		0		0
TOTALS		182	22	120	21	116	21	116

SIGN-IN SHEET

DES PLAINES RIVER WATERSHED WORKGROUP GENERAL MEMBERSHIP MEETING

February 16, 2023 * 1:30 PM - 3:30 PM * Lake County Public Works Conference Room (Libertyville, IL)

NAME	ORGANIZATION	E-MAIL	ARE YOU A DRWW MEMBER? (Y/N)	IF YES, ARE FOR YOU
Ashley Shelburne	SNC	astshelburne@lakecountyny.gov	Y	N
Jim BRAND	EPS INC.	IMBRAND@CAMCASTING	Y	N
Brian Kubler	Libertyville	BKubler@Libertyville.com	Y	N
Nick Leach	Gurnee	nleach@village.gurnee.il.us	Y	Y
Rob Flood	NSWRD		X	X
NICK HUBER	LCCFPD	nhuber@lccfpd.org	Y	Y
Chuck Budden	NSWRD	chbudden@northshoreward.org	Y	Y
Leonard Dene	Fehr Graham	ldene@Fehrgraham.com	Y	Y

SIGN-IN SHEET

DES PLAINES RIVER WATERSHED WORKGROUP GENERAL MEMBERSHIP MEETING

February 16, 2023 * 1:30 PM - 3:30 PM * Lake County Public Works Conference Room (Libertyville, IL)

NAME	ORGANIZATION	E-MAIL	ARE YOU A DRWW MEMBER? (Y/N)	IF YES, ARE FOR YOU
Willy Dietrich	Village of Lincolnshire	w.dietrich@lincolnshire.il.gov	Y	
Mike Adams	Lake Co Health Dept	medem@lccounty.il.gov	Y	
Davis Brown	V of Vernon Hills	DavisBrown@villages.org	Y	
Ron WERCHER	LAKE COUNTY DOT	RWERCHER@LAKECOUNTY.IL.GOV	Y	N
Kevin Lill	Manhard	klill@manhard.com	N	N
Joel Sensing	LCPD	jsensing@lcpd.org	Y	Y
Jesus Aguirre	City of Waukegan	Jesus.Aguirre@waukegan.il.gov	Y	Y
KAROLINA MO	Gewa It Tamilton Associates Village of Long Grove Fremont and Elm TOWNSHIPS	kcmo@ga-engineers.com	Y	Y
DAVE BUCKLEY	Christopher Burke Engineering	dbuckley@cbhel.com	Y	N

SIGN-IN SHEET

DES PLAINES RIVER WATERSHED WORKGROUP GENERAL MEMBERSHIP MEETING

February 16, 2023 * 1:30 PM - 3:30 PM * Lake County Public Works Conference Room (Libertyville, IL)

NAME	ORGANIZATION	E-MAIL	ARE YOU A DRWW MEMBER? (Y/N)	IF YES, ARE FOR YOU
Pall Kenozor	LIBERTYVILLE	Plandizio@libertyville.com	X	
Bar Metzner	Cedar Point / Green Oaks	bar.metzner@cedarpoint.com	X	N
Len MORTIMER	Village of Lind Lake	TMORTIMER@lindlake.com	Y	Y
STEVE WATERS	NWRWD	stwaters@northsharond.org	Y	N
Arona BASTOLAI	LCHD	ABASTOLAI@lchd.org	Y	N
Melissa SILBERT	Kilders	msilbert@willis-kilders.com	Y	Y

DES PLAINS RIVER WATERSHED WORKGROUP (DRWW) NUTRIENT ASSESSMENT REDUCTION PLAN (NARP) UPDATE

February 16, 2023

AGENDA

NARP Overview

Modeling Background

DRWW Model Setup and Calibration

Watershed Management Scenarios

Next Steps





DRWW NARP

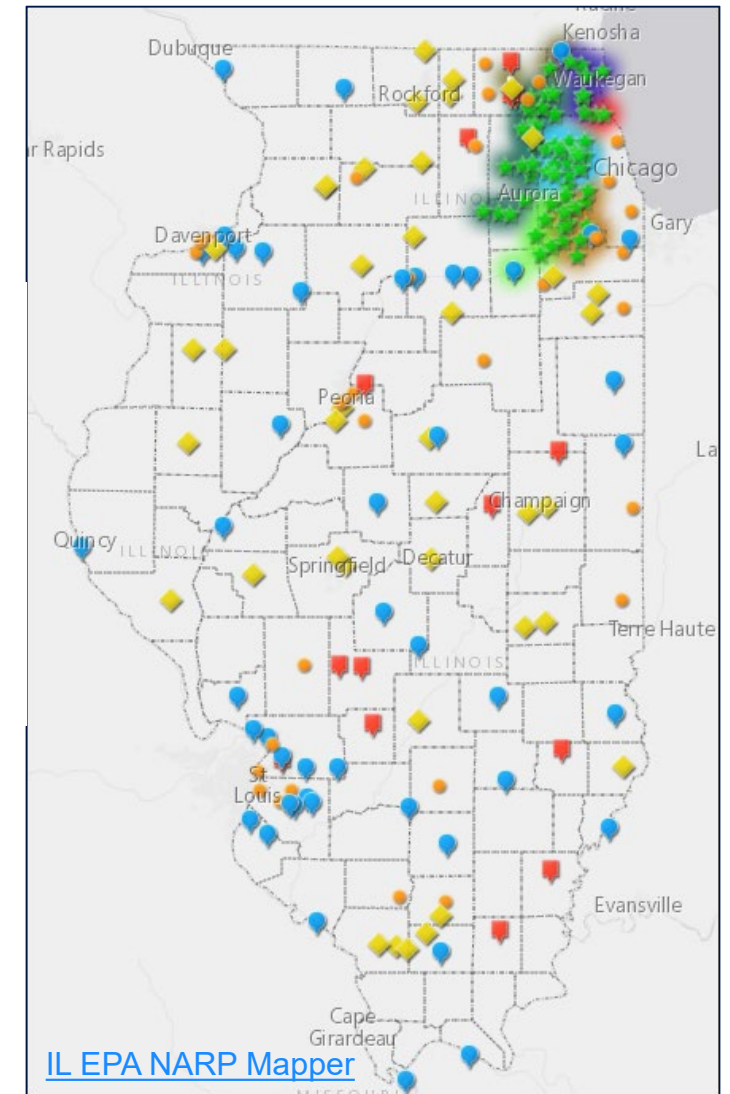
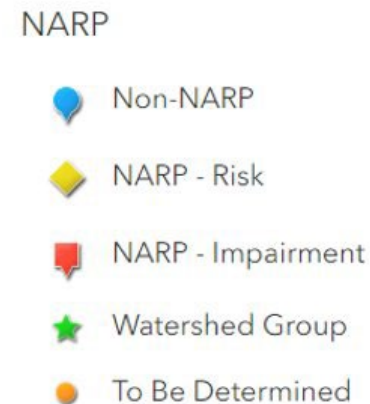
Overview and Schedule



NARP – Overview

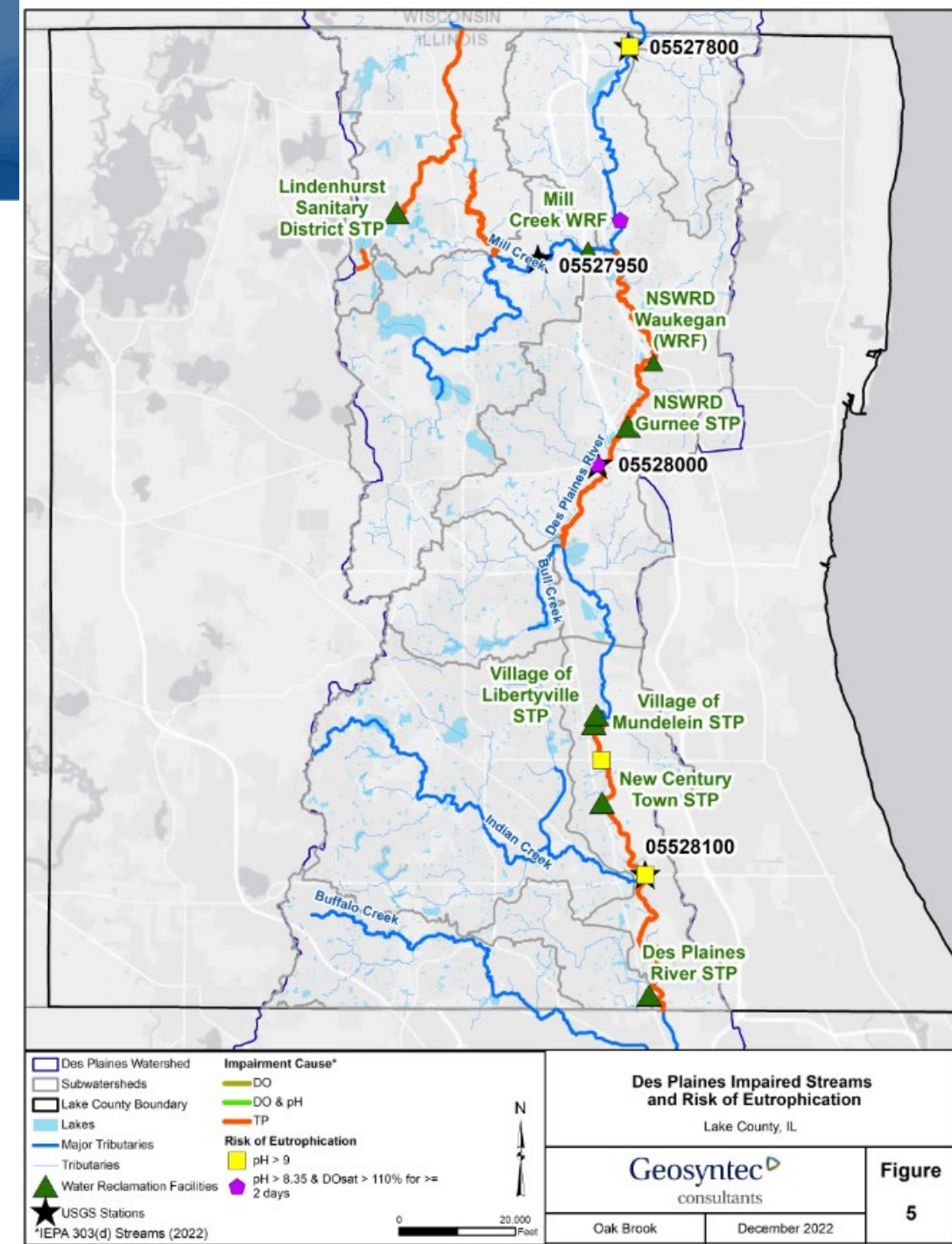
- **What's a NARP?**
 - Nutrient Assessment Reduction Plan
 - Negotiated special conditions in NPDES permits to address phosphorus-related impairments*
 - Dissolved oxygen (DO)
 - Nuisance algae
- **Who gets a NARP?**
 - Dischargers to a 303 (d) listed stream due to a phosphorus-related impairment
 - Dischargers upstream of station at “Risk of Eutrophication”
- **When is NARP Due?**
 - December 31, 2023, or 2024

* Major (>1 MGD) publicly owned treatment works (POTWs)



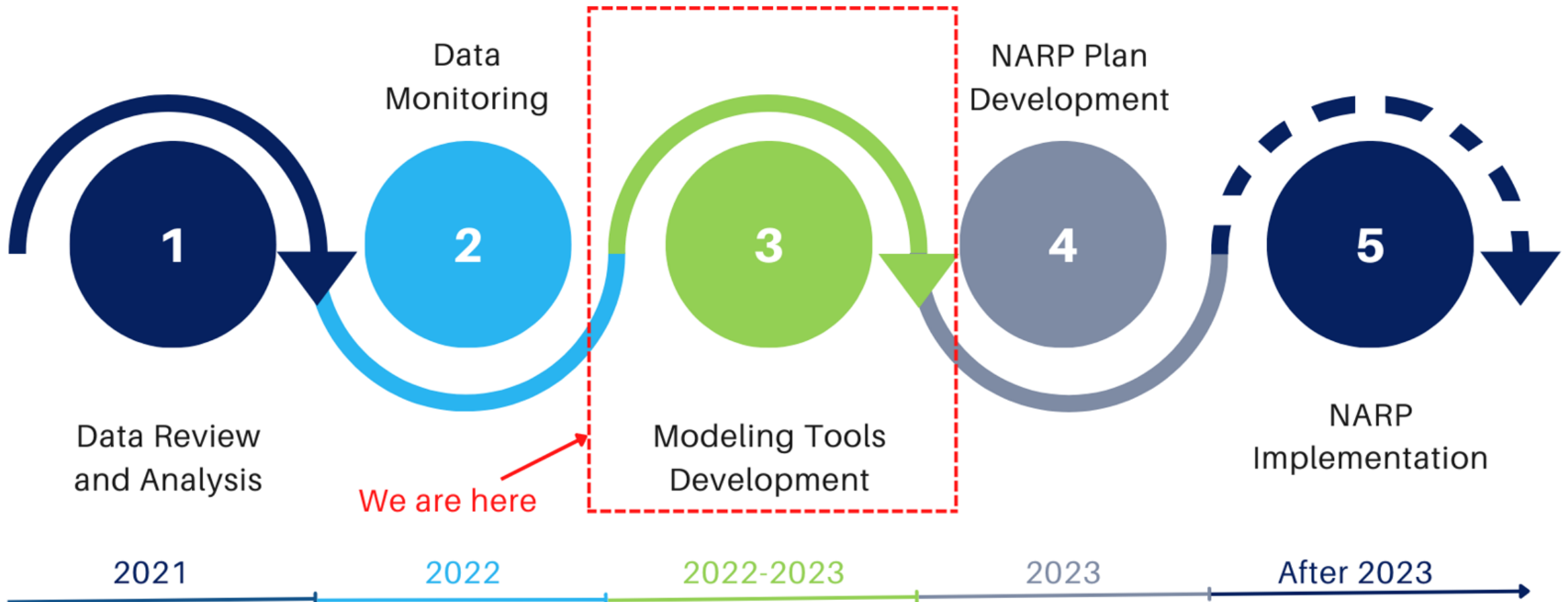
DRWW NARP – Overview

- POTWs discharging to
 - Des Plaines River mainstem (6)
 - Mill Creek (1)
 - Hastings Creek (1)
- The upstream station is at risk of eutrophication



DRWW NARP – Schedule

NARP is due December 31, 2023



Modeling Background

Overview, Framework,
and Input/Output



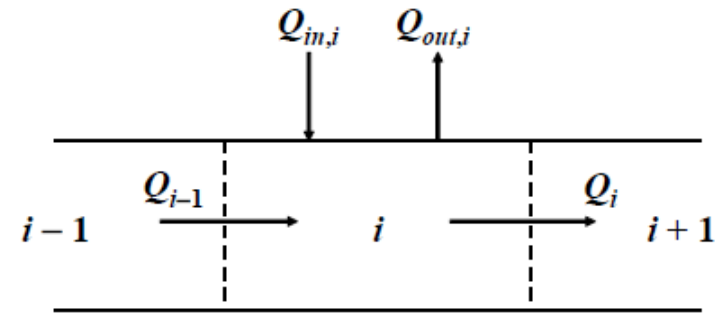
Modeling Background – Overview

- **What's a model?**

- A model is a mathematical representation of the physical, chemical, and biological processes in a waterbody.

