Demystifying the Detroit River: Assessing phosphorus sources and management options

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Fred A. and Barbara M. Erb Family Foundation

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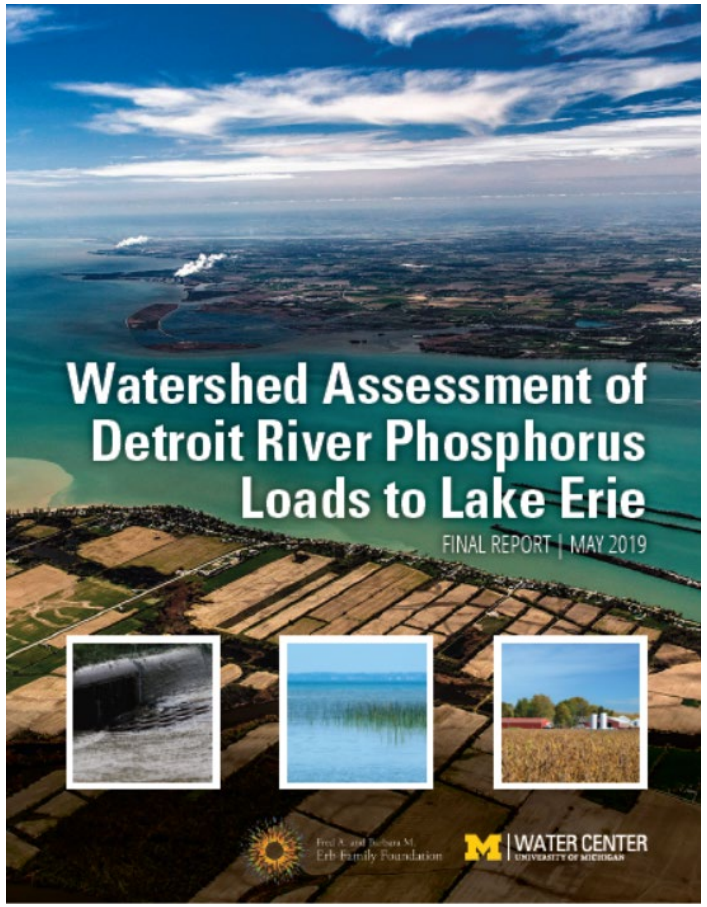
Project overview



TEAM: Don Scavia, Jen Read , Lynn Vaccaro, Awoke Dagnew, Becca Muenich, Branko Kerkez, Yao Hu, Serghei Bocaniov, Colleen Long, Yu-Chen Wang

