

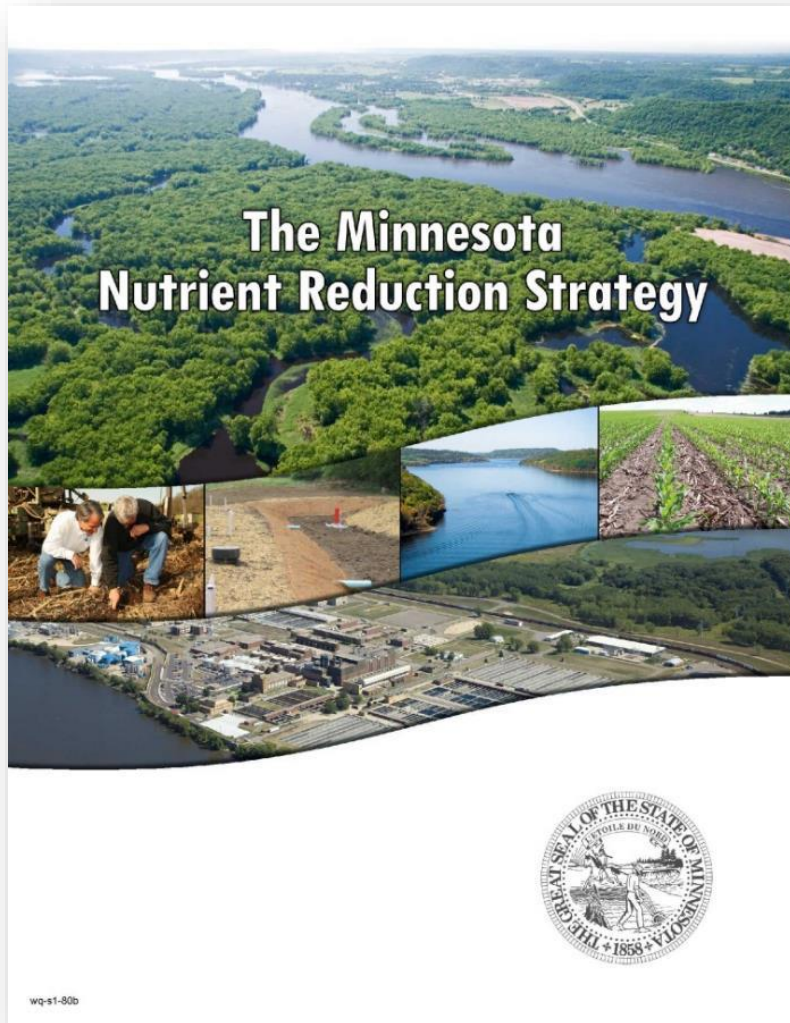


Reducing Nutrients in Minnesota,
Cross-Program Coordination

Steve Weiss | Supervisor, Watershed Analysis and Modeling Unit

6/6/2024

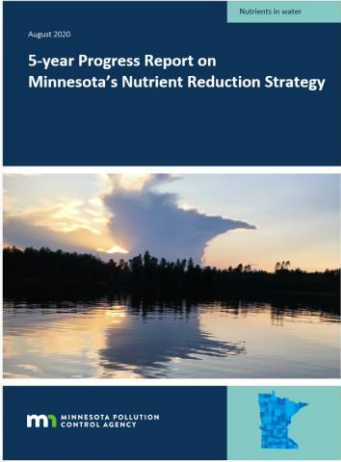
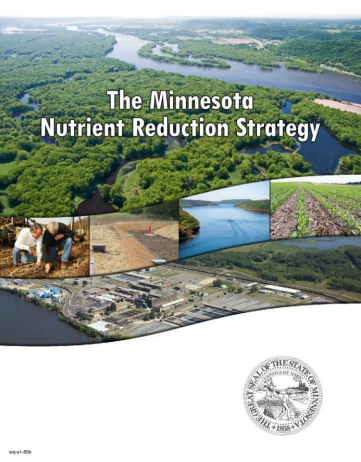
Minnesota Nutrient Reduction Strategy finalized in 2014 by 11 organizations



- Nutrient conditions in MN waters
- Causes and sources
- Goals
- Science-based solutions/practices
- Magnitude of changes on land
- Specific strategies to promote/advance
- Ways to track progress toward goals



NRS timeline



mi

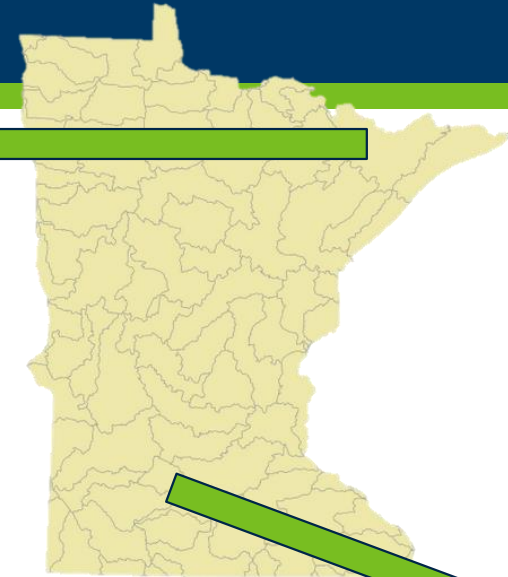
2025
Revised strategy

Headwaters state for three major drainages to oceans Phosphorus & total nitrogen load reduction needs



Wilderness, cities, and...a big ag state

Boundary Waters Canoe Area (BWCA)



Nationwide

- #4 corn
- #3 soy bean
- #2 hog
- #1 turkey



Nutrient Standards (TP/NO₃)