- **Why are models useful?**

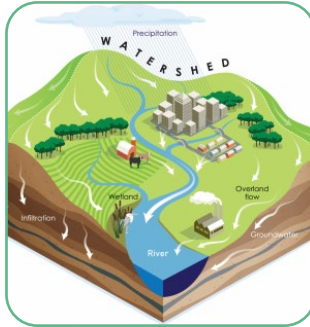
- Fill the gaps in observed data
- Have a predictive capability
- Help with evaluation of management strategies
- Identify causes of water quality problems



$$\frac{dc_i}{dt} = \frac{Q_{i-1}}{V_i} c_{i-1} - \frac{Q_i}{V_i} c_i - \frac{Q_{out,i}}{V_i} c_i + \frac{E'_{i-1}}{V_i} (c_{i-1} - c_i) + \frac{E'_i}{V_i} (c_{i+1} - c_i) + \frac{W_i}{V_i} + S_i$$



Modeling Background – Overview



Watershed Model

- Simulates the response of water quantity and quality to hydrologic processes

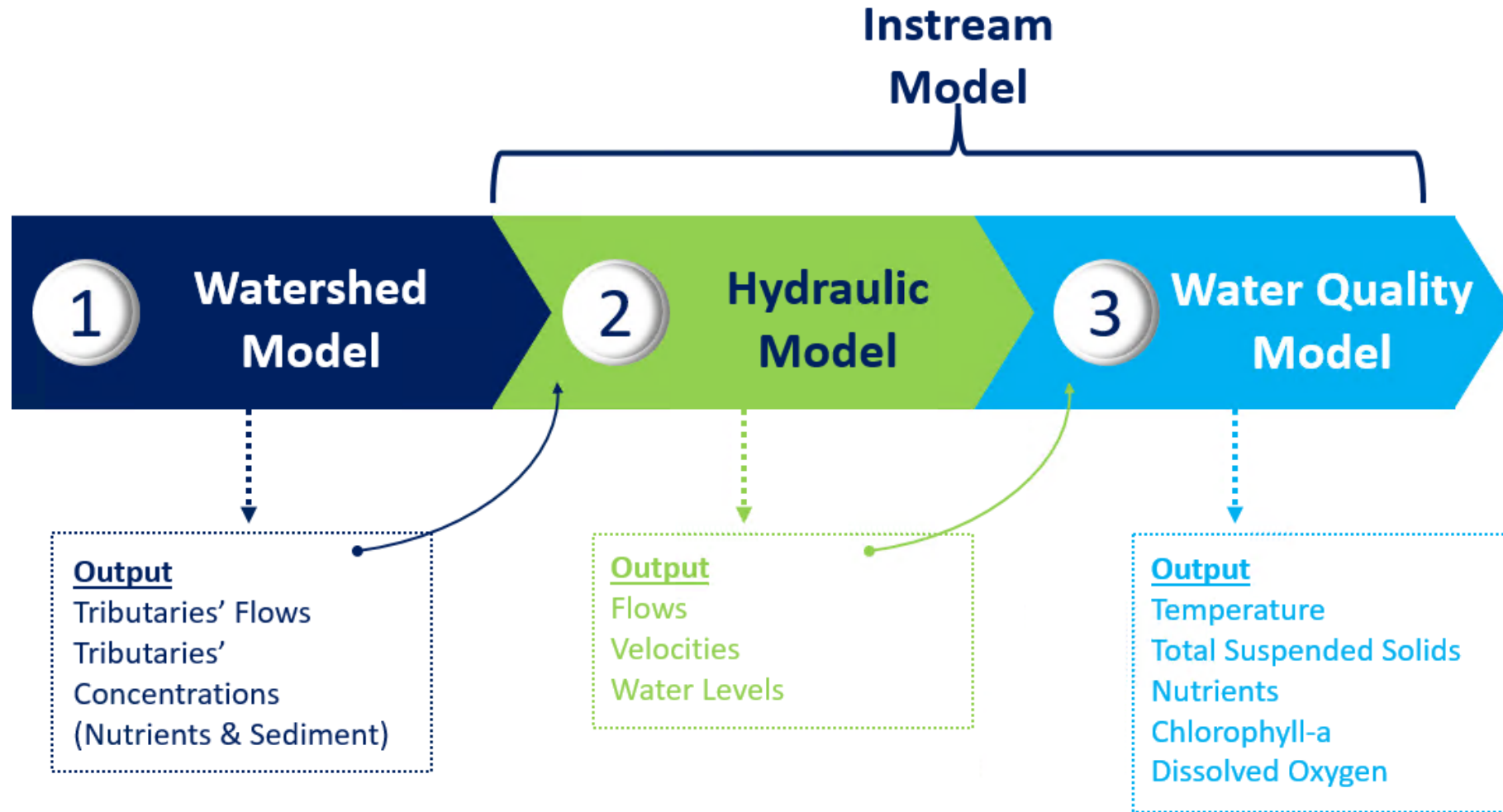


Instream Model

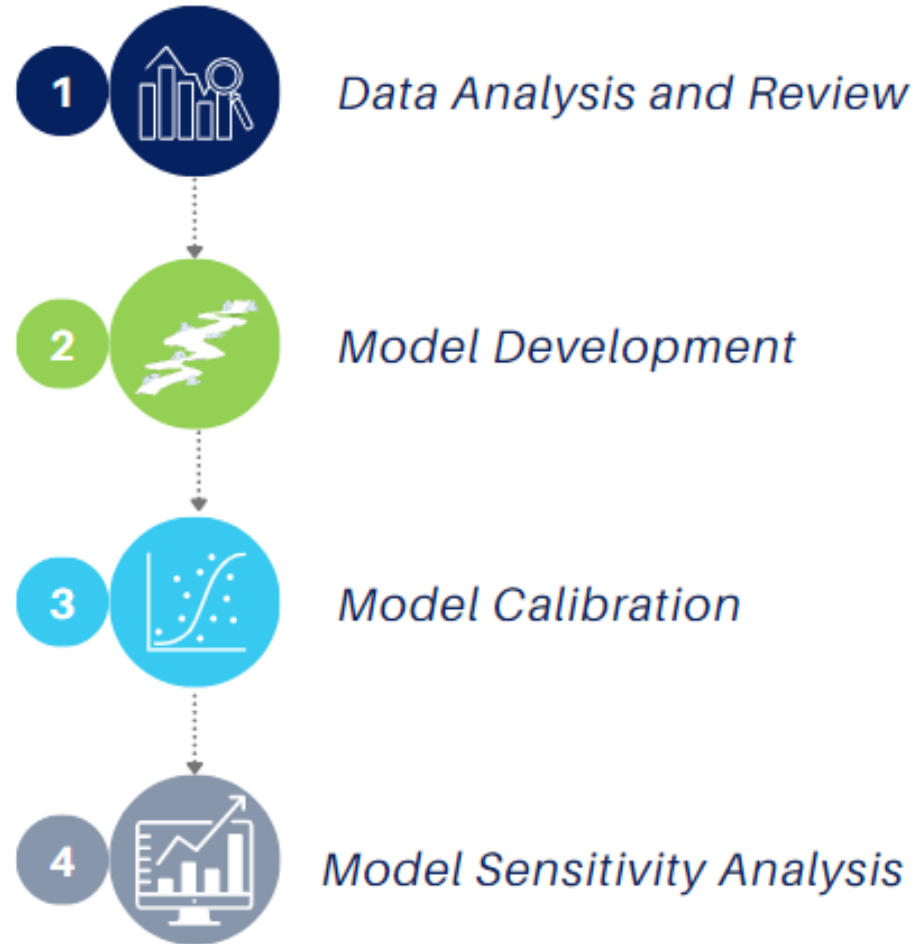
- Simulates hydraulics and water quality condition within a stream or river
- Hydraulic and water quality models



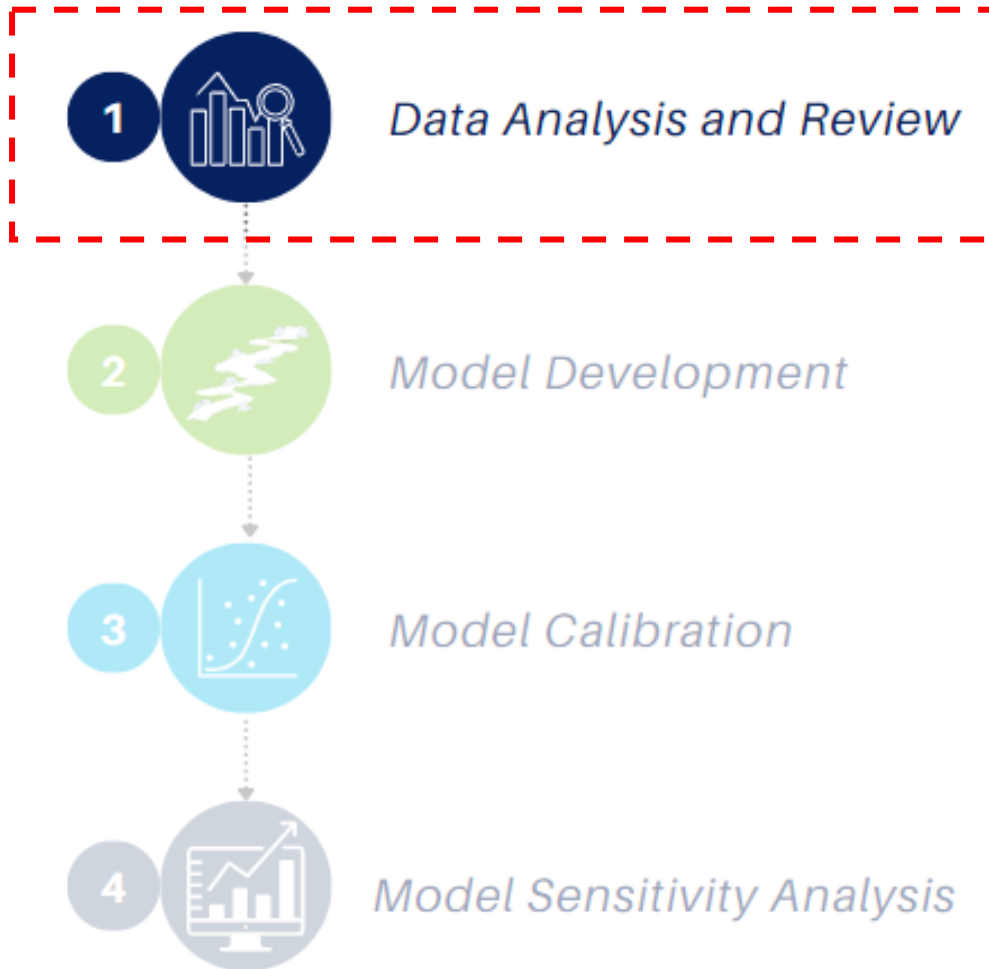
Modeling Background – Framework



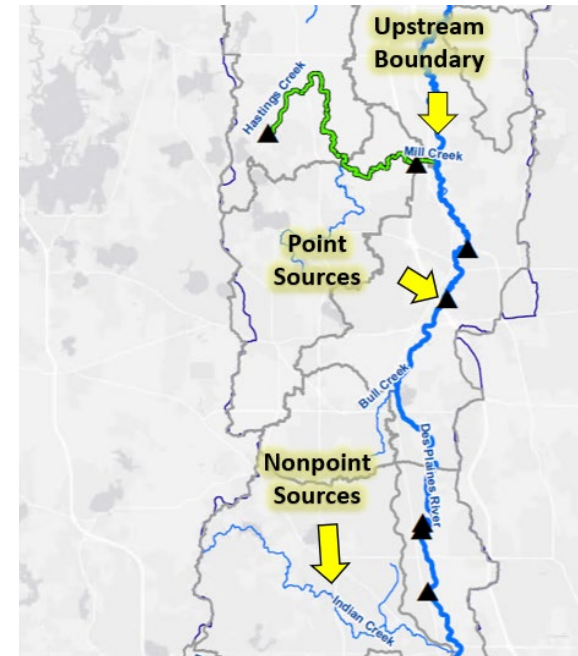
Modeling Process



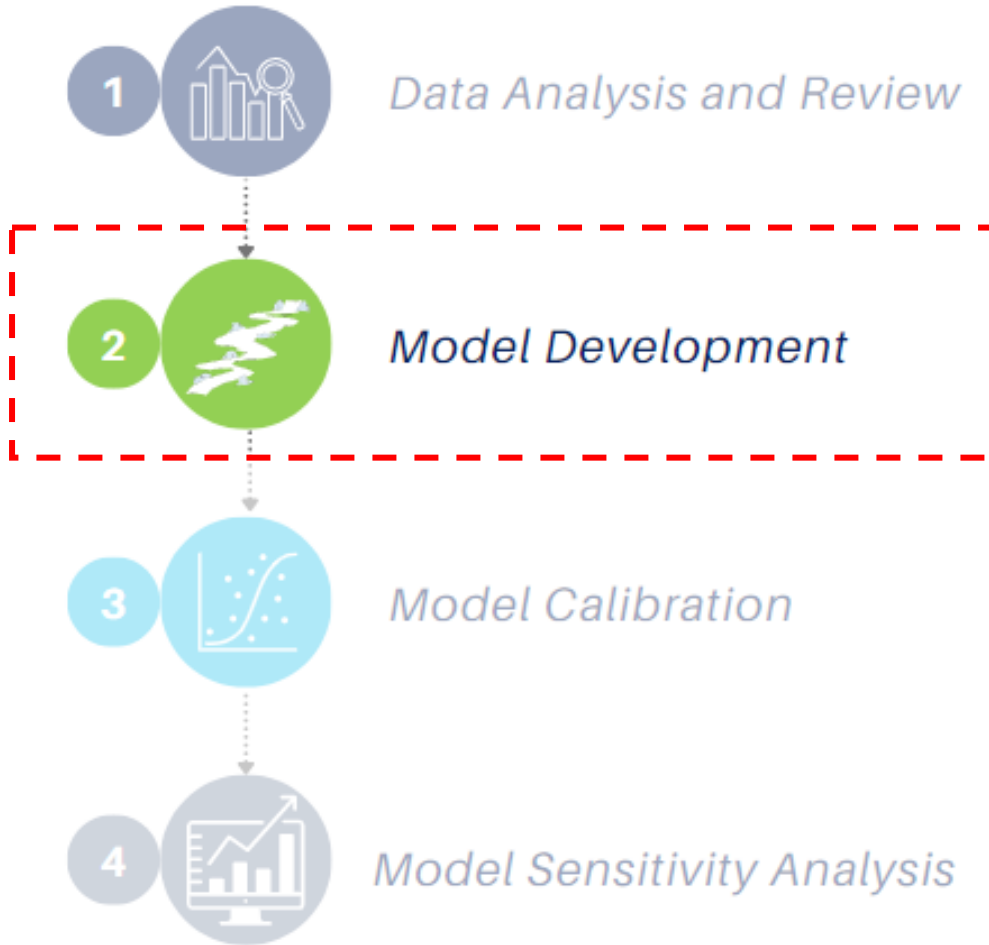
Modeling Process



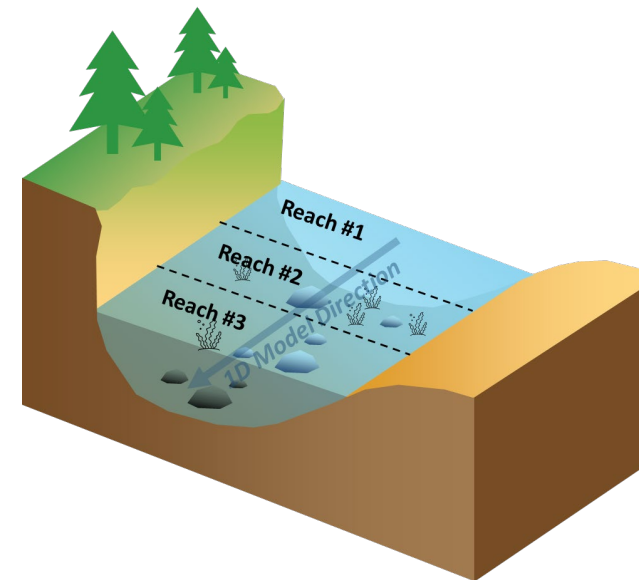
- ✓ Review existing data
- ✓ Identify data gaps
- ✓ Develop and execute a sampling program
- ✓ Determine model spatial and temporal extent



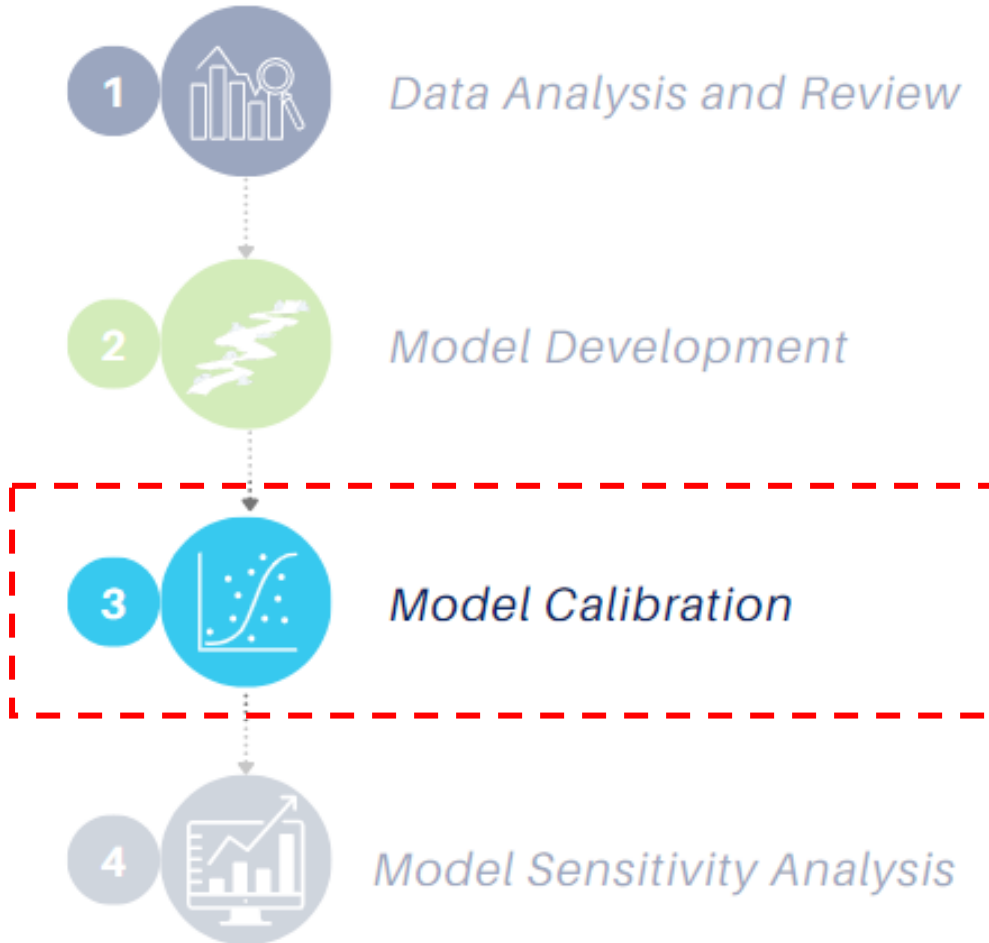
Modeling Process



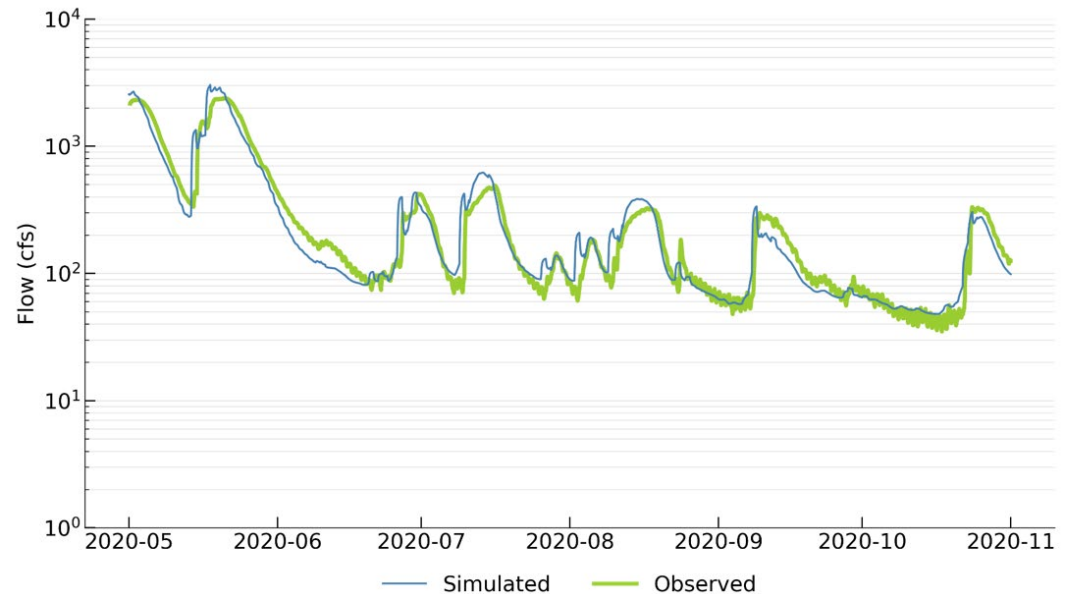
- ✓ Segment the river
- ✓ Preprocess input data
- ✓ Select model parameters
 - Biochemical oxygen demand, algae growth rate, etc.



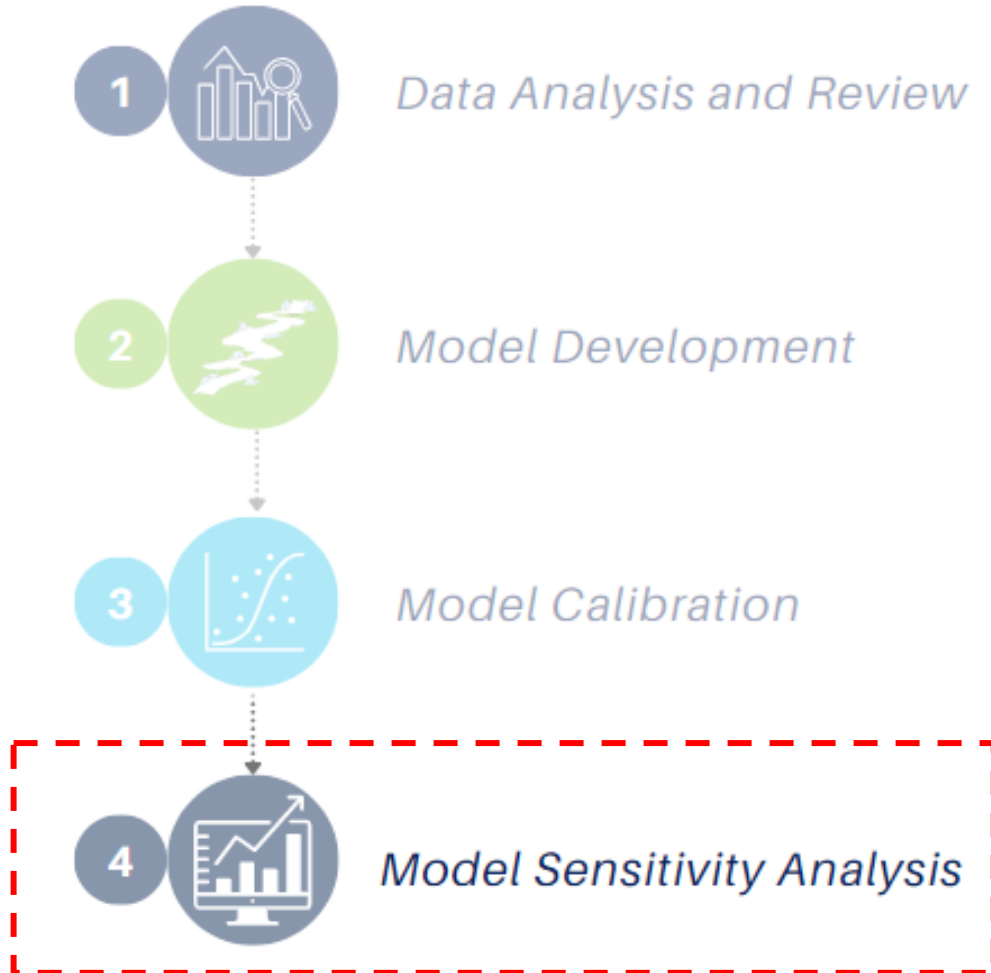
Modeling Process



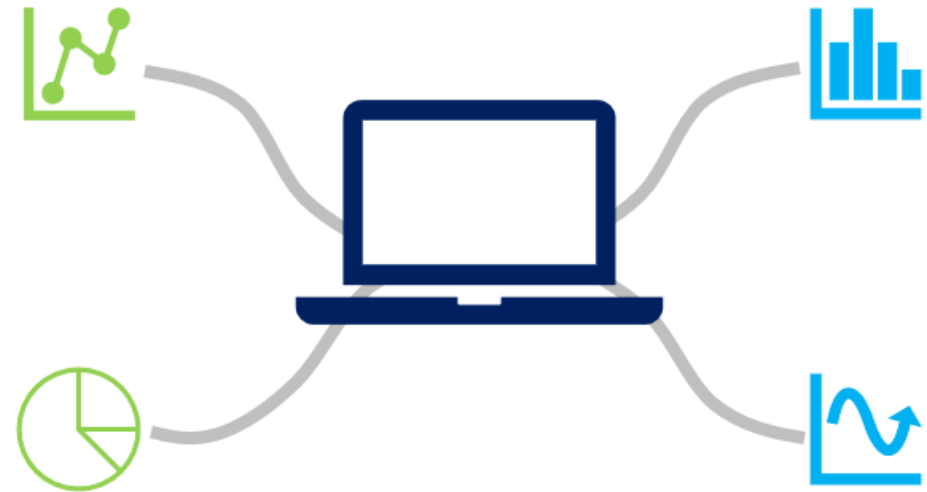
- ✓ Troubleshoot the model simulation
- ✓ Adjust parameters to match simulated and observed data
 - Use measured data, literature values, or best professional judgement



Modeling Process



- ✓ Identify the most sensitive model parameters
 - Inform the management scenarios choices
 - Identify the importance of data gaps



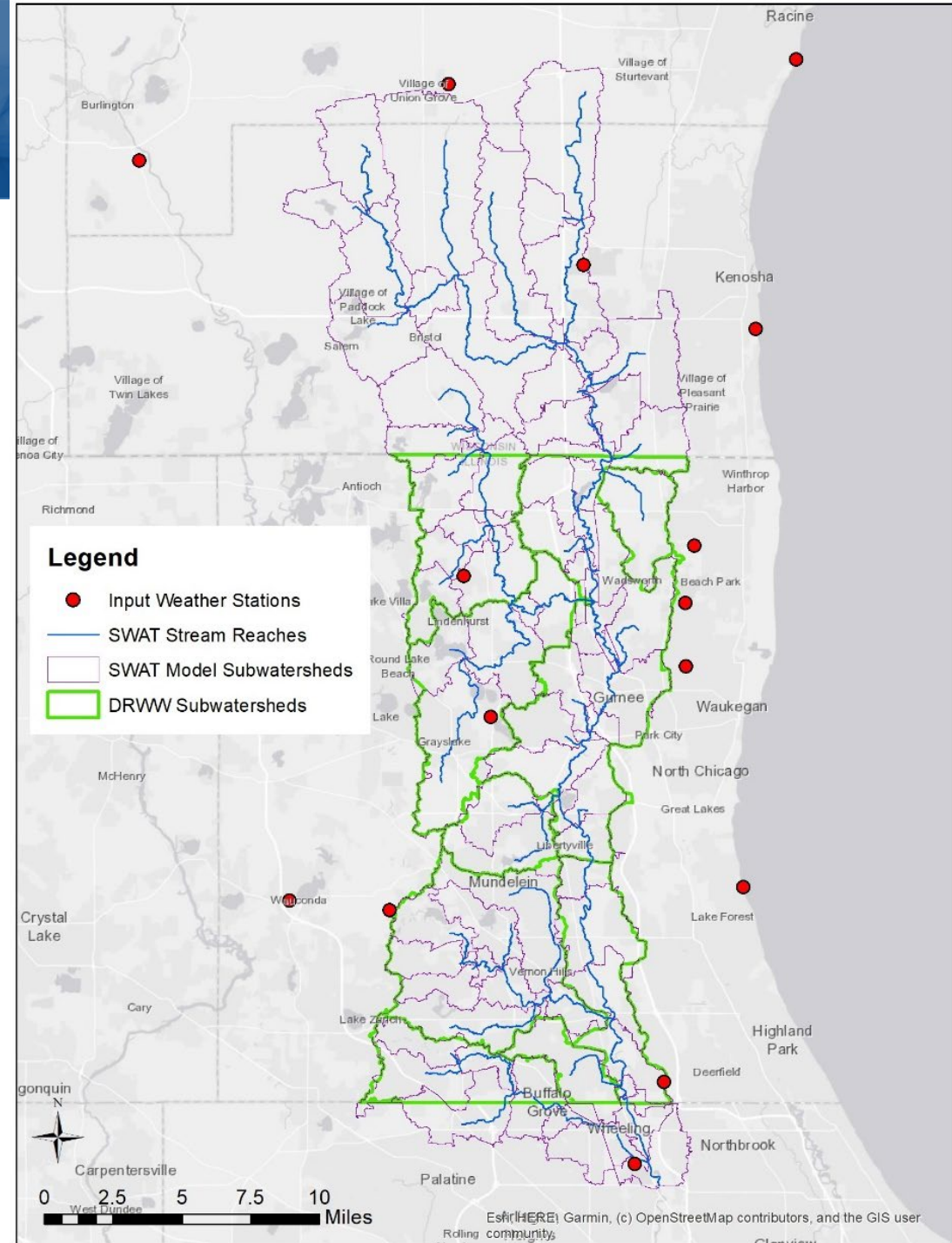
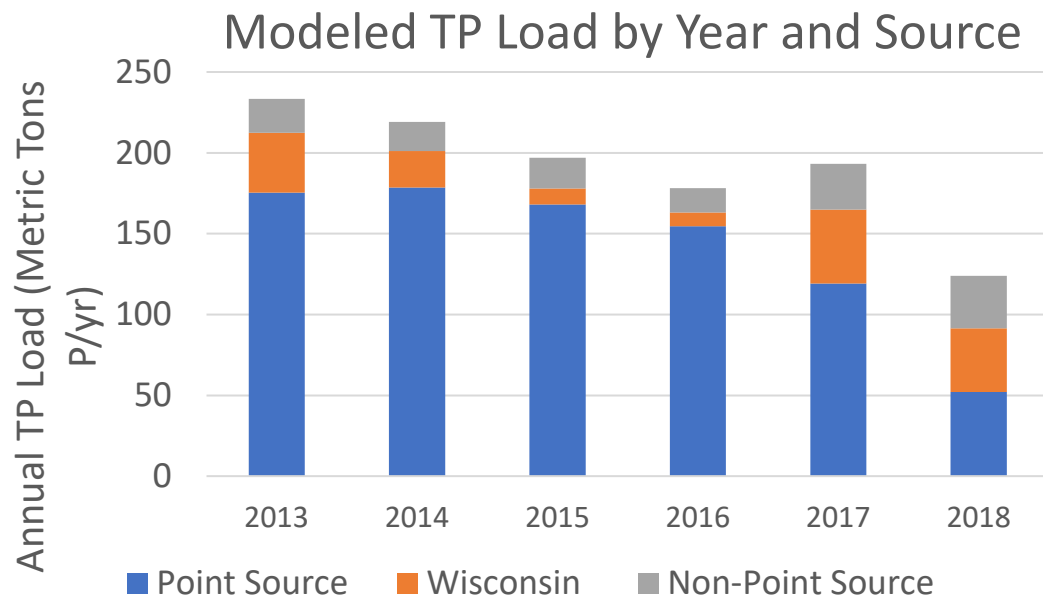
DRWW NARP Model

Setup and Calibration



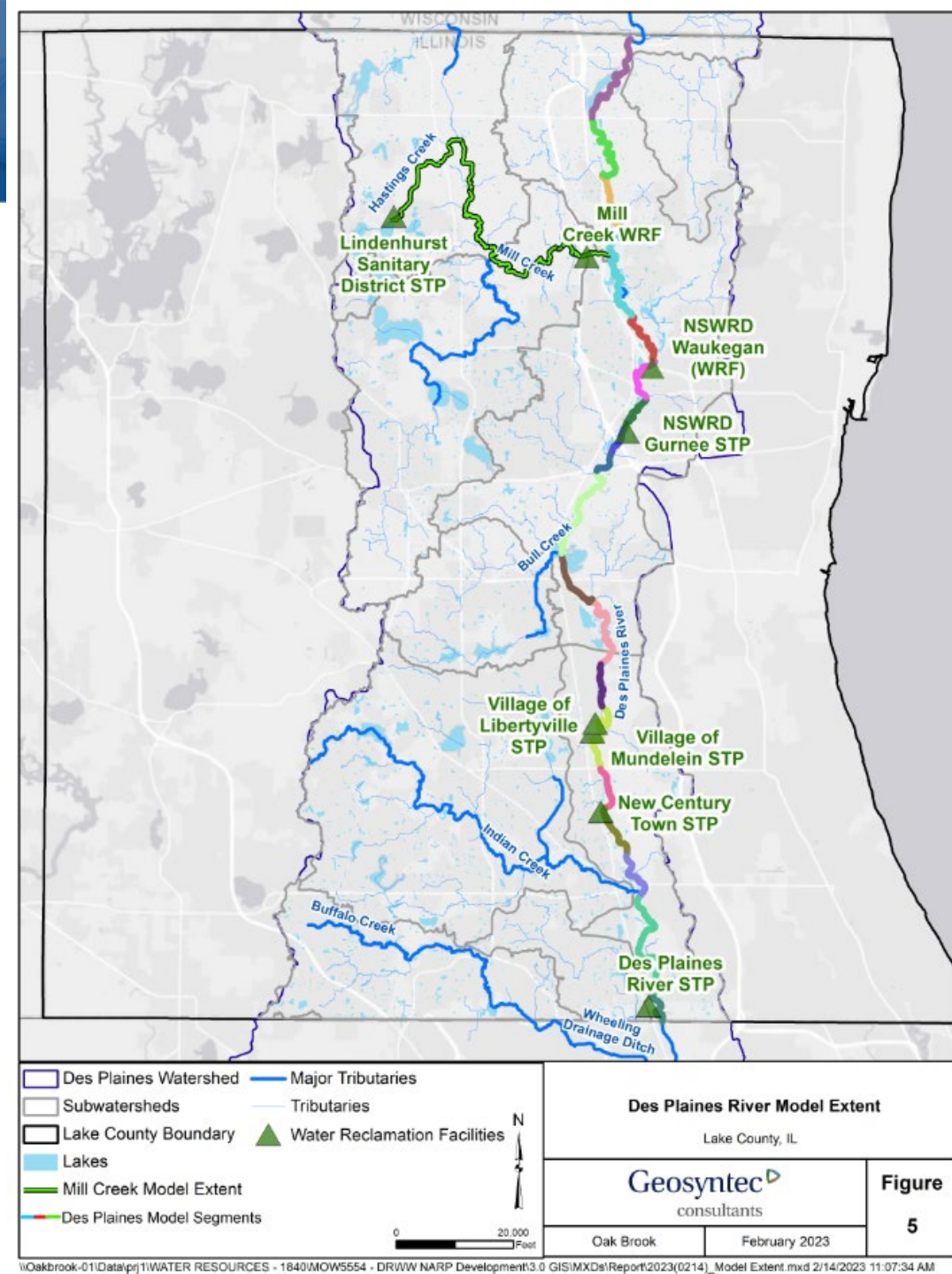
Watershed Model

- Development and calibration presented at the DRWW General Membership meeting on Feb. 17, 2022



Instream Model – Setup

- **Model Domain**
 - Mainstem Model
 - Russell Road to the confluence of the Des Plaines River and the Wheeling Drainage Ditch
 - Tributary Model
 - Hastings Lake to the confluence of Mill Creek and the Des Plaines River
- **Simulation Period**
 - 2020 Growing season (May – October)
 - Lowest flow period with the maximum data availability



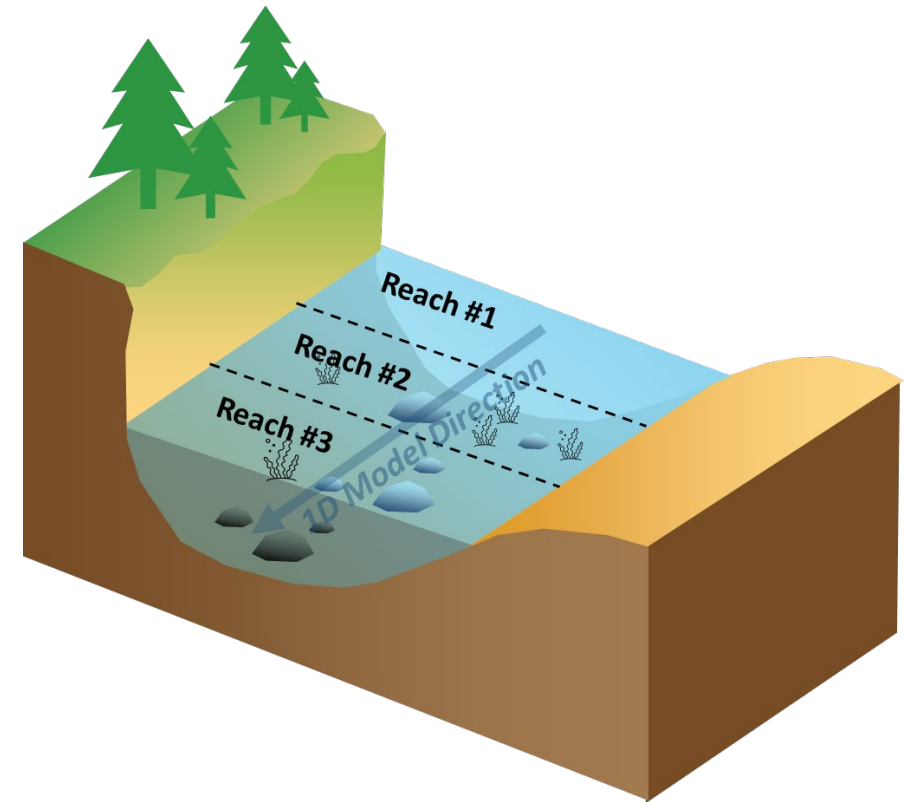
Water Quality Calibration Results

Selected Reaches



Instream Model – Qual2kw

- Qual2kw is a one-dimensional model
 - Qual2kw 1D model represents a river as a series of reaches with constant hydraulic and water quality characteristics
 - In reality, factors influencing water quality might change in the 2D or even 3D
 - Model simulations might not capture all variations in observed data
 - Observed data depends on where the sondes were exactly deployed within each reach