Phosphorus eutrophication standards

Cause (TP) and response (Chl-a) variables

Lake Eutrophication Standards

		TP (ug/L)	Chl-a (ug/L)	Secchi (m)
Northern Lakes and forest		30	9	2.0
North Central Hardwood Forest	deep	40	14	1.4
North Central Hardwood Forest	shallow	60	20	1.0
Western Cornbelt Plains	deep	65	22	0.9
Western Cornbelt Plains	shallow	90	30	0.7

2008

River Eutrophication Standards

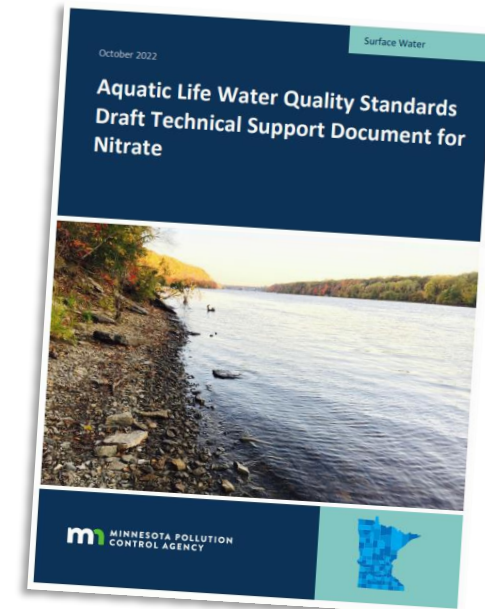
	TP (ug/L)	Chl-a (ug/L)	Diel DO Flux (mg/L)	BOD5 (mg/L)
North	50	7	3	1.5
Central	100	18	3.5	2
South	150	40	4.5	3

2014

Nitrate

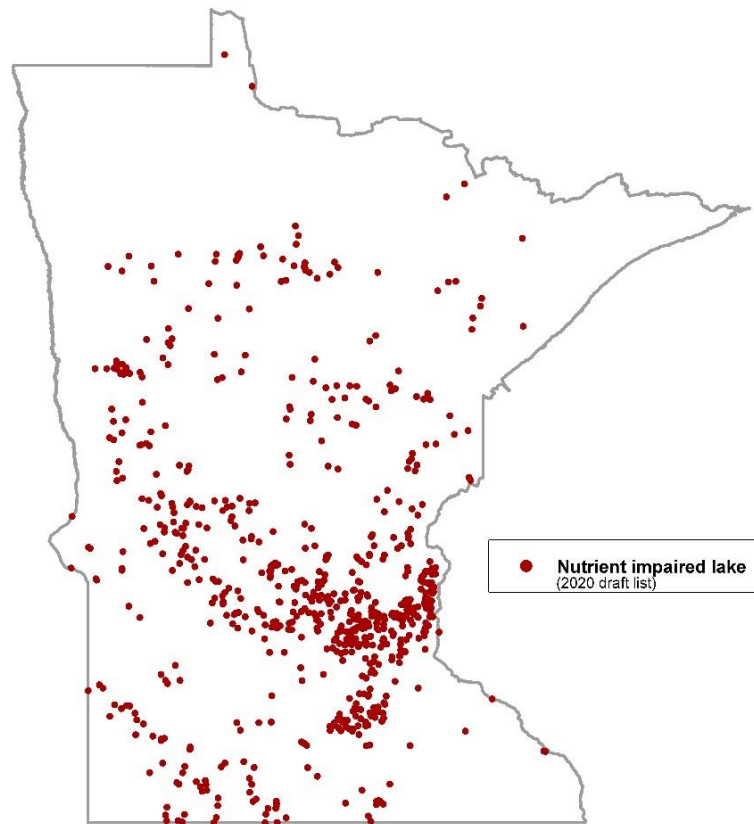
Technically not “nutrient” standards

NO ₃ (mg/L)	Designated Use
10	human health (drinking water)
100	livestock and wildlife (terrestrial)
8	(DRAFT) chronic aquatic life - cold and warm water
5	(DRAFT) chronic aquatic life - cold water