Model Calibration Error Statistics

Relative Root Mean Square Error (RRMSE)*

- RRMSE < 10% → Excellent
- 10% < RRMSE < 20% → Good
- 20% < RRMSE < 30% → Fair
- RRMSE > 30% → Poor

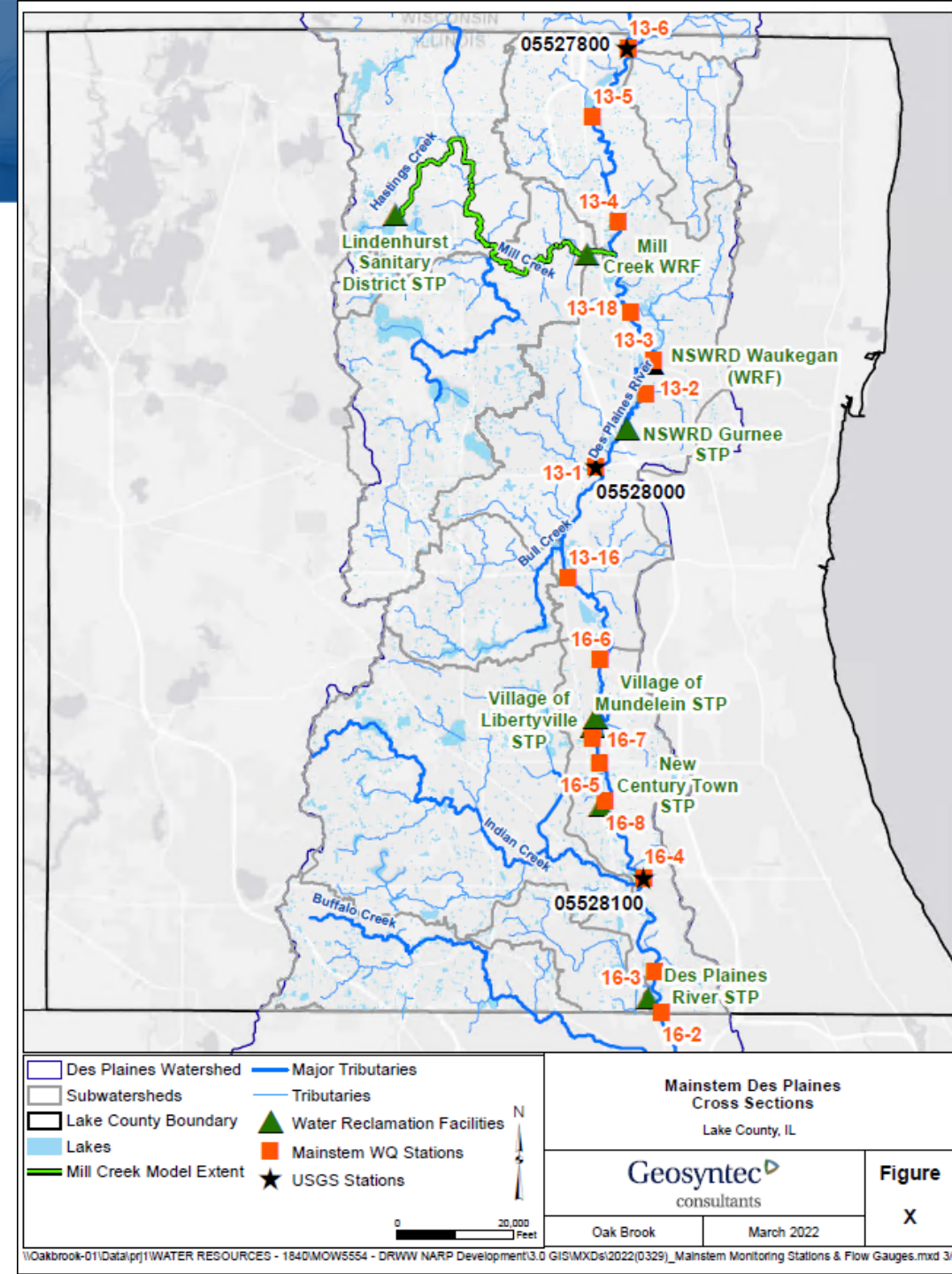
$$\text{RRMSE} = \sqrt{\frac{\frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2}{\sum_{i=1}^n (\hat{y}_i)^2}}$$



Calibration Stations

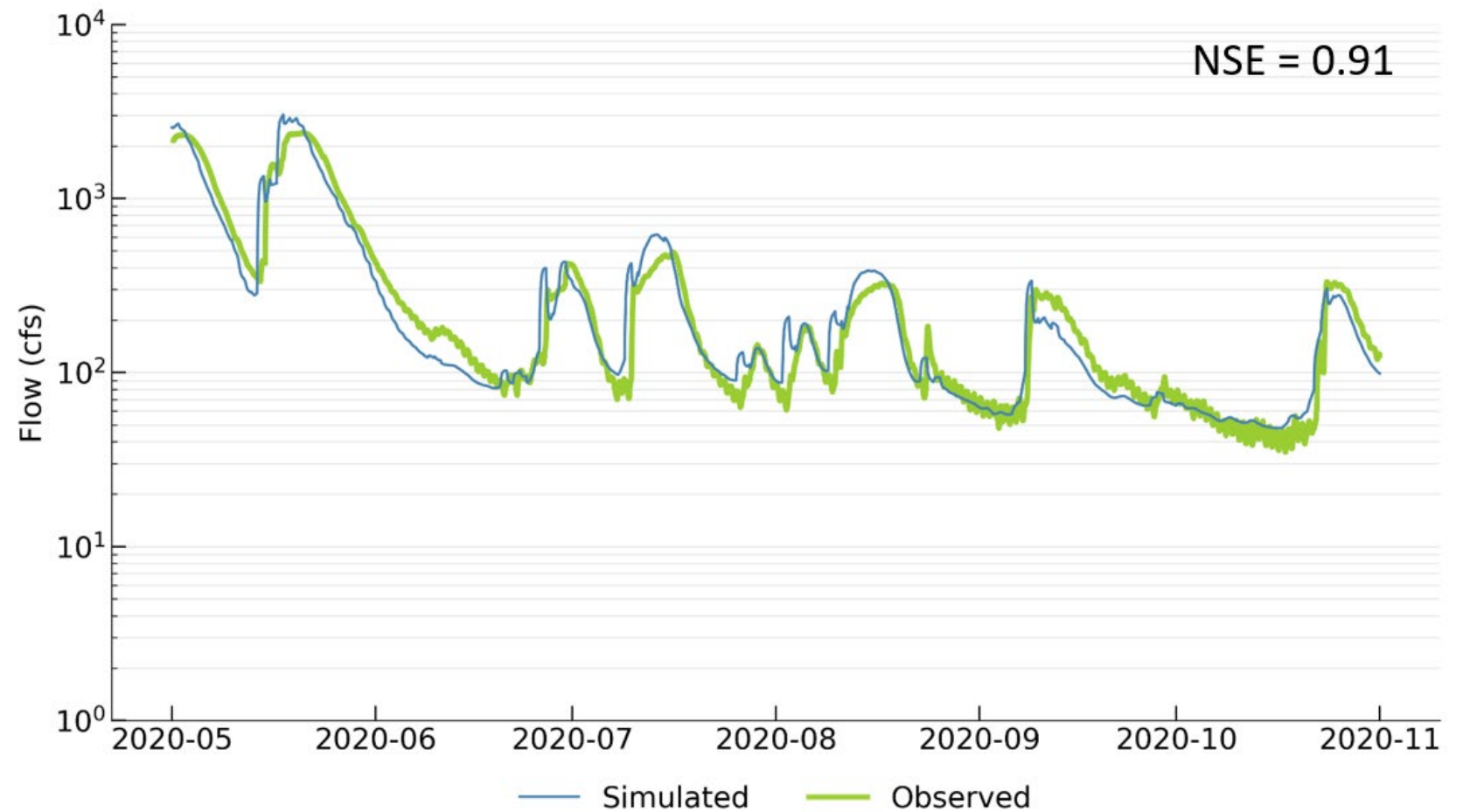
14 water quality stations on the mainstem

- 2 continuous
- 11 discrete



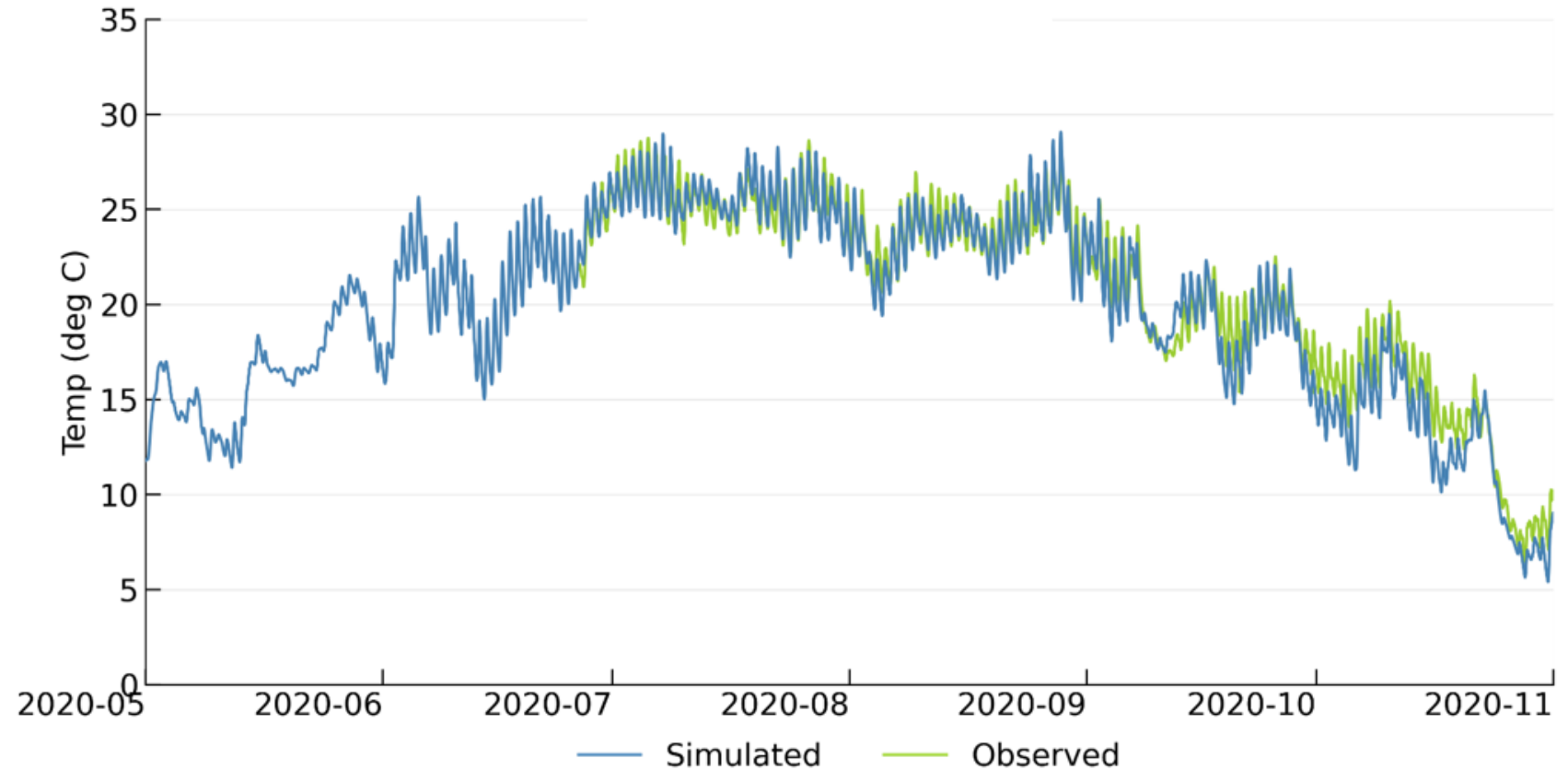
Flow Calibration

USGS 05528000
Des Plaines
River near
Gurnee, IL
(River Mile 20.8)



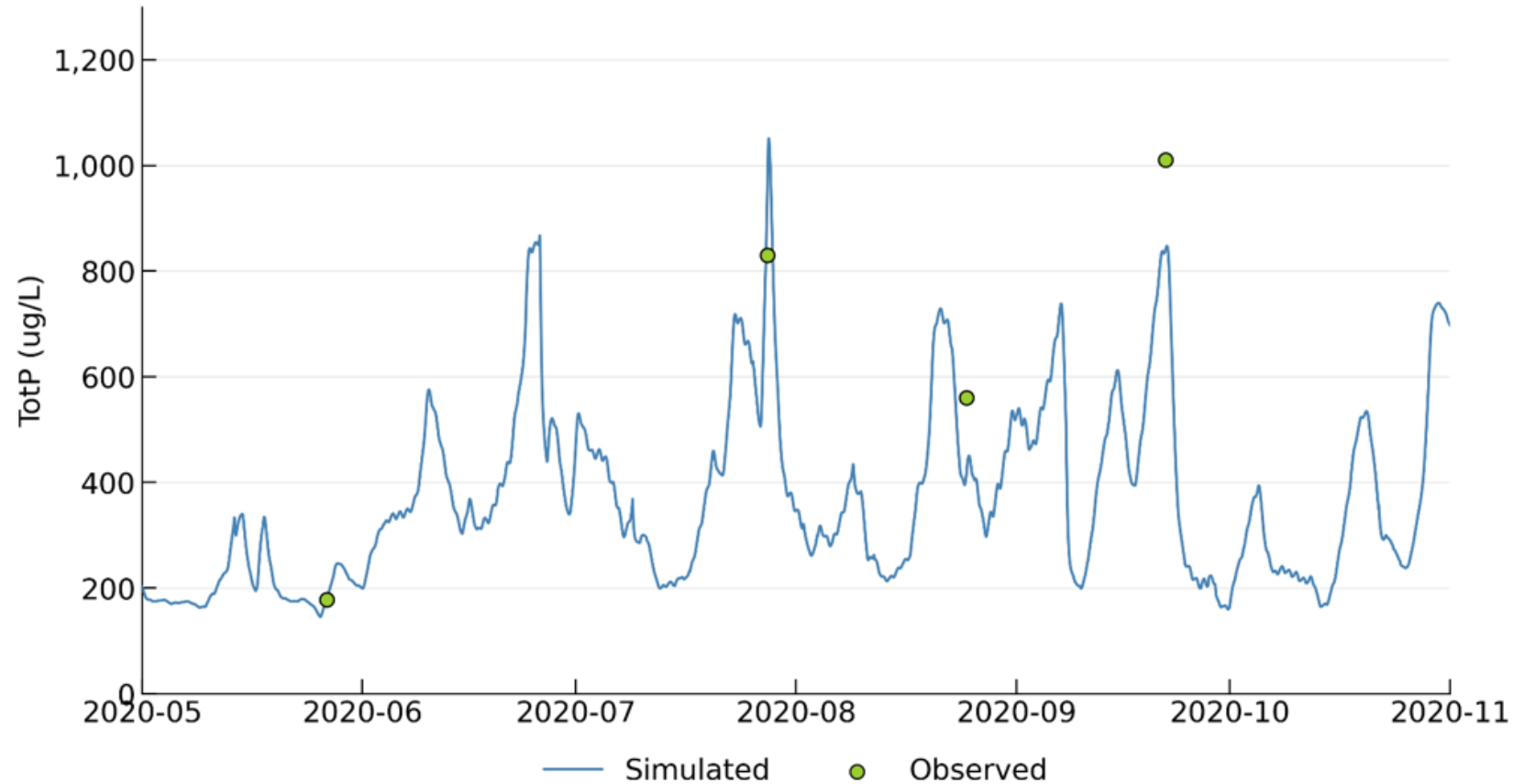
Temperature Calibration

Des Plaines River
at HWY 120
(River Mile: 20.8)