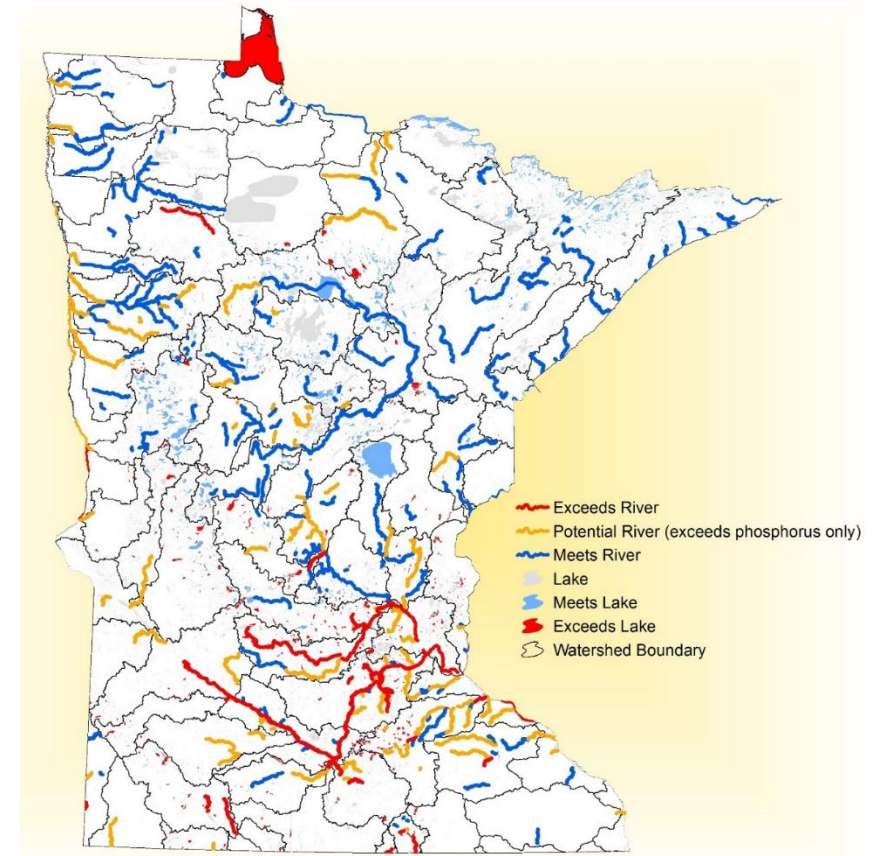


Phosphorus - Local motivation for in-state reduction

Lake eutrophication 693 lakes impaired



River Eutrophication 51 stream reaches impaired



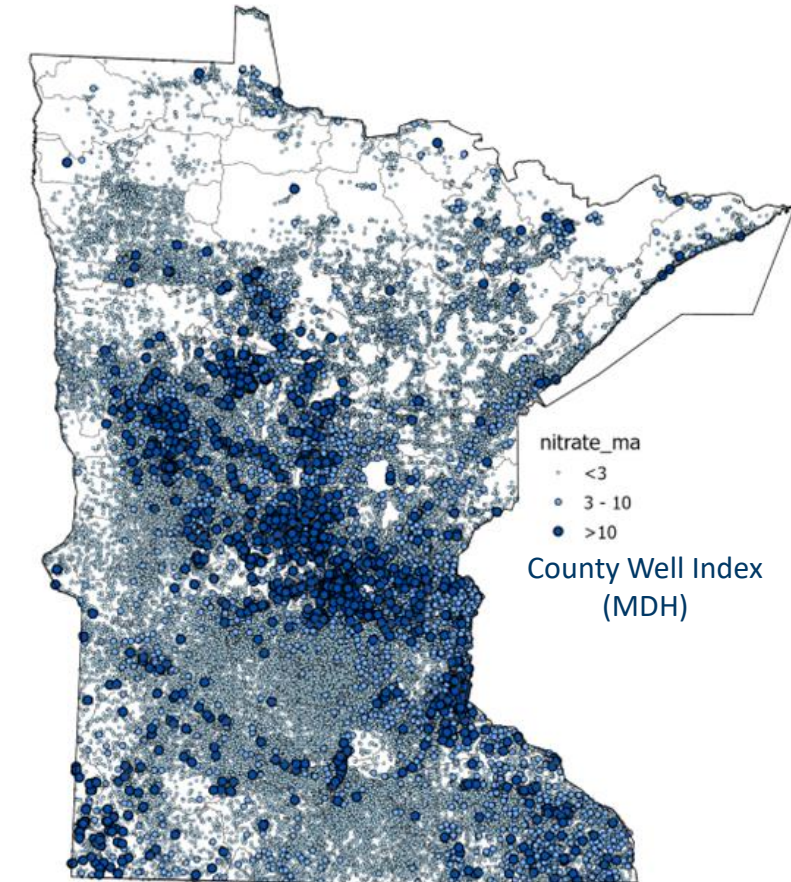
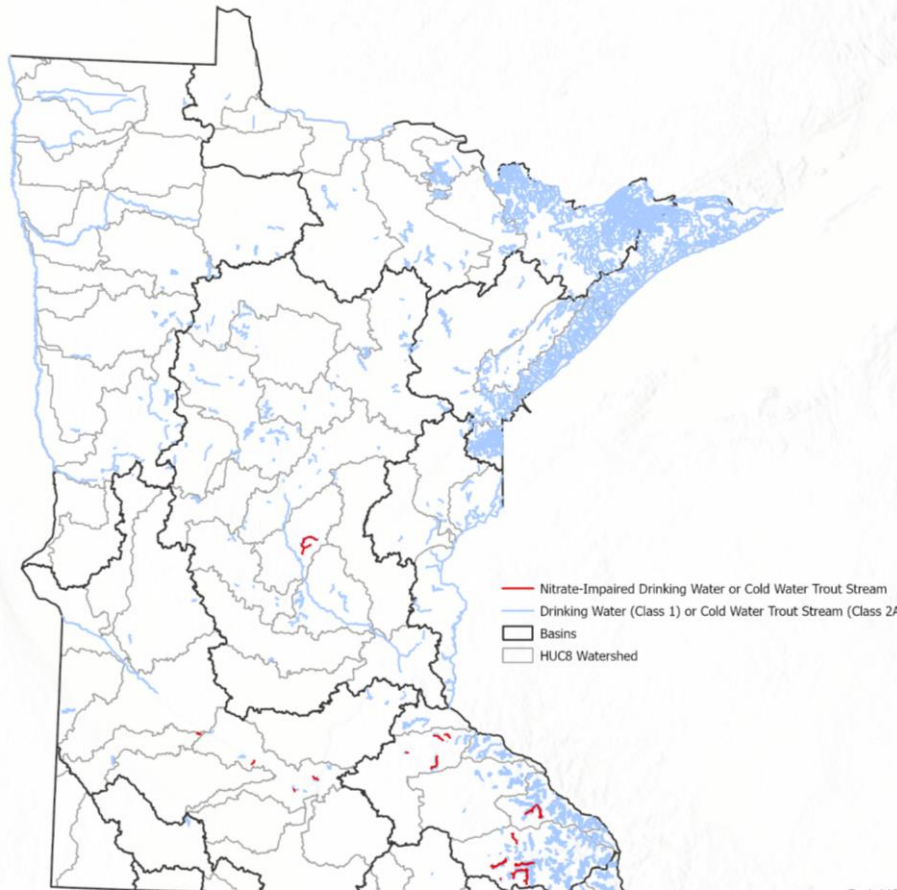
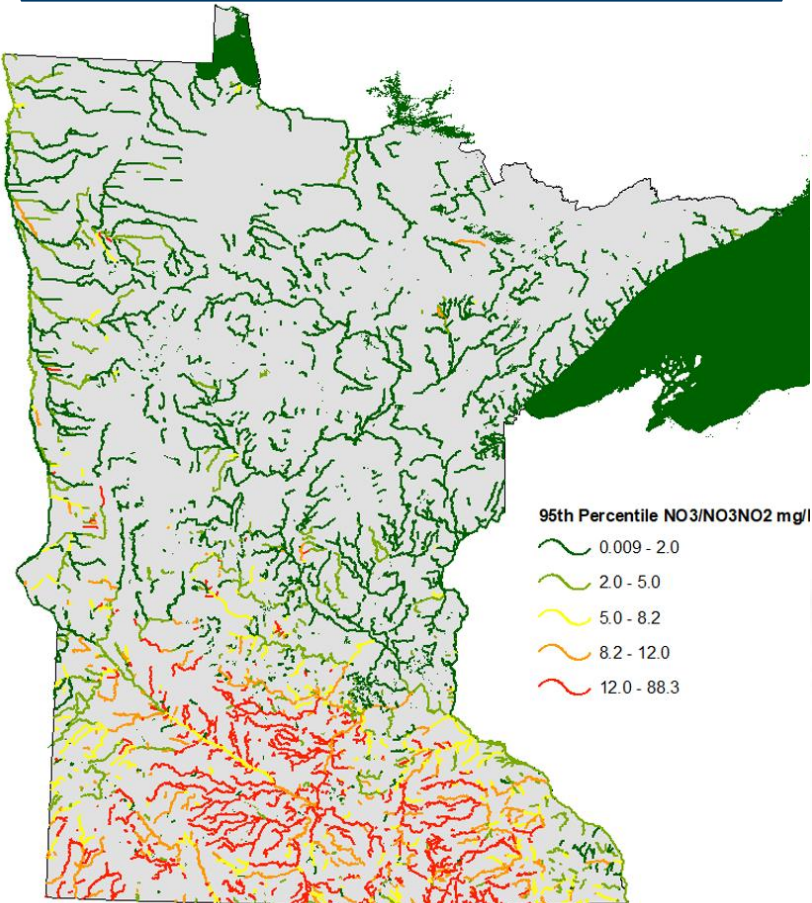
Nitrate concentrations

Local motivation due to in-state reduction needs

High nitrate in Southern MN streams affecting certain aquatic life

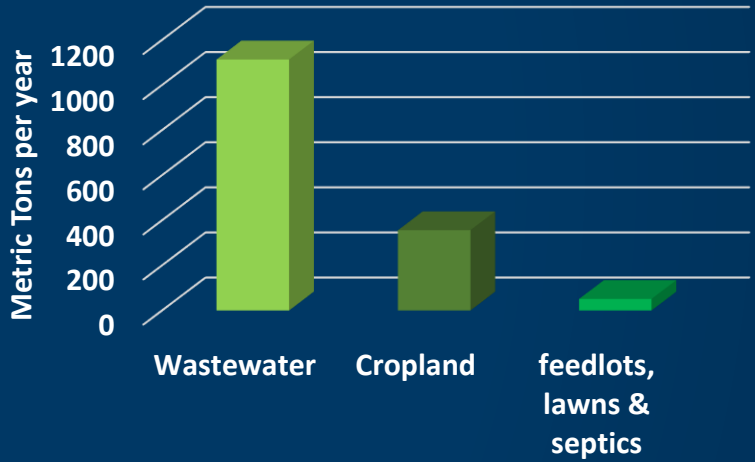
32 cold water stream reaches **impaired** for drinking water (nitrate-N >10 mg/l)