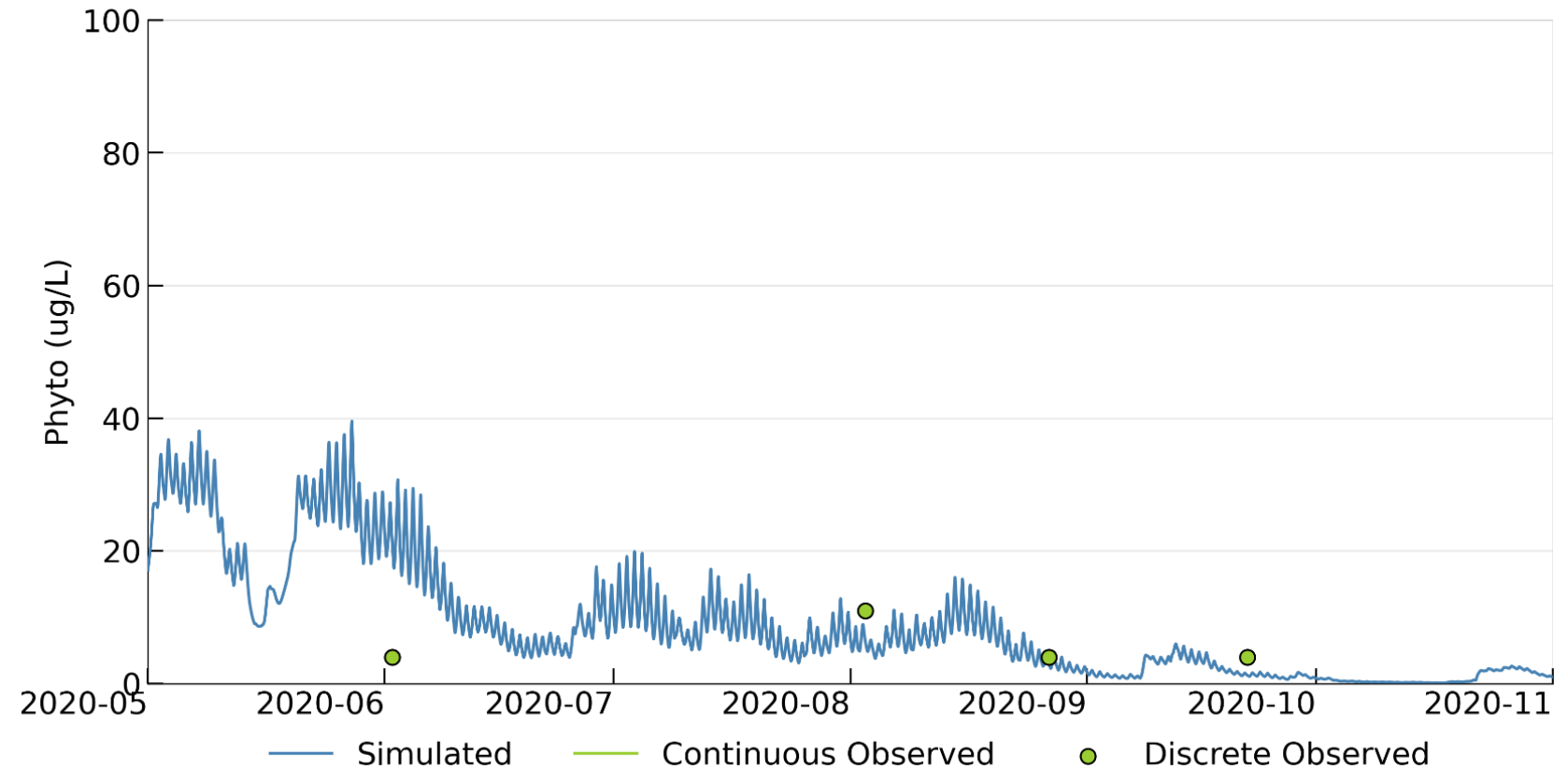
Total Phosphorus Calibration

Des Plaines River
at HWY 120
(River Mile: 20.8)



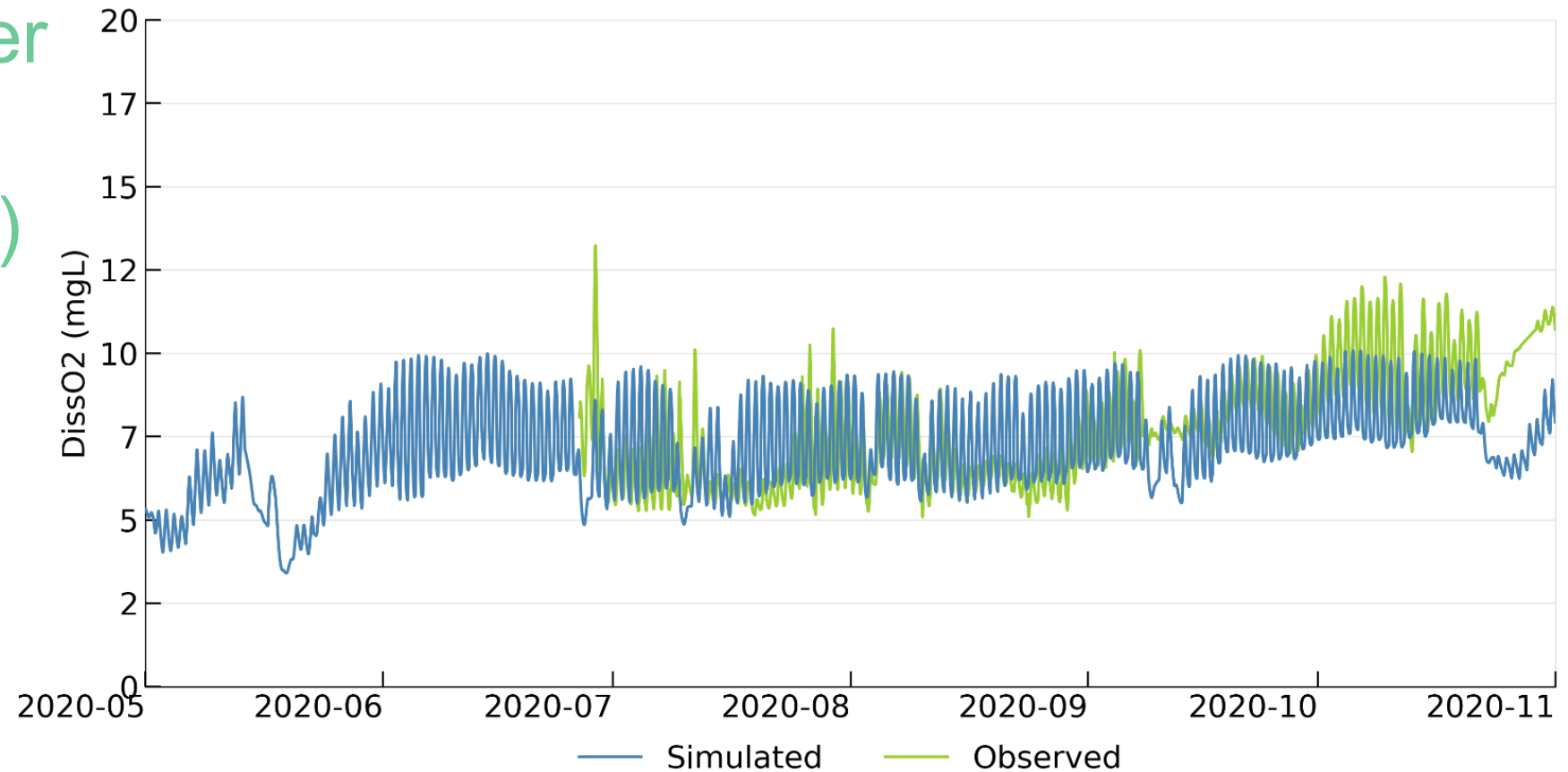
Chlorophyll-a Calibration

Des Plaines River
at Rockland Rd.
(River Mile: 14.4)



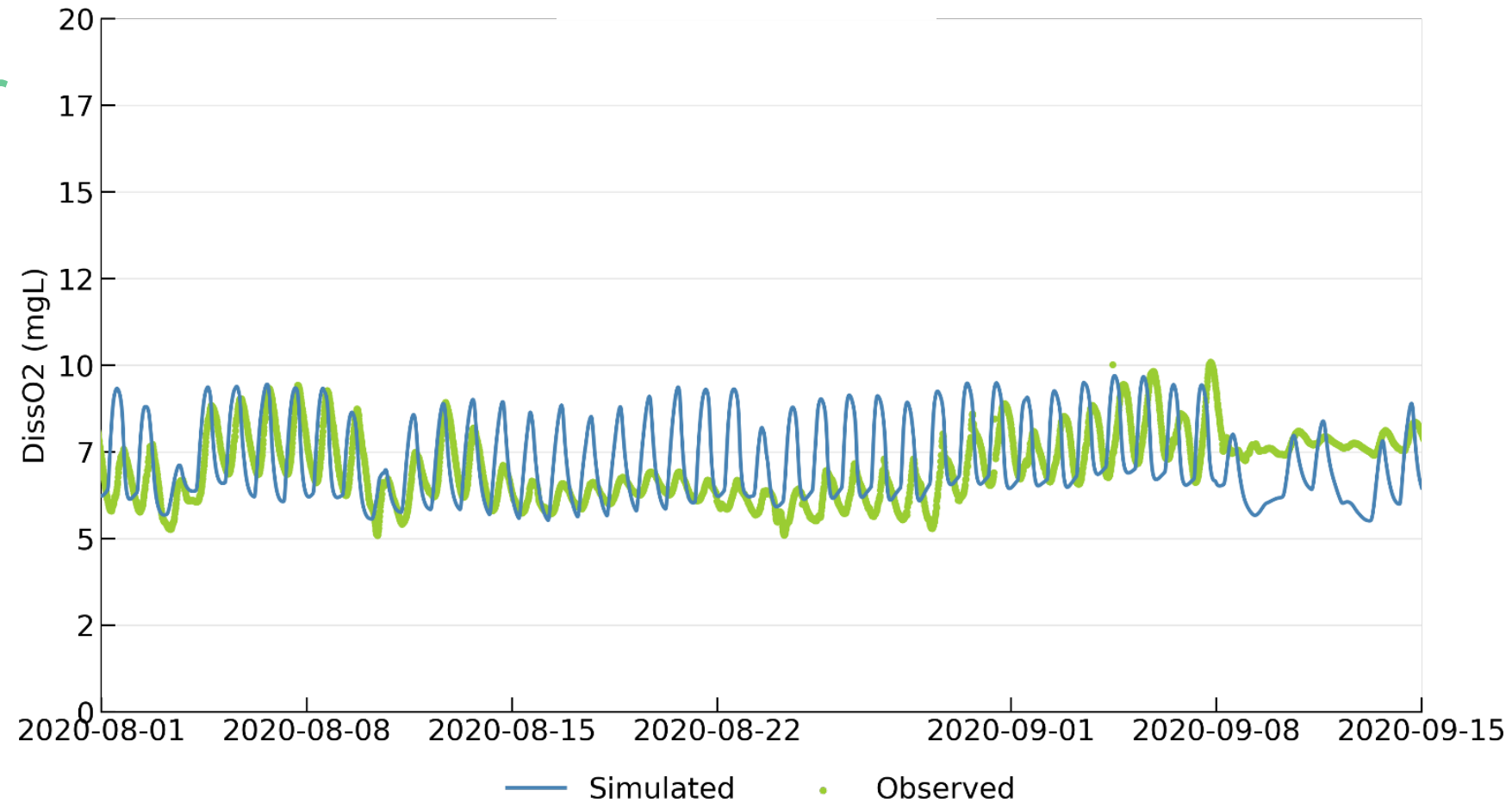
Dissolved Oxygen Calibration

Des Plaines River
at HWY 120
(River Mile: 20.8)



Dissolved Oxygen Calibration

Des Plaines River
at HWY 120
(River Mile: 20.8)



Watershed Management Scenarios

Individual and Combined
Scenarios



Watershed Management Scenarios – Individual Scenarios



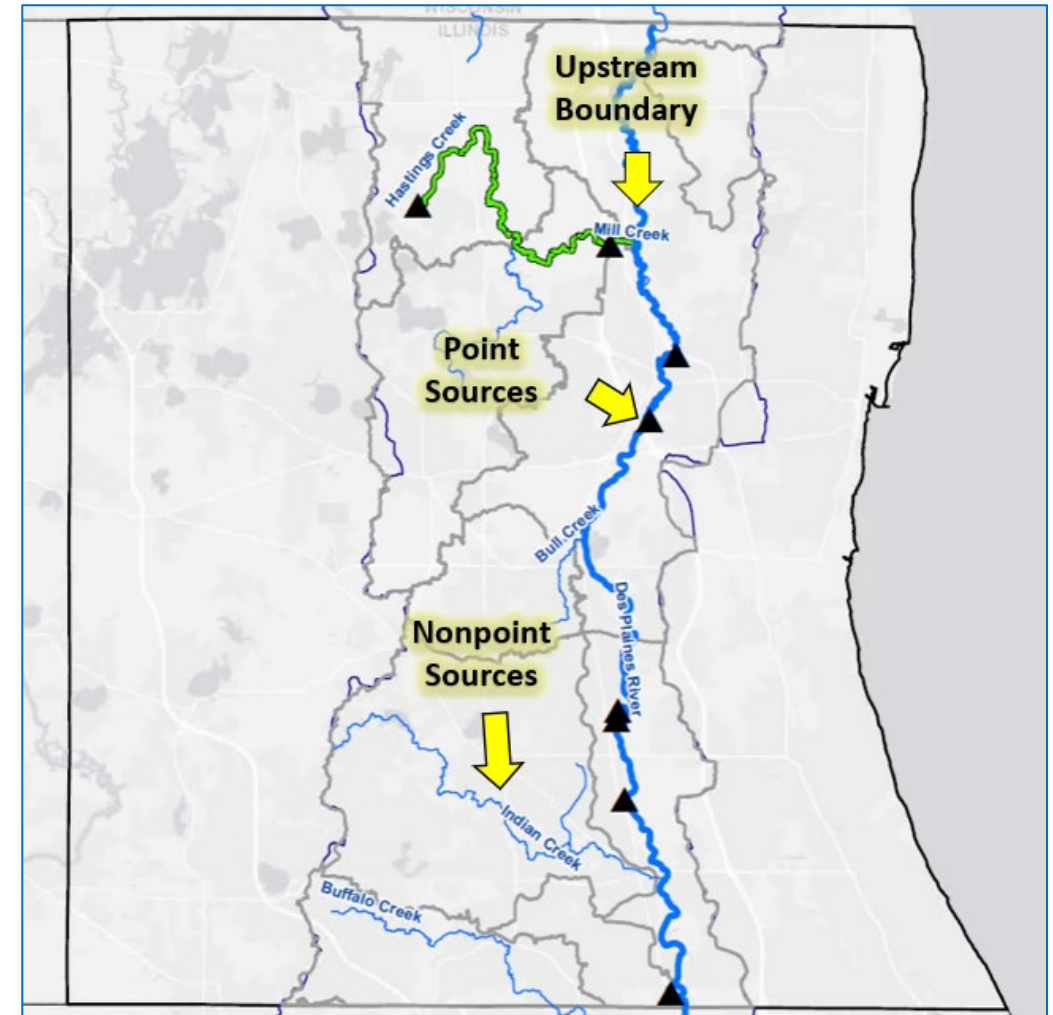
Upstream Load Reduction
75%



Tributary Load Reduction
75%



WWTP Load Reduction
0.5 and 0.1 mg/L



Key Takeaways

Takeaway #1: Upstream TP reduction reduces sestonic Chl-a and improves DO following large flow events

Takeaway #2: Tributary TP reductions reduce sestonic Chl-a but has minimal impact on DO

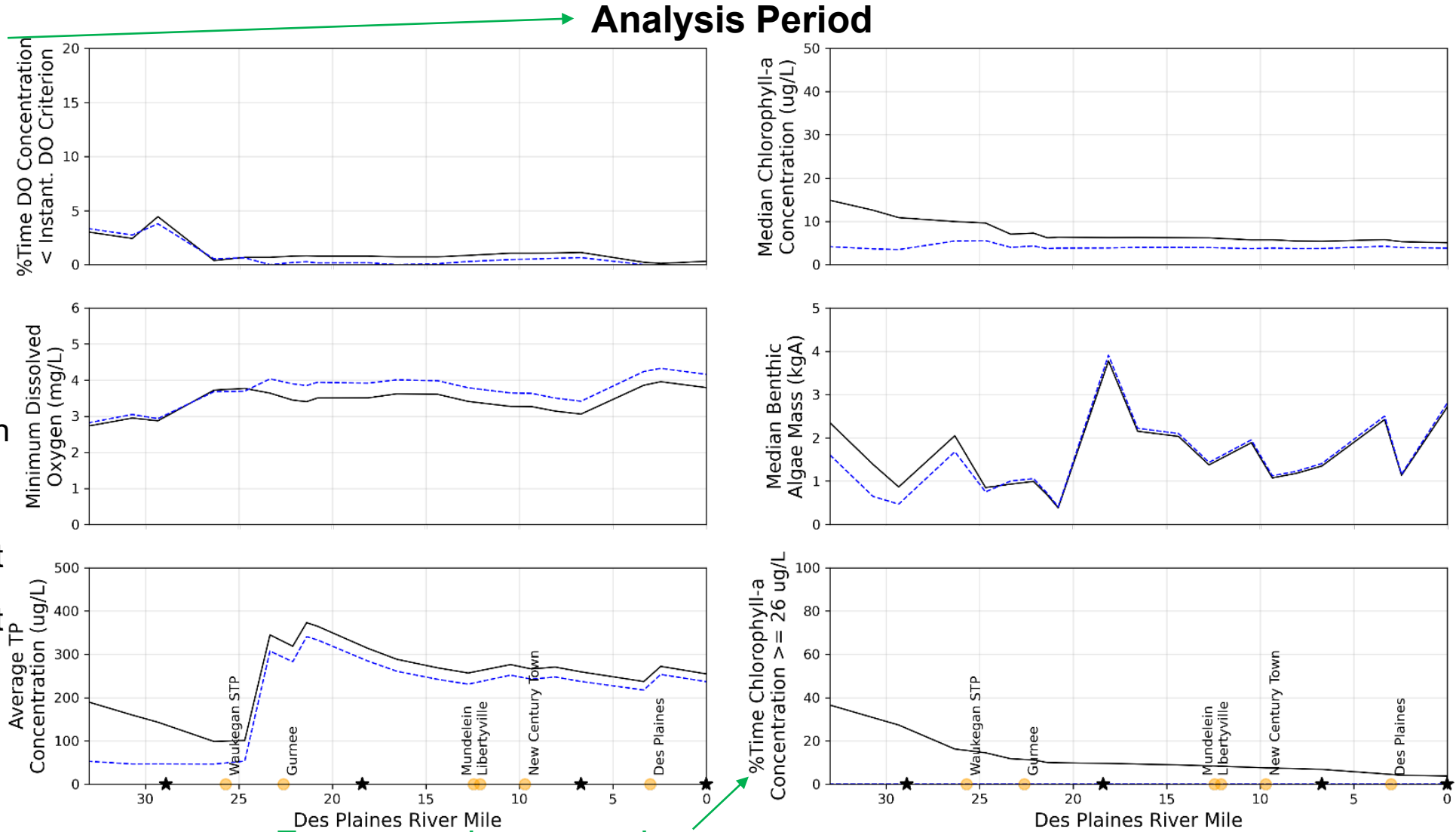
Takeaway #3: POTW TP reductions have minimal impact on water quality