Wells exceeding nitrate drinking water standard in many parts of MN

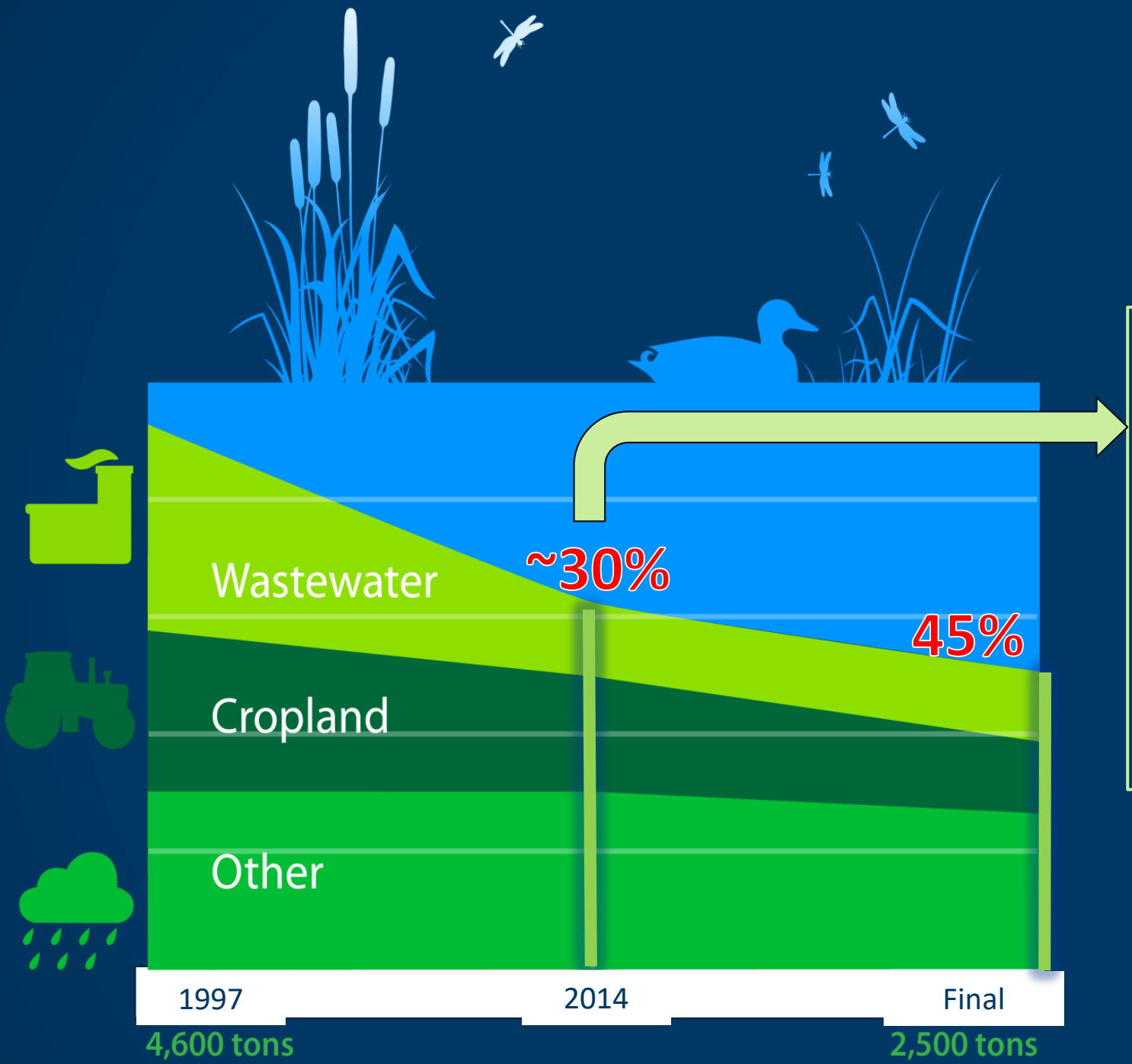


Mississippi River Phosphorus

Phosphorus reduced into Mississippi River 1997-2014



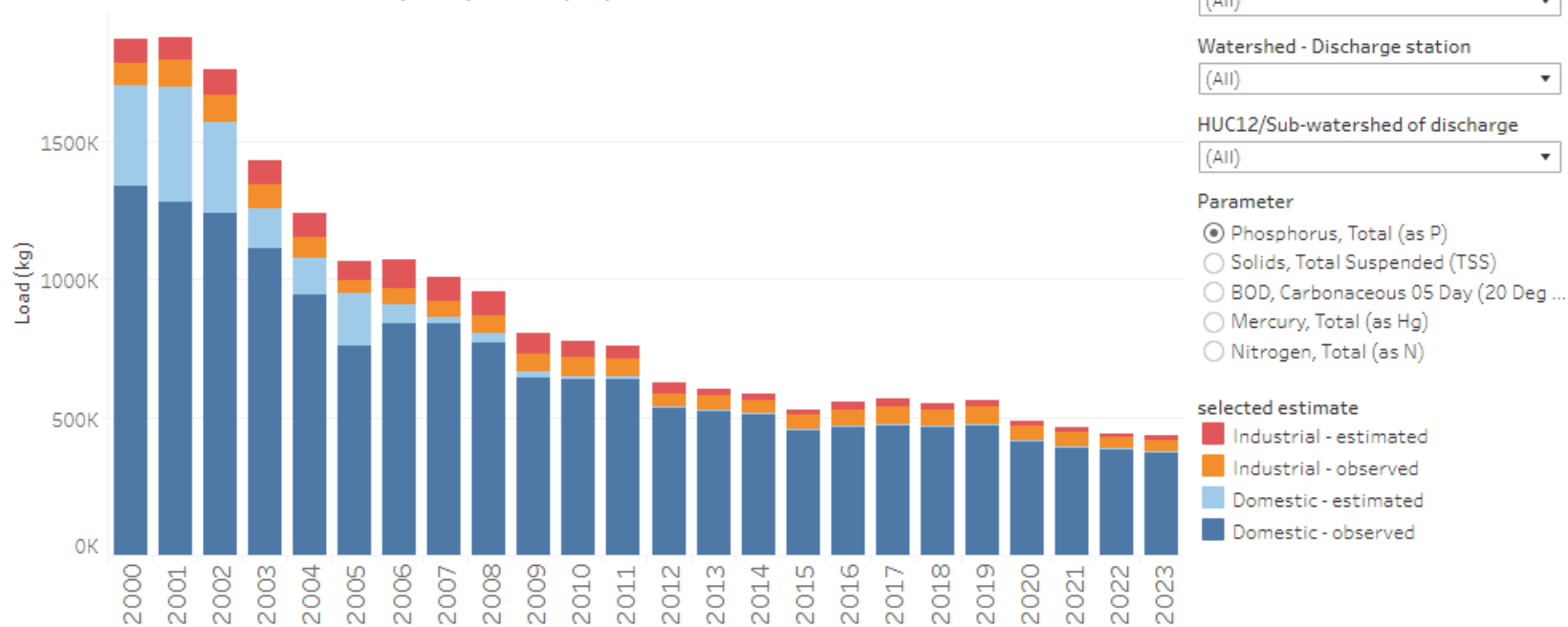
Note: additional cropland P reductions documented by USDA for decades prior to 1997



Wastewater nutrient discharges are closely monitored and tracked

Introduction | Watershed summary | Facility totals | Watershed detail | Annual flow by facility type | Flow and Conc | Facility load | Facility calc table

Annual Phosphorus, Total (as P) load (kg)

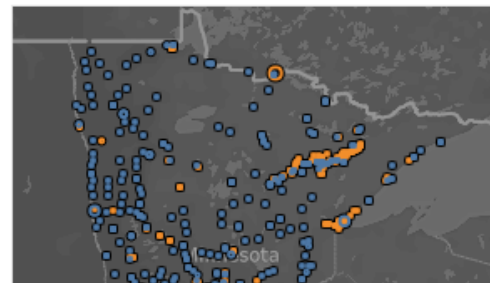


<https://tableaup.pca.state.mn.us/#/views/Wastewaterpollutantloads/Watershedsummary?:iid=1>

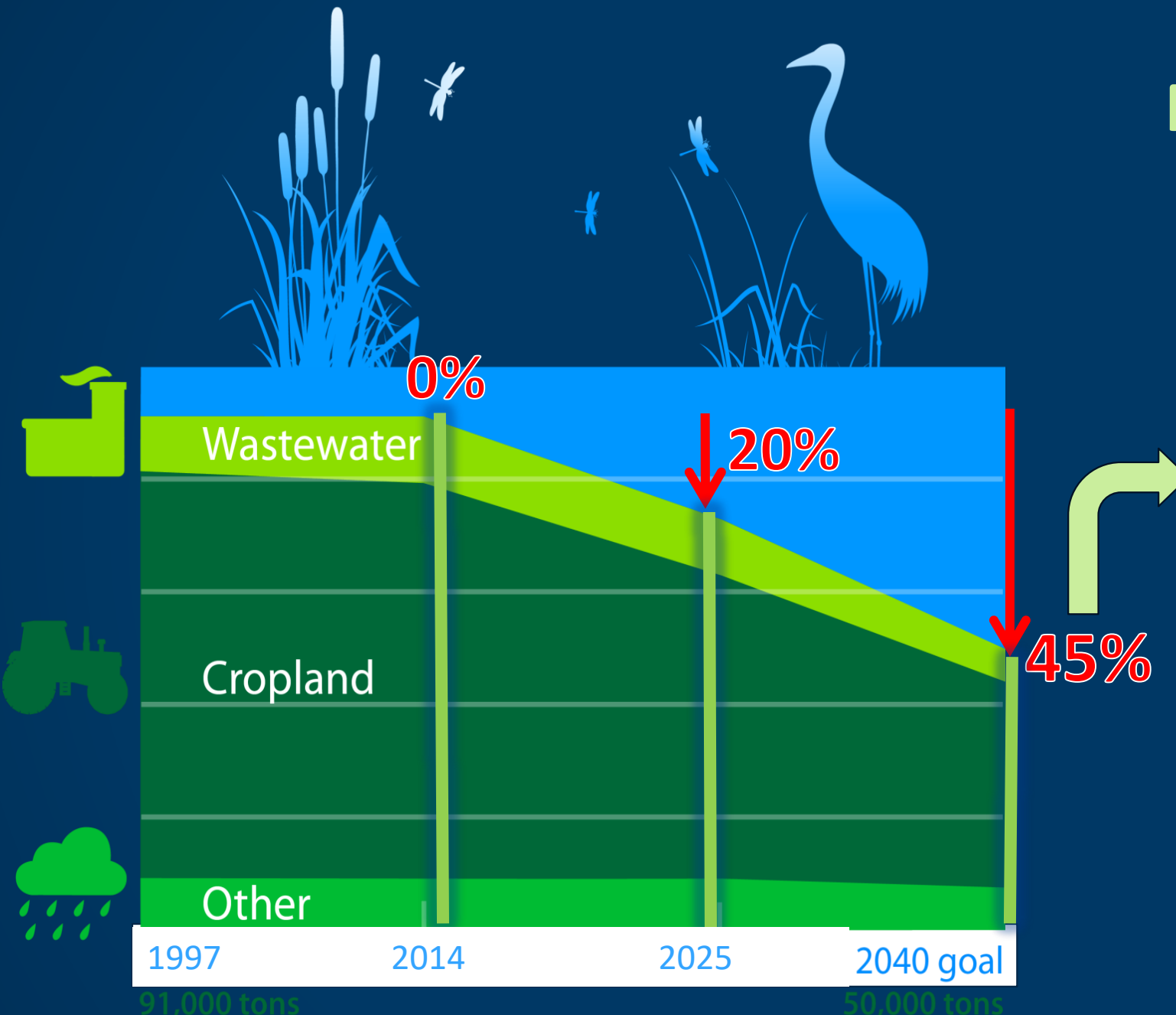
Phosphorus, Total (as P) loads by facility type

Y. #	Total	Domestic - observed	Domestic - estimated	Industrial - observed	Industrial - estimated
2023	432,300	372,430	1,316	40,573	17,981
2022	443,221	384,825	907	40,765	16,724
2021	462,973	392,580	460	54,324	15,608
2020	486,451	417,157	350	50,275	18,669
2019	560,303	472,364	1,044	67,455	19,441