Results Presentation Format

Analysis Period:
Growing season, low
DO period, or high flow
period

- WWTP
- ★ Tributaries
- Baseline
- - - 75% Upstream Reduction
- . - . 75% Nonpoint Reduction
- - - 0.5 mg/L POTWs effluent
- ⋯ 0.1 mg/L POTWs effluent



For comparing scenarios,
not a "threshold"

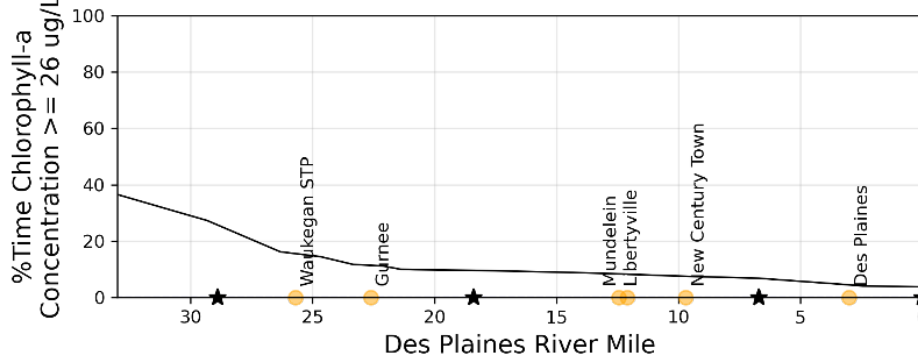
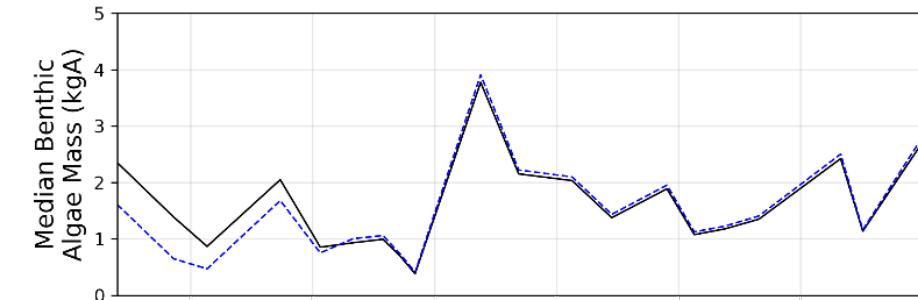
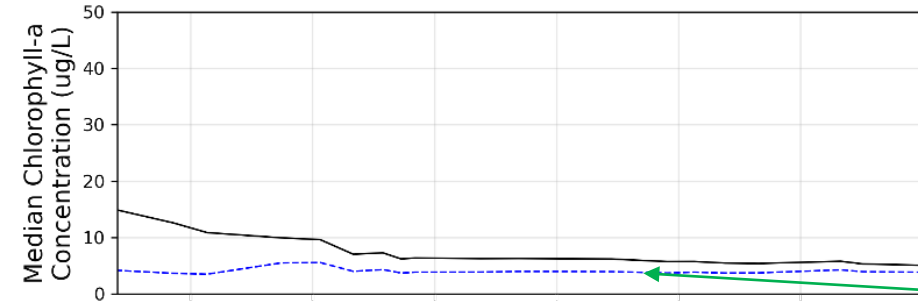
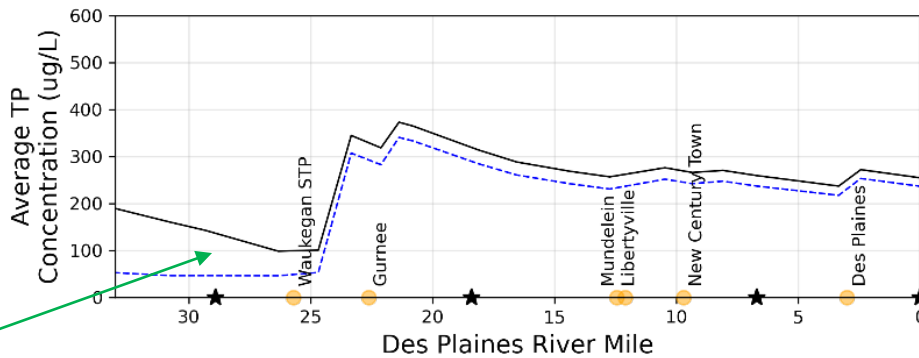
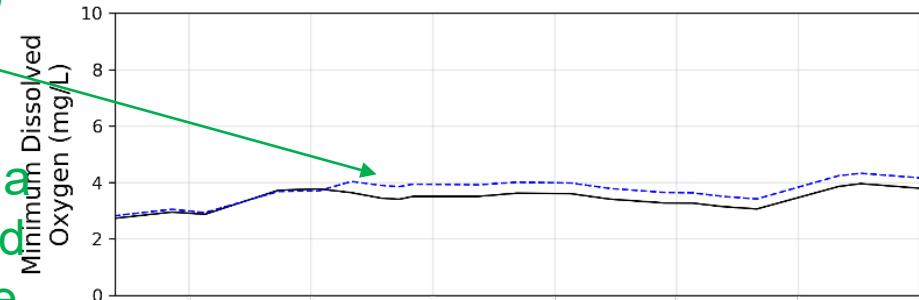
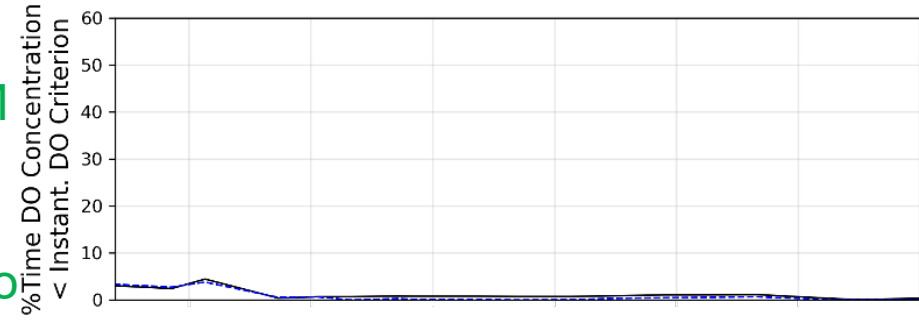
Baseline and 75% Upstream Reduction

Growing Season (May-October 2020)

Improvement in minimum DO after RM 25 following large wet events due to reduced DO swings with reduced upstream Chl-a and increased benthic algae

Reduction in TP due to reduction in upstream TP

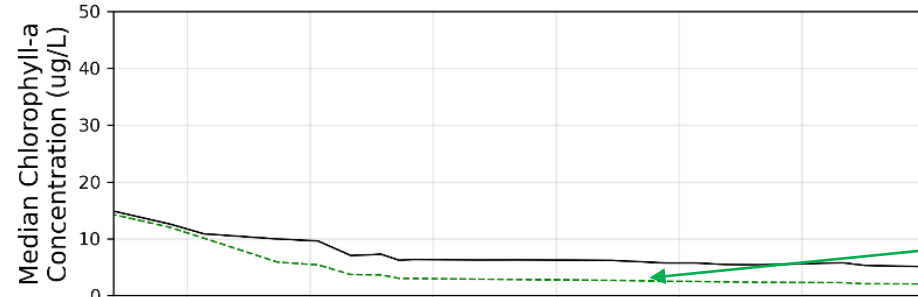
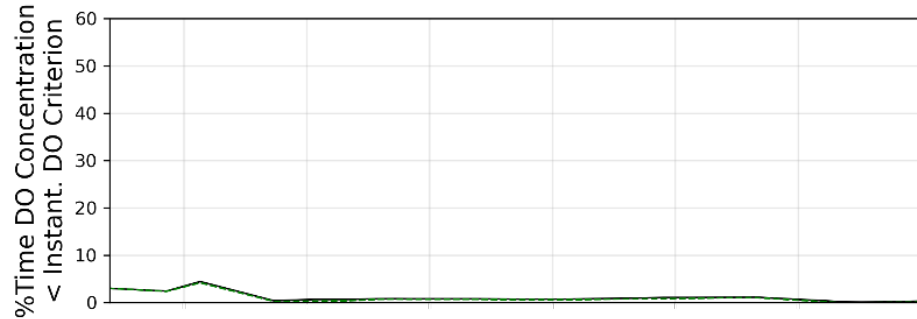
Reduction in Chl-a, due to reduction in upstream Chl-a boundary



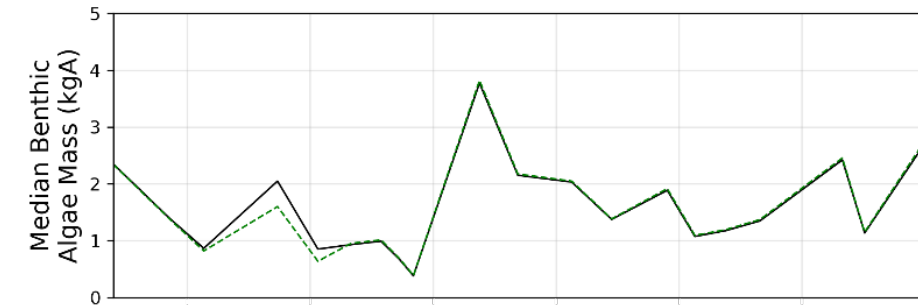
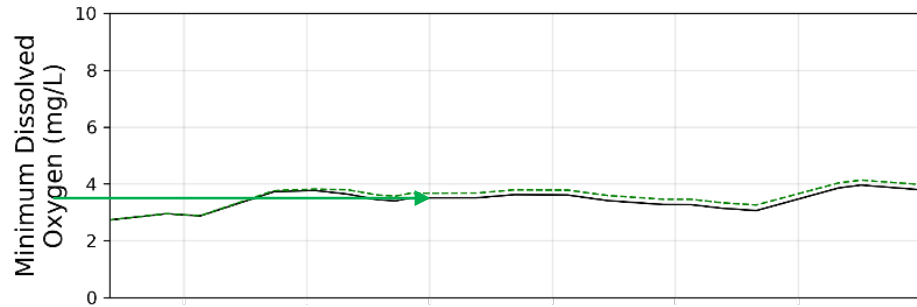
— Baseline - - - 75% Upstream Reduction ★ Tributaries ● WWTPs

Baseline and 75% Nonpoint Reduction – Longitudinal

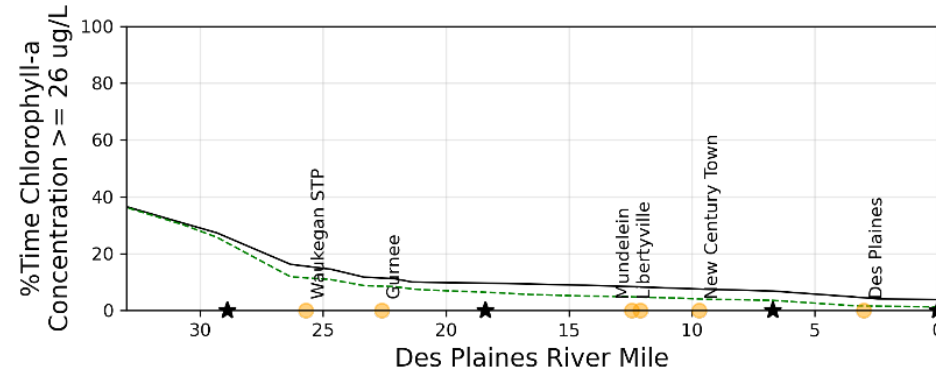
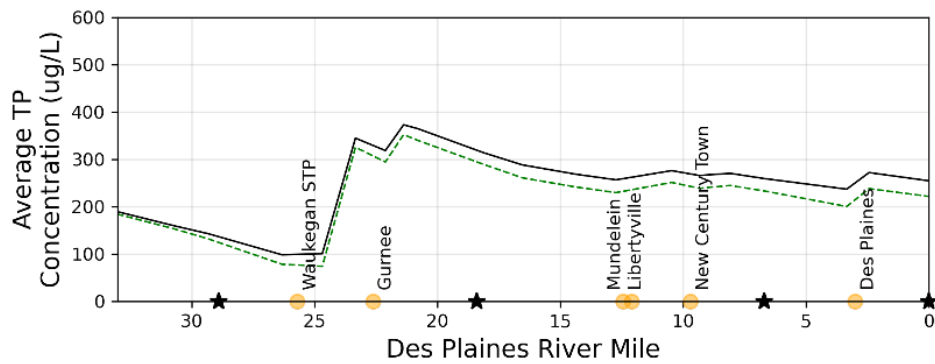
Growing Season (May-October 2020)



Slight reduction in Chl-a due to reduced nonpoint sources Chl-a and TP



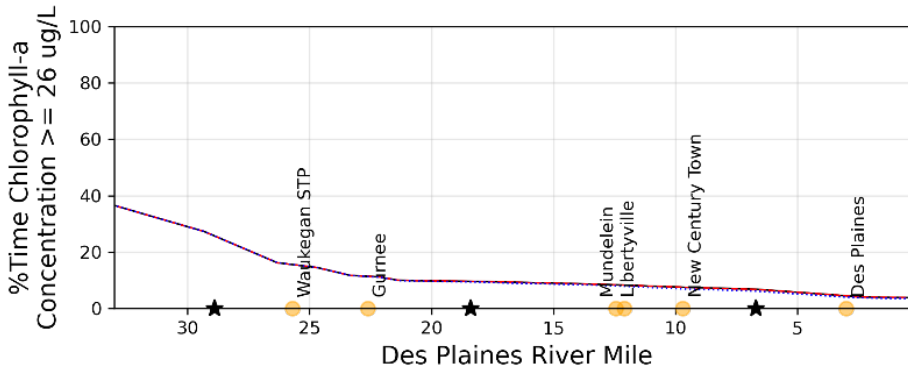
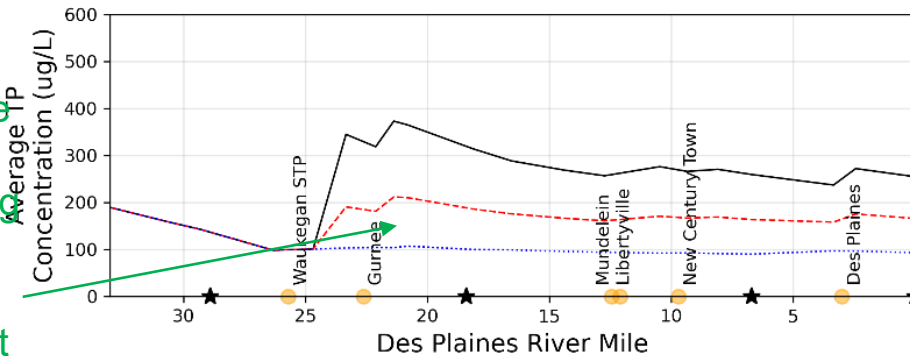
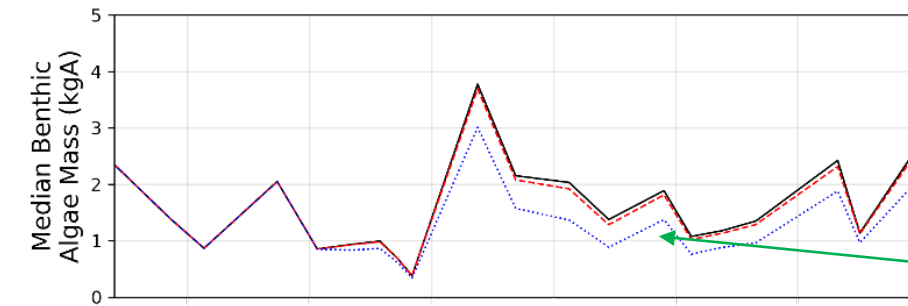
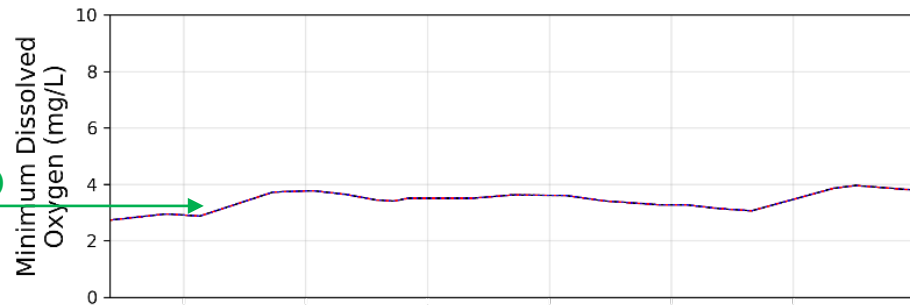
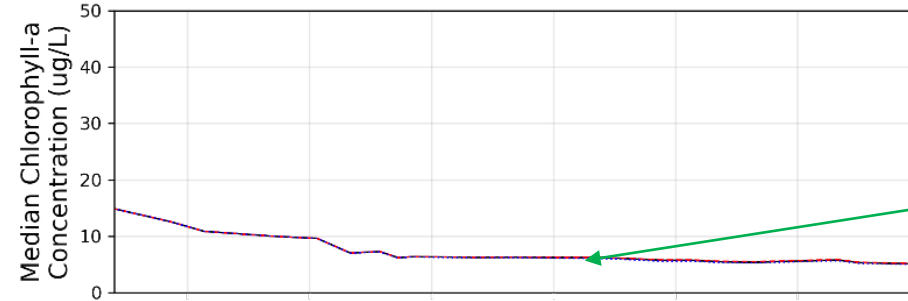
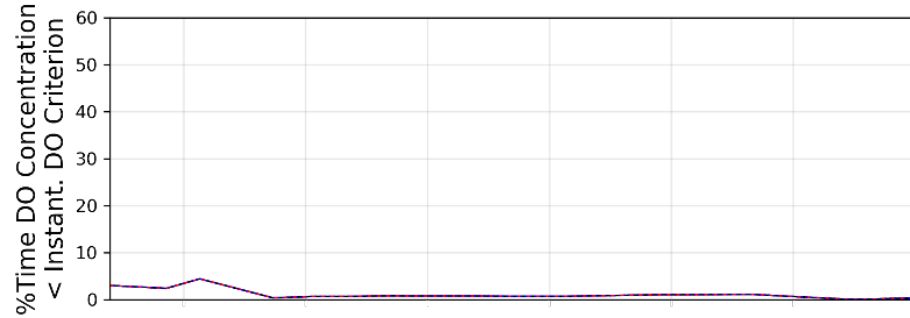
No significant impact on DO