Includes data through 10-2023



Mississippi River Nitrogen



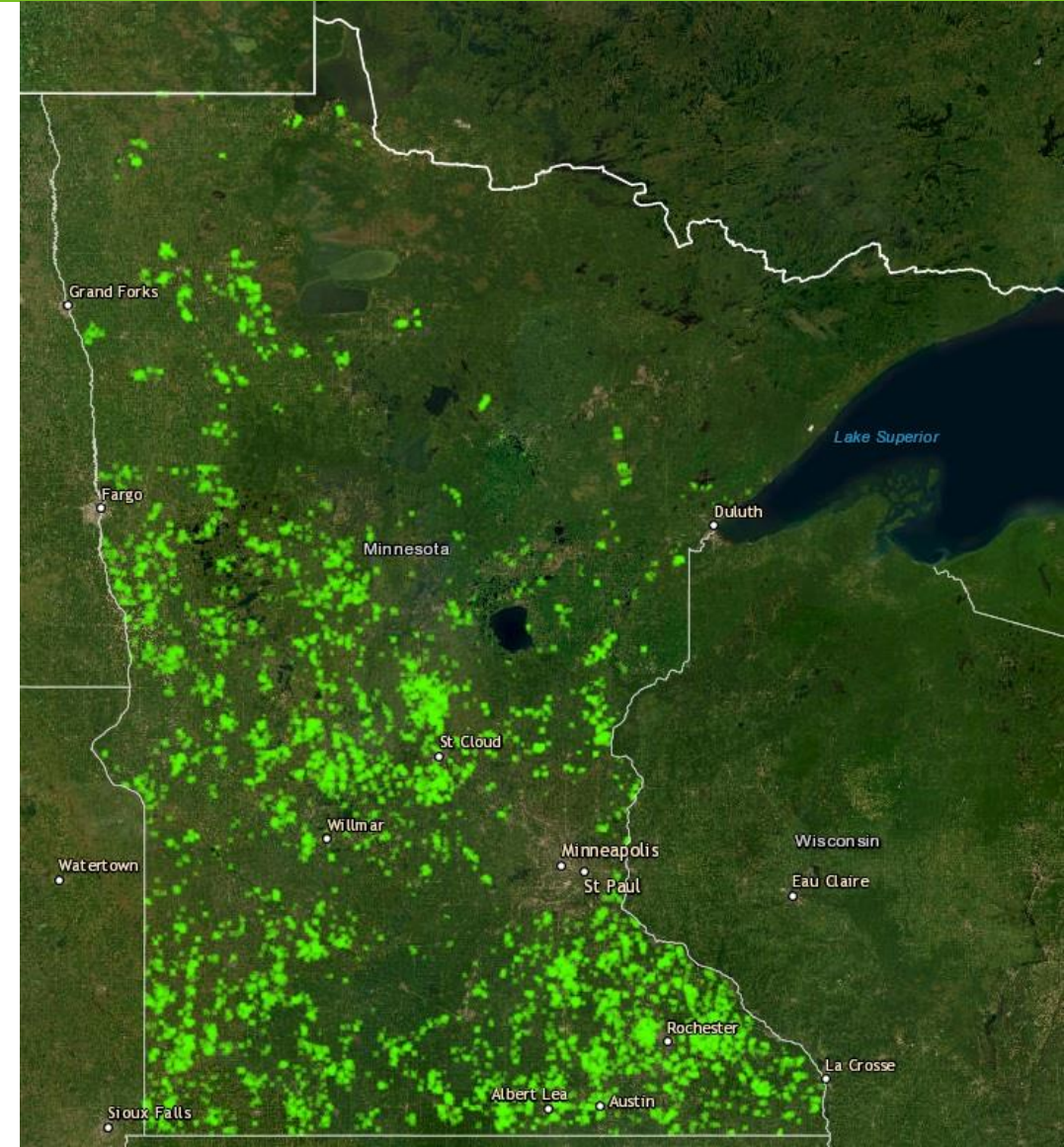
- Millions of additional Acres**
- Cover crops
 - Perennial cropping systems
 - Manure & fertilizer optimized
 - Ag-drainage water stored
- +
- Wastewater nitrogen treated

Minnesota has multiple programs driving improvements

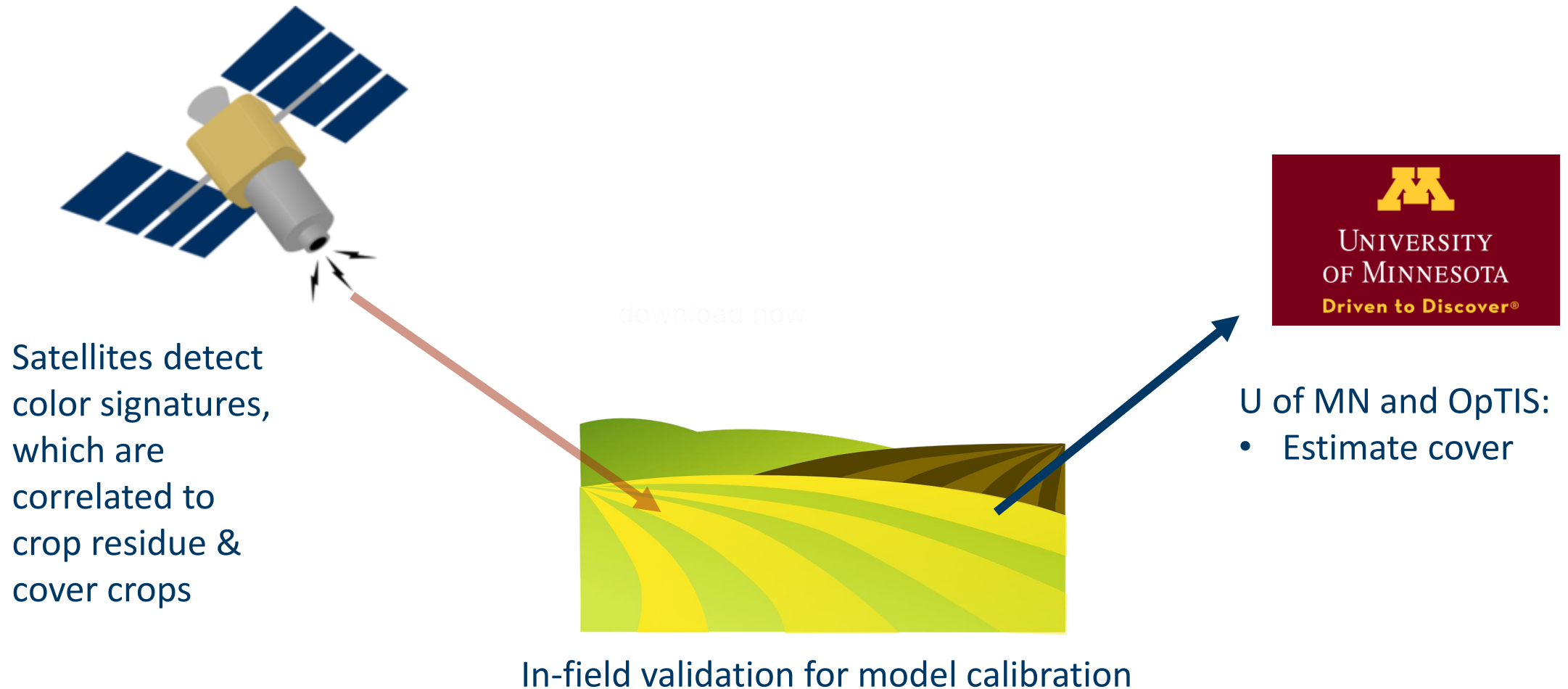
Minnesota Agricultural Water Quality Certification Program