— Baseline - - - 75% Nonpoint Sources Reduction ★ Tributaries ● WWTPs

Baseline and POTW Reductions – Longitudinal

Growing Season (May-October 2020)



— Baseline - - - 0.5 mg per L Effluent ····· 0.1 mg per L Effluent ★ Tributaries ● WWTPs

Next Steps

Documentation and
Implementation Plan

NARP Next Steps

- Run additional scenarios based on Monitoring Committee
- Present the NARP progress to Illinois EPA
- Document the modeling setup, calibration, and management scenarios in a NARP report chapter
- Develop a NARP Implementation Plan





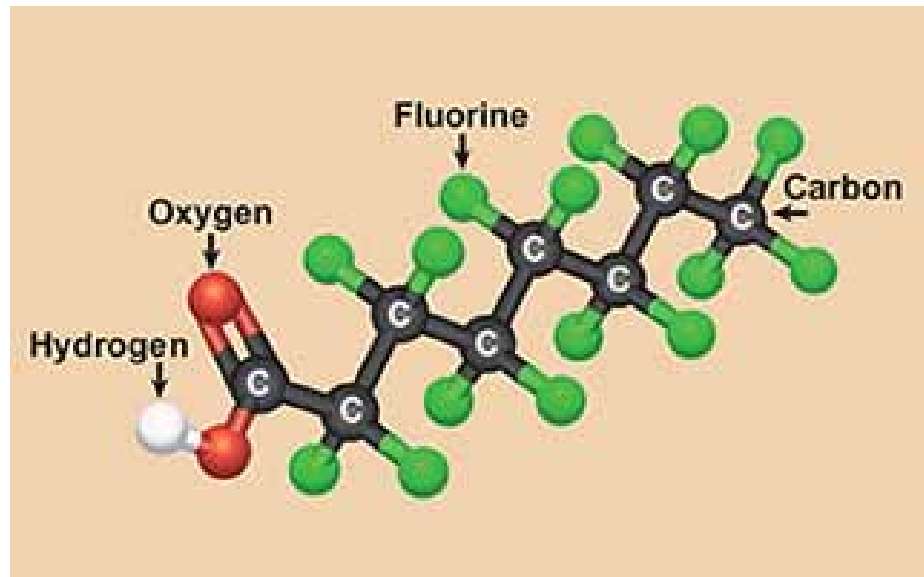
PFAS: SCIENCE, ENGINEERING, AND PUBLIC POLICY

DRWW General Membership Meeting
Feb. 16, 2023

Adrienne Nemura
734.476.0357
anemura@Geosyntec.com

OVERVIEW

History & Background
PFAS Health Effects & Criteria
Sampling & Laboratory Techniques
Treatment Challenges
Regulatory Actions



<https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm>

HISTORY & BACKGROUND

PER- AND POLYFLUOROALKYL SUBSTANCES

Group of manufactured chemicals

- One of strongest bonds (carbon-fluorine) in organic chemistry
- Resistant to fire, degradation

Used in industry & consumer products since 1940s – polymers, surfactants, lubricants, etc.

Ambiguous and conflicting definitions

- EPA's master list has 12,000*
- Includes other fluorinated organic compounds (pesticides, pharmaceuticals , veterinary drugs)**
 - Lipitor, Prozac, Flonase, Pavloxi

* <https://comptox.epa.gov/dashboard/chemical-lists/pfasmaster>

** [Fluorinated Compounds \(mass.gov\)](https://www.mass.gov/info-details/fluorinated-compounds)



PERFLUOROOCTANOIC ACID (PFOA)



Keeps coatings like Teflon from clumping
Animal and human health impacts studied since the 1960s

1998 call to corporate attorney by his grandmother's neighbor about his cattle in Parkersburg, WV*

Required a 2000 Court Order to obtain studies

Epidemiological study of 70,000 people (exposed for decades) links to diseases

Dupont ceases production and use of PFOA in 2013

http://www.nytimes.com/2016/01/10/magazine/the-lawyer-who-became-duponts-worst-nightmare.html?_r=0

* <https://www.chicagotribune.com/news/environment/ct-pfas-history-20220710-iqrm53d4qrtd3dzbxr5exvvfli-htlstory.html>

PERFLUOROOCTANESULFONIC ACID (PFOS)

Key ingredient in Scotchguard

PFOS and PFOA used to make aqueous film forming foam (AFFF)

3M had documented adverse effects in animals in 1970s – did not pursue findings of PFAS in breast milk of animals or elevated rates of prostate cancer in factory workers

2002 – Minnesota Pollution Control Agency

- Requests MDH develop Health Based Values* for PFOA (700 ng/L) and PFOS (100 ng/L)
- Extensive investigation at 3M Cottage Grove manufacturing facility in Twin Cities

2018 - State settles with 3M for \$850M

Chemical	Revised Minnesota HBV (ng/L)	Year
PFOA	35	2017
PFOS	15	2019
PFHxS	47	2019
PFHxA	200	2021
PFBS	100	2022
PFBA	7	2022

* Lifetime drinking water source

[History of MDH Activities - Per- and Polyfluoroalkyl Substances \(PFAS\) - MN Dept. of Health \(state.mn.us\)](#)

New Hollywood film 'Dark Waters' highlights the shocking reality of PFAS pollution

February 4, 2020 By Eleanor Hawke



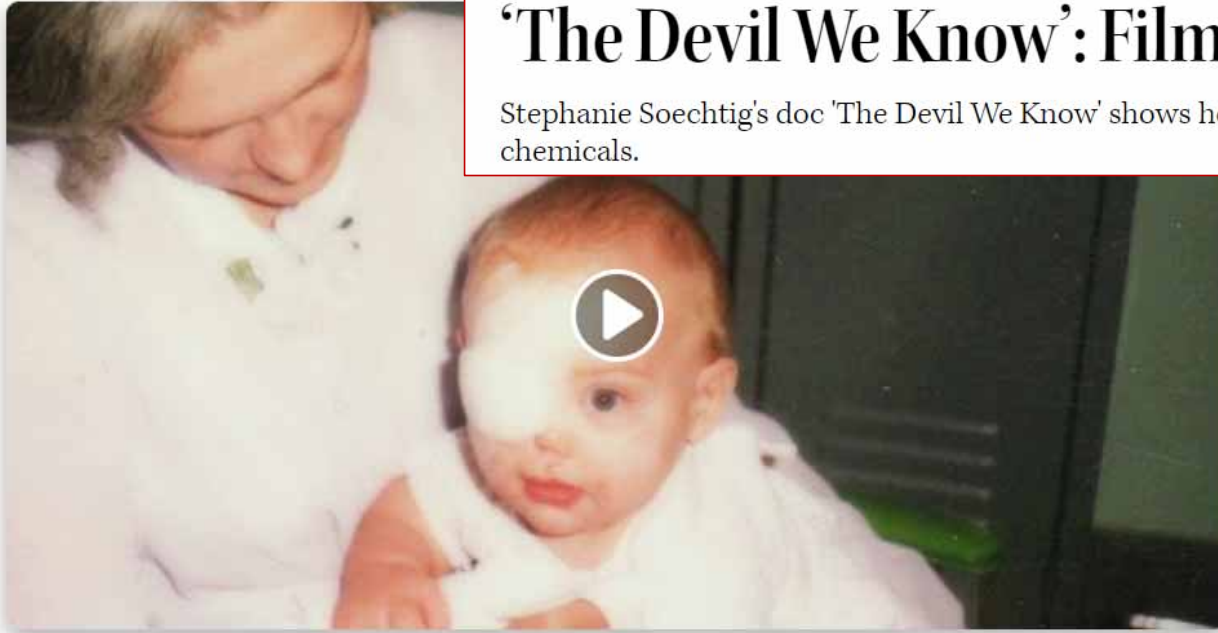
Dark Waters is the most important American film in a decade, although it squanders an opportunity to fully portray PFAS* contamination as the nationwide human health epidemic it has become. The film leaves out half of the story and that involves the military's role.



A new Hollywood film 'Dark Waters' highlights the dire reality of pollution from harmful PFAS chemicals and the urgent need for strong, protective legislation to protect human health and the environment.

'The Devil We Know': Film Review | Sundance 2018

Stephanie Soechtig's doc 'The Devil We Know' shows how 3M and DuPont have made billions by exposing us to toxic chemicals.



THE
Hollywood
REPORTER



THE DEVIL WE KNOW

2018, Documentary, 1h 35m



100%

TOMATOMETER
7 Reviews



89%

AUDIENCE SCORE
100+ Ratings

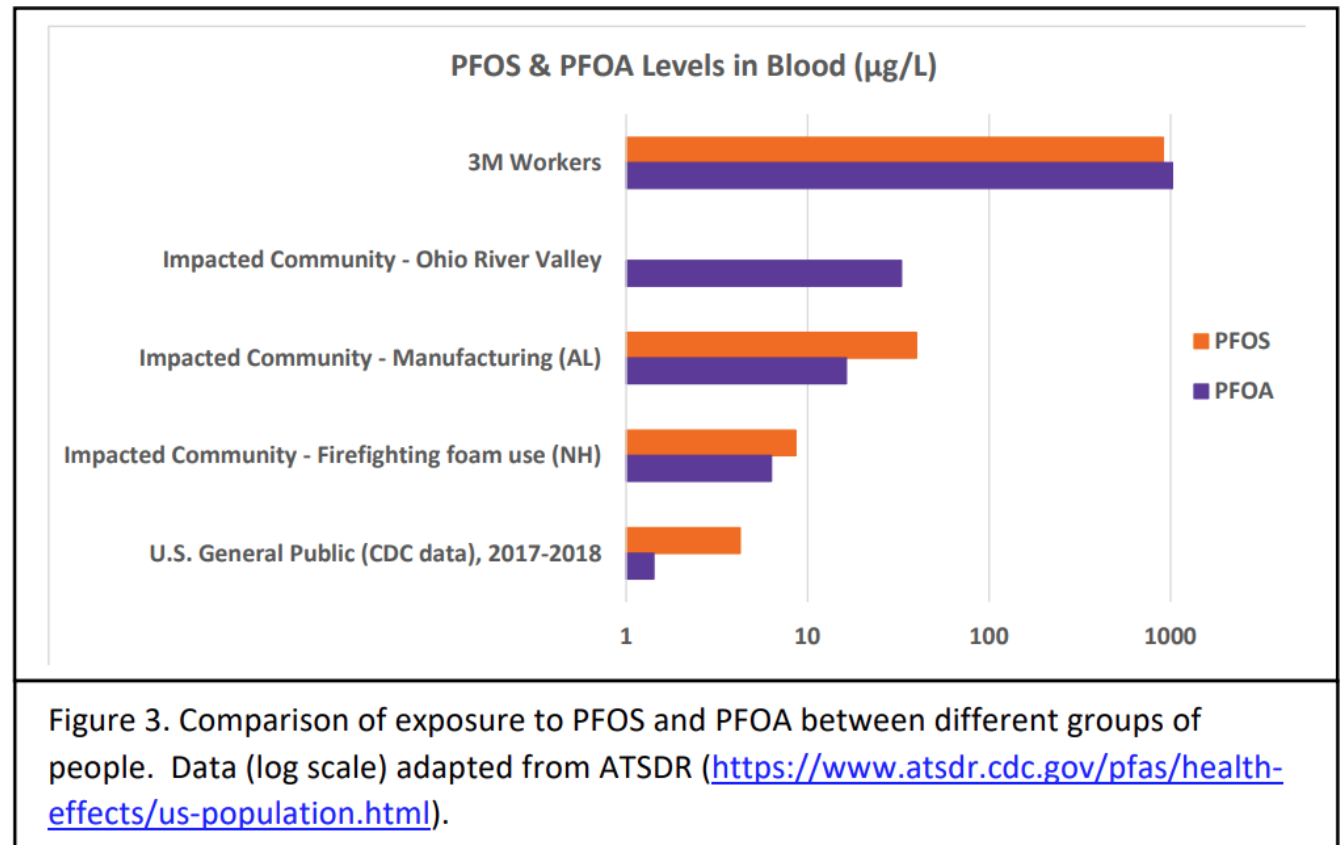
PFAS HEALTH EFFECTS & CRITERIA

PFAS SCIENCE IS “FULL OF UNCERTAINTIES AND INCONSISTENT INTERPRETATIONS BY SCIENTISTS”

PFOA may be associated with kidney and testicular cancer

PFOS and PFOA may be associated with

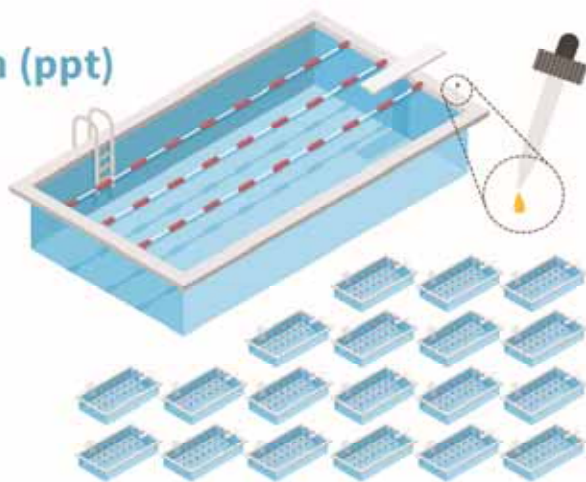
- Increased cholesterol
- Decreased vaccine response for children
- Kidney disease



1 part per trillion (ppt)

IS EQUIVALENT TO A
SINGLE DROP OF
WATER IN

**20 olympic-sized
swimming pools**



<https://www.michigan.gov/-/media/Project/Websites/PFAS-Response/Images/PPT-Swimming-Pool.pdf?rev=5104c6f80cc74cf79fcb5e2add3c9088>



If you were 31.8 million years old, 1 part per quadrillion (ppq) or a picogram per liter is equivalent to a blink.

CHANGING (AND LOW) TARGETS & CRITERIA

USEPA HAs
 PFOA = 0.004
 PFOS = 0.020
 HFPO-DA = 10
 PFBS = 2,000

State	PFOA	PFOS	PFHxS	PFHxA	PFBS	PFBA	PFNA	PFHpA	HFPO-DA
CA	10	40			5,000				
MA	20	20	20				20	20	
MI	8	16	51	400,000	420		6		370
MN	35	15	47	200	100	7			
NH	12	15	18				11		
NJ	14	13					13		
NY	10	10							
PA	14	18							
RI	20	20	20						
VT	20	20	20				20	20	
WA	10	15	65		345		9		

Table is promulgated for drinking water

All concentrations are ppt (or ng/L)

- THE US EPA LIFETIME DRINKING WATER HEALTH ADVISORIES FOR PFOS AND PFOA ARE OFTEN LOWER THAN THEIR RESPECTIVE LEVELS IN RAINWATER AND THE DANISH DRINKING WATER LIMIT VALUE FOR $\Sigma 4$ PFAS IS ALSO OFTEN LOWER THAN THE LEVEL OF $\Sigma 4$ PFAS IN RAINWATER
- THE EUROPEAN UNION (EU) ENVIRONMENTAL QUALITY STANDARD (EQS) FOR PFOS FOR FRESHWATERS IS OFTEN LOWER THAN LEVELS IN RAINWATER
- THE CYCLING OF PFAAs IN THE WORLD'S HYDROSPHERE MEANS THAT LEVELS OF PFAAs IN RAINWATER WILL BE PRACTICALLY IRREVERSIBLE

Outside the Safe Operating Space of a New Planetary Boundary for Per- and Polyfluoroalkyl Substances (PFAS)

Ian T. Cousins,* Jana H. Johansson, Matthew E. Salter, Bo Sha, and Martin Scheringer

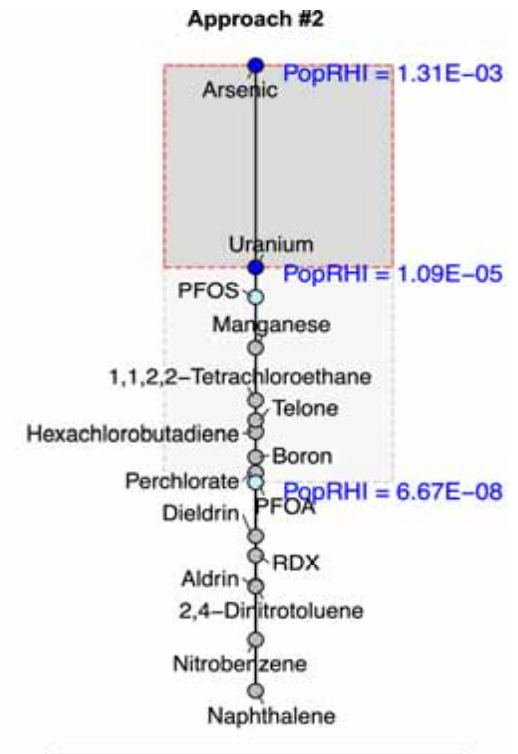
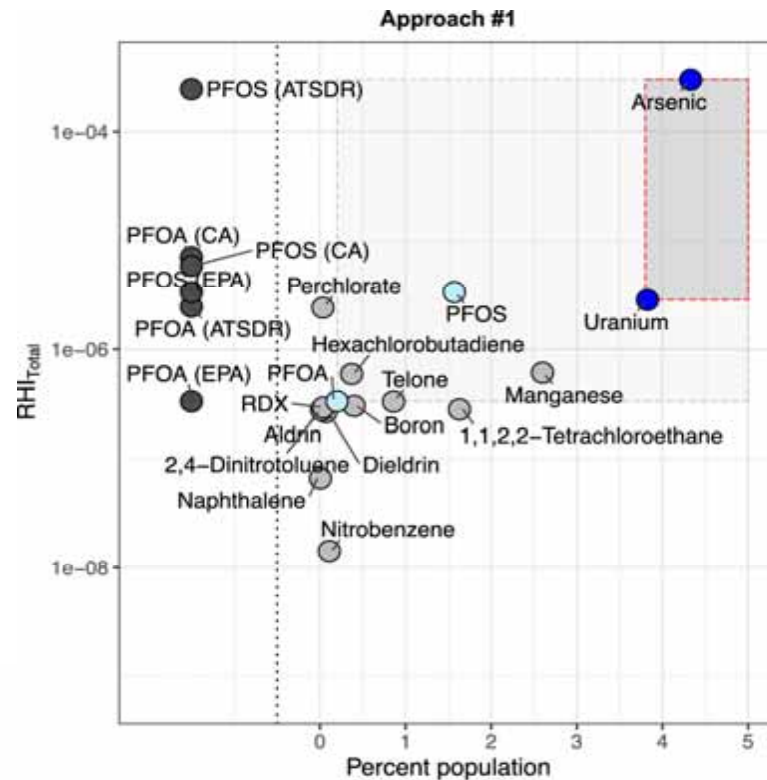
Cite This: <https://doi.org/10.1021/acs.est.2c02765>

Read Online

PFAS (ng/L)	USEPA HAs	Tibetan Rain	Antarctic Rain
PFOA	0.004	0.055	0.22
PFOS	0.020	0.005	0.106

Does regulating per- and polyfluoroalkyl substances represent a meaningful opportunity for health risk reduction?