1 million + acres

October 27, 2023



New technologies now enable assessing total adoption during a given year (crop residue/cover crops)

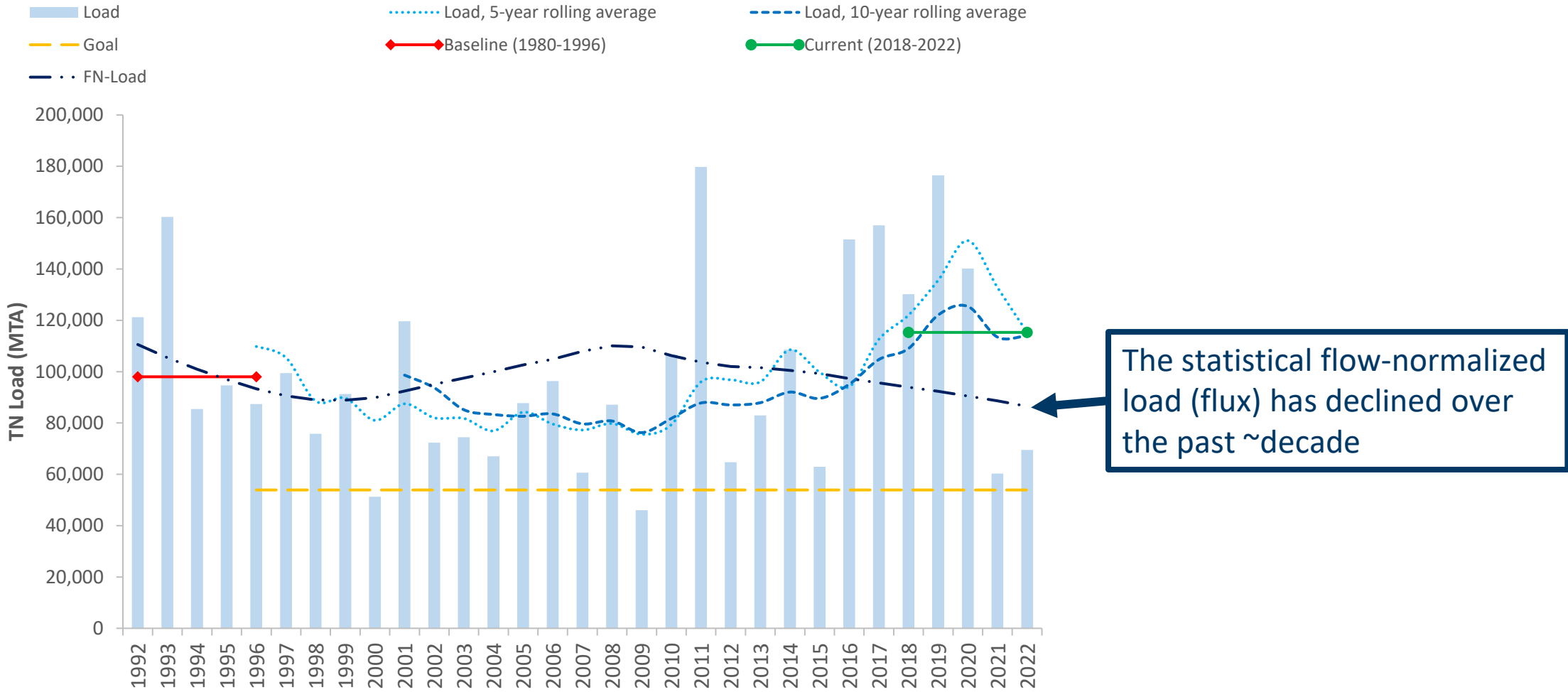


La Crosse Load changes baseline compared to recent years ending 2022

Mississippi River La Crosse	% change Load avgs 1980-96 to 2018-22	% change load/flow FWMC avgs 1980-96 to 2018-22	WRTDS flow- normalized load 1980-96 to 2022	WRTDS flow- normalized concentration 1980-96 to 2022	HSPF modeled load analysis MN watersheds	low vs high flow analysis 1980-96 to 2013-2022
Nitrogen (total)	+18%	-7%	-12%	-18%	TBD	TBD
Phosphorus (total)	+5%	-21%	-22%	-30%	TBD	TBD

Trends that adjust for flow
variability showing improvement...
But time will tell more.

Nitrogen - flow-normalized statistical trends (dark blue line) Mississippi River La Crosse



This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science. The information is provided on the condition that neither the U.S. Geological Survey nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information.

- Making progress
- Ongoing work needed