If PFOA & PFOS were present in 100% of our drinking water systems, levels of 227 ng/L PFOS and 2295 ng/L PFOA would be needed to exceed the minimum threshold of percent population to justify “meaningful opportunity”



Regulatory Determination: ● Positive ● Do not regulate ● PFAS ● Alternative PFAS values



EMERGING CONTAMINANT ARTICLE | Open Access

Does regulating per- and polyfluoroalkyl substances represent a meaningful opportunity for health risk reduction?

Katherine Alfredo, Chad Seidel, Amlan Ghosh

First published: 14 September 2021 | <https://doi.org/10.1002/aws2.1240> | Citations: 1

[Chemical & Engineering News: Letter to the Editor of PFAS Drinking Water Advisories - Water & Health Advisory Council \(wateradvisory.org\)](#)

- Debate on study EPA relied on
- Advisories' credibility is doubtful
- Misdirecting drinking-water priorities and expenditure
- Serious peer review is essential

Everyone agrees that per- and polyfluoroalkyl substances (PFAS) are environmentally and biologically persistent and should be managed. Exposures occur from many sources, including household products and fabrics, some foods, and food contact containers. Their manufacture, uses, and exposures are being reduced by company and government agreements from the early 2000s. Human blood levels of PFOA and PFOS in the US are more than 70–85% less than they were in 1999. Some drinking waters are exposure sources, usually at low parts per trillion, especially some groundwaters, where they may persist for many years.

The EPA's calculations are based partly on a study in the Faeroe Islands with an inverse relationship between child blood levels and antibody titers for diphtheria and tetanus. There is debate on the study's applicability. Even if the finding is valid, the US Centers for Disease Control and Prevention's data show no relationship with cases in the US. Cases of diphtheria are extremely low. Vaccinations are very effective, so those health advisories are protecting against a nonexistent consequence at high cost.

The advisories' credibility is doubtful, and those unmeasurable numbers raise public concern and result in major expenditures in the over 150,000 public water systems in the US. They also misdirect drinking-water priorities and expenditures that should deal with decaying water distribution systems and water-related legionellosis, a deadly waterborne disease.

The EPA must reexamine its scientific risk assessments and provide a more credible scientific basis for its health advisories. Serious peer review is essential.

SAMPLING AND LABORATORY TECHNIQUES

SAMPLING TECHNIQUES

Avoid

- Clothes washed with fabric softener
- Clothes made or washed with stain resistant chemicals
- Certain insect repellents and sunscreens
- Certain personal care products
- Pre-wrapped food or snacks



Polypropylene (or HDPE)
Trizma® (pH 7)
from qualified lab
Watch carpets & car interiors



Wash hands
Powderless nitrile gloves

Place bottles on PFAS-free surfaces (not the ground)

Bag samples in LDPE resealable storage bags

Decontamination

- Alconox, Liquinox, and Citranox
- PVC brush to remove particles
- Triple rinse with PFAS-free deionized water

USEPA LABORATORY TECHNIQUES

USEPA Method 537 Revision 1.1 (SPE and LC/MS/MS)

- For 18 PFAS in finished drinking water samples

USEPA Method 533 (Isotope Dilution Anion Exchange SPE and LC/MS/MS)

- Isotope dilution method targeting 25 “short-chain” PFAS in finished drinking water samples

USEPA Method 8327 (External Standard Calibration and MRM LC/MS/MS)

- Direct injection method for 24 analytes in groundwater, surface water and wastewater

Draft Method 1633 (3rd draft in Dec. 2022)

- Direct injection method for 40 PFAS in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue (single lab validation)
- EPA and DoD collaborating with a multi-laboratory validation study
- EPA recommending for use in individual NPDES permits

USEPA LABORATORY TECHNIQUES - TOTAL

Method 1621 (multi-laboratory validation ongoing)

- Adsorbable organofluorines in wastewater and surface waters

Total Organic Fluorine (TOF) – in development

- Total PFAS presence and absence

Total Organic Precursors (TOP) – under consideration

- Identify PFAS precursors that may transform to more persistent PFAS
- TOP methods are commercially available

32 accredited labs (including American Water Central Laboratory in Belleville, IL)

TREATMENT CHALLENGES

TREATMENT CHALLENGES

Relied upon technologies focus on PFAS removal, not destruction

- Granulated activated carbon (GAC)
- Ion exchange (IX)
- Reverse osmosis (RO)

Produce a concentrated residual stream that must be treated

- Hazardous waste landfill
- Incineration

No demonstrated in situ treatment technologies



“An under-sink RO filter integrates with the plumbing under your kitchen sink to provide treated drinking water for you and your family. **The concentrated PFAS brine is discharged directly down the drain, so there is not waste to manage or dispose of.**”

REGULATORY ACTIONS

NPDES PROGRAM – USEPA DEC. 5, 2022 MEMO

Quarterly monitoring for 40 PFAS

Best management practices (BMPs) - product substitution, reduction, or elimination of PFAS

BMPs to address firefighting foams for stormwater permits

Technology-based effluent limits (TBELs) based on best professional judgment

Water-quality based effluent limits (WQBELs) including numeric translation of narrative water quality standards

INDUSTRIAL DISCHARGERS (Effluent Limit Guidelines)

- OCPSF (Spr. 2024)
- Metal finishing
- Electroplating (Dec. 2024)
- Electric and electronic components
- Landfills (TBD)
- Pulp, paper, & paperboard (phasing out)
- Leather tanning & finishing
- Plastics molding & forming
- Textile mills (lack of data)
- Paint formulating
- Airports (phasing out)

NPDES PROGRAM – USEPA DEC. 5, 2022 MEMO

For POTWs:

Effluent, influent, and biosolids monitoring

Update industrial user inventories

Use BMPs and pollution prevention

Notify potentially affected public water systems of draft permits with PFAS-monitoring, BMPs, or other conditions

VARIETY OF STATE ACTIONS

Maine – statewide ban on biosolids application

Michigan – organized MPART – statewide sampling of influent, effluent, biosolids

Led to “industrially impacted” approach

Focus on source reduction and restricting biosolids application when necessary

California – statewide sampling of targeted industries

Illinois – initiating discussion with Illinois Association of Wastewater Agencies

Consideration of drafting model NPDES permit language

Begin sampling of major municipal and industrial wastewater treatment plants

“McKinsey analysis suggests that new PFAS requirements could lead to a threefold increase in PFAS-related annual capital spending between 2021 and 2025.”

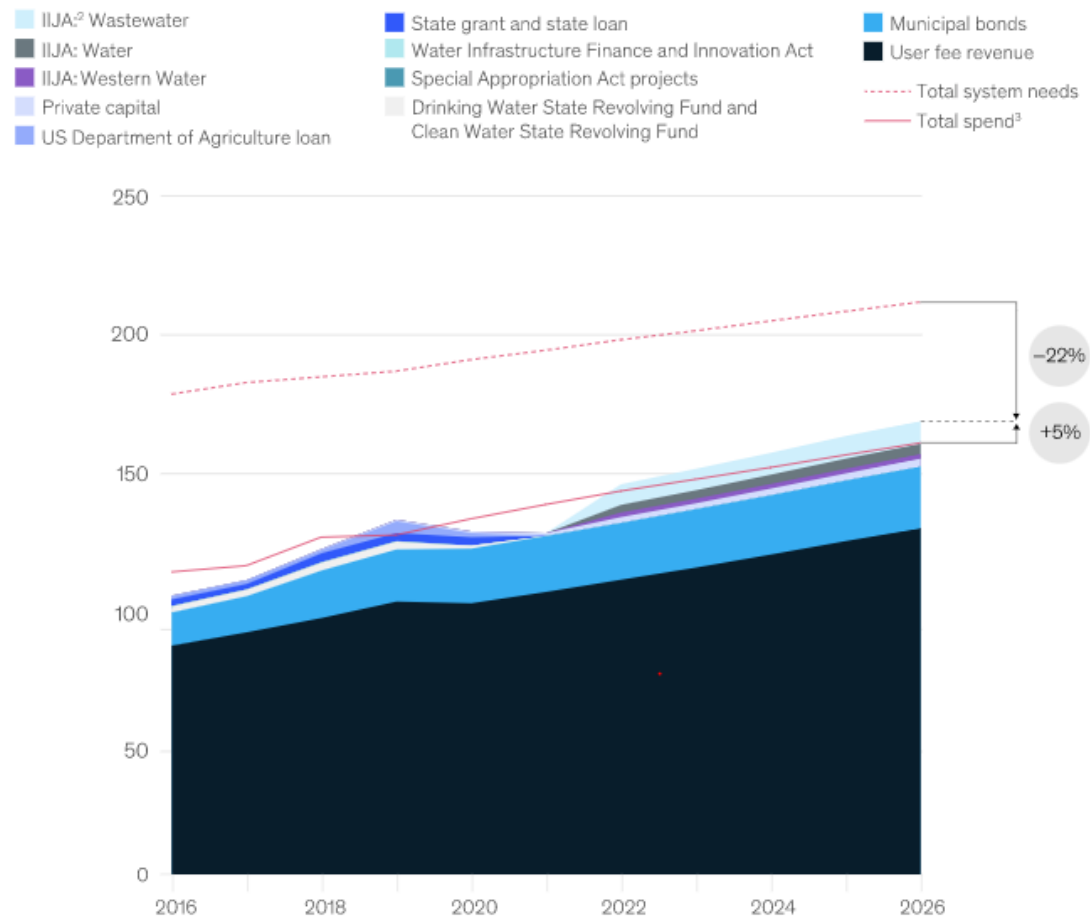
OTHER FUNDING NEEDS:

- Lead and copper rule
- Fixing water leaks
- Cybersecurity
- Combined sewer overflows
- Nutrients
- Climate resilience

<https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/us-water-infrastructure-making-funding-count>

A fivefold increase in federal funding would raise total funds in the industry by about 5 percent in the short term, but funding would still fall 22 percent short of the necessary capital.

Water and wastewater funding sources by year,¹ \$ billions





THE ROANOKE TIMES
Monday, September 20, 2004



STEPHANIE KLEIN-DAVIS | The Roanoke Times

Mellisa Williamson, 35, a Bullitt Avenue resident, worries about the effect on her unborn child from the sound of jackhammers.

TRAFFIC: Official says
wait for end result

EXTRA SLIDES

SMOLDERING

Low-cost / energy thermal technique to treat contaminated soils and media

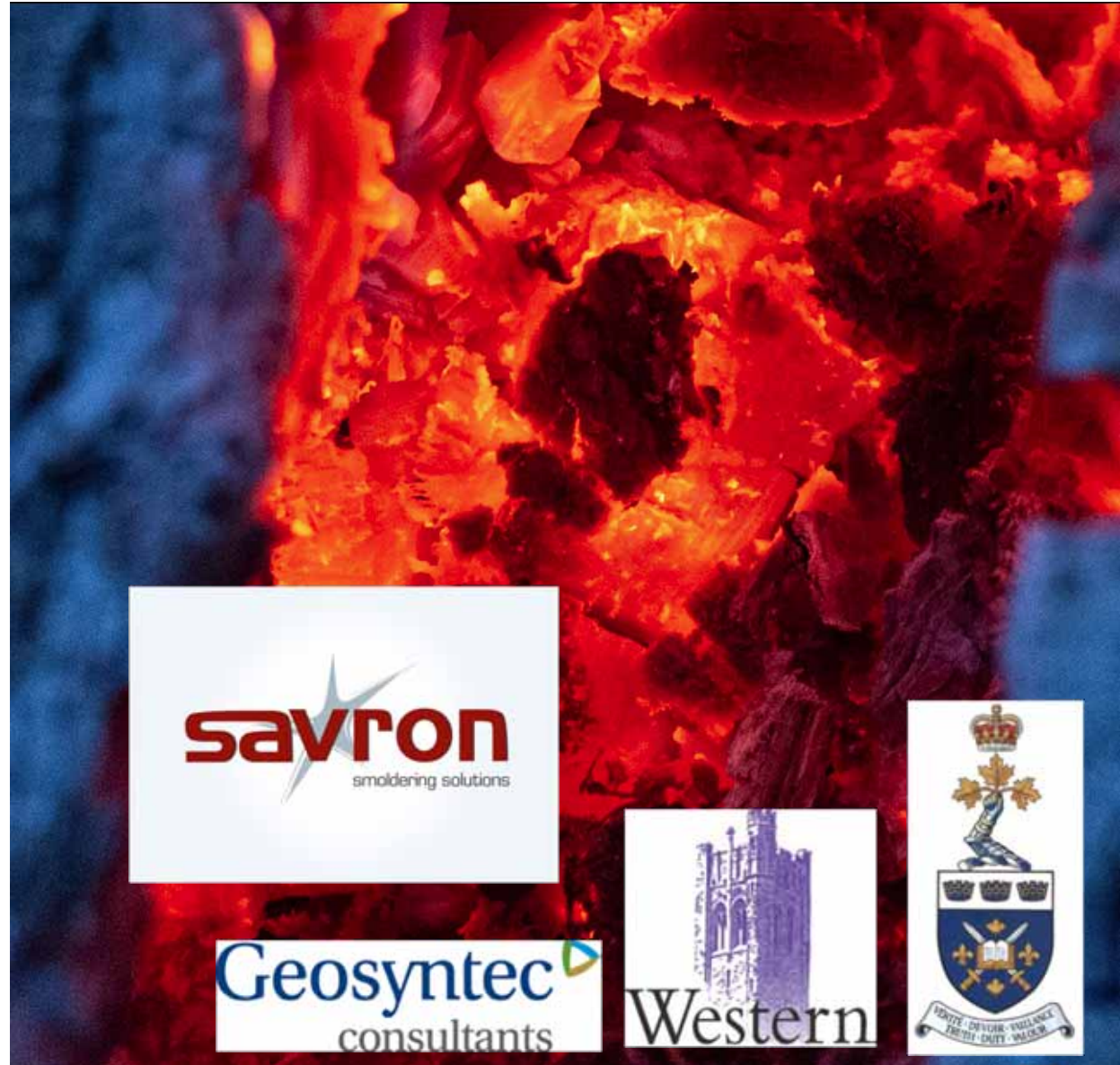
- Temperatures > 700°C
- Use GAC to support



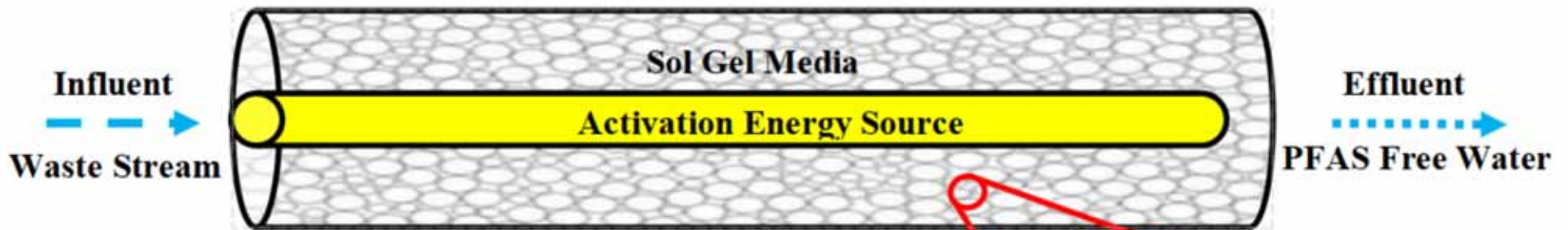
[Demonstration of Smoldering Combustion Treatment of PFAS-impacted Investigation-Derived Waste \(serdp-estcp.org\)](https://serdp-estcp.org)

[Innovations – Savron \(savronsolutions.com\)](https://savronsolutions.com)

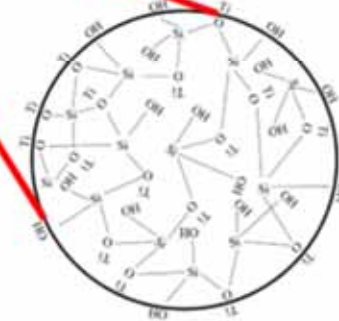
GEOSYNTEC CONSULTANTS



ULTRA-VIOLET ACTIVATION WITH STABLE PHOTOCATALYST



Relatively low energy, low cost for PFOS (50 mg/L in 30 minutes)



Theorized Media Structure