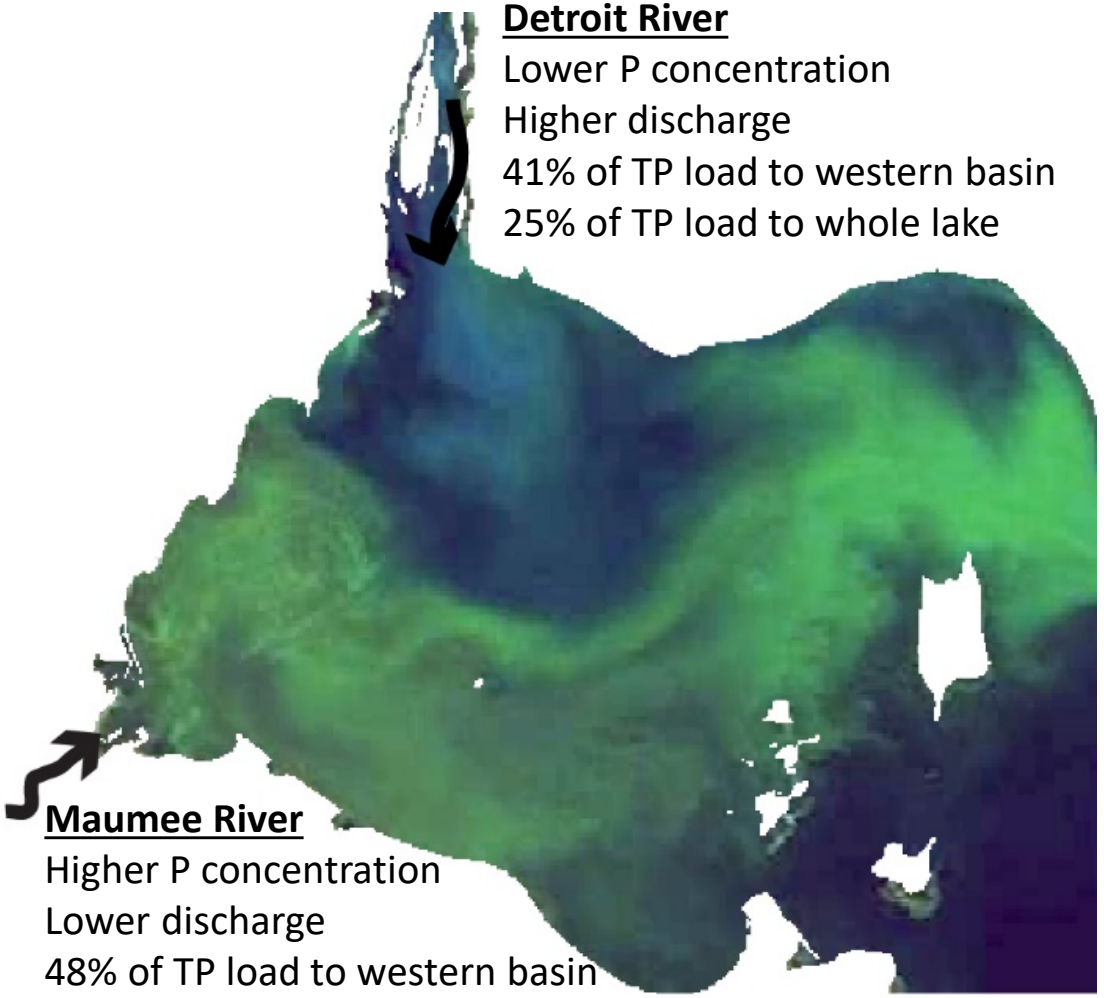
FUNDING: Erb Family Foundation

Fred A. and Barbara M. Erb Family Foundation

ADVISORY GROUP: 30 people from US and Canadian government, non-profit, industry, and academic sectors provided feedback throughout entire project

Report (released May 2019) and supporting documents available at: myumi.ch/detroit-river

Why we undertook this study



- P drives Lake Erie HABs and hypoxia
- 2012 Great Lakes Water Quality Agreement
- Targets: 40% reduction in 2008 WB and CB loads

Uncertainty about the role of the Detroit River, sources of Detroit River nutrients, and managing Detroit river loads.

Known and unknown information

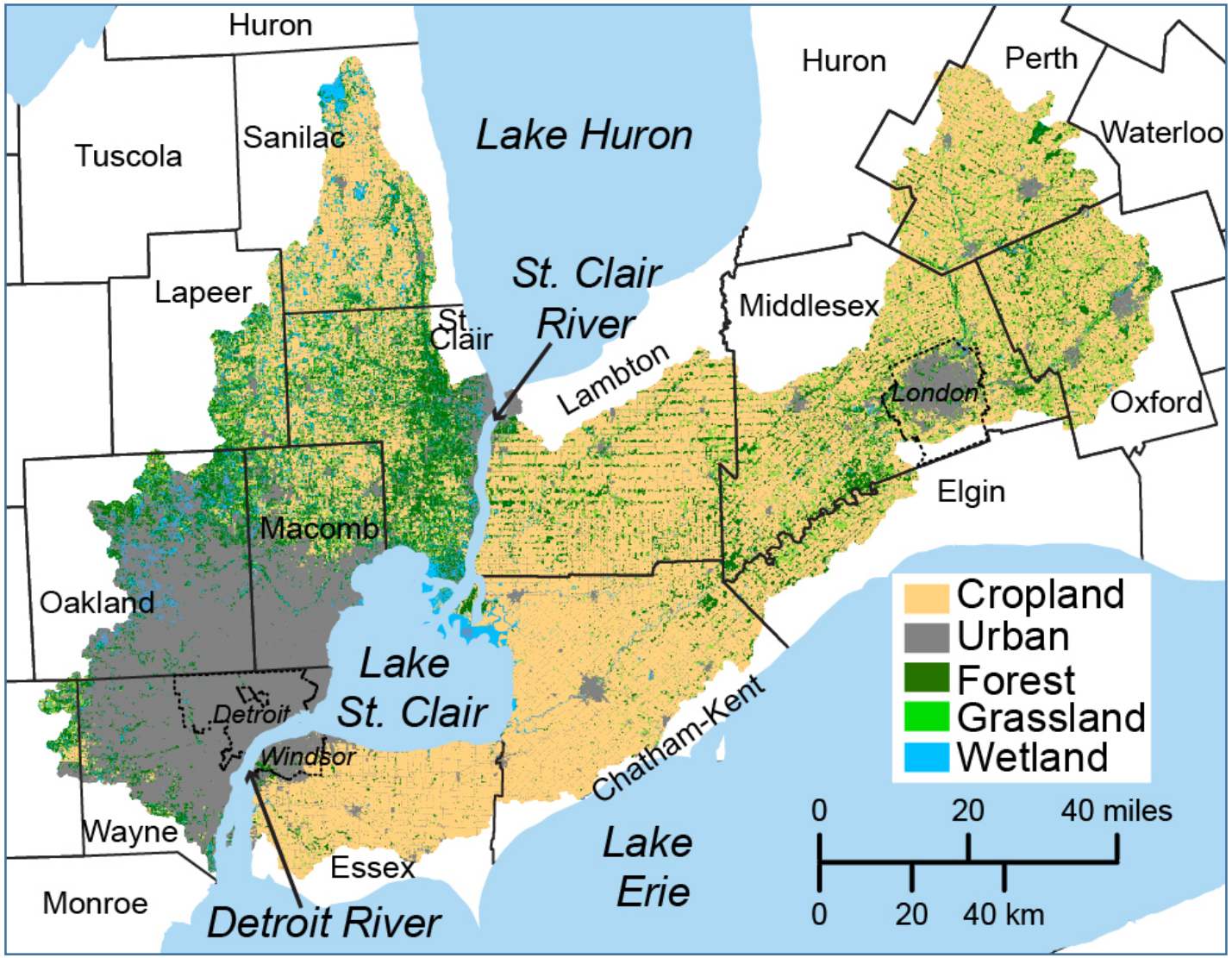
Previous studies quantified the TP and DRP loads from the Detroit River, but…

- attribution by source type and land use (e.g., point vs. nonpoint; urban loads vs. agricultural) were unclear
- trends caused by Lake Huron zebra mussels and improved wastewater treatment in Detroit on the reduction in the Detroit River load had not been articulated
- the role of Lake St. Clair as a modulator of upstream loads was not quantified
- the effects of load reduction strategies were not quantified with calibrated and validated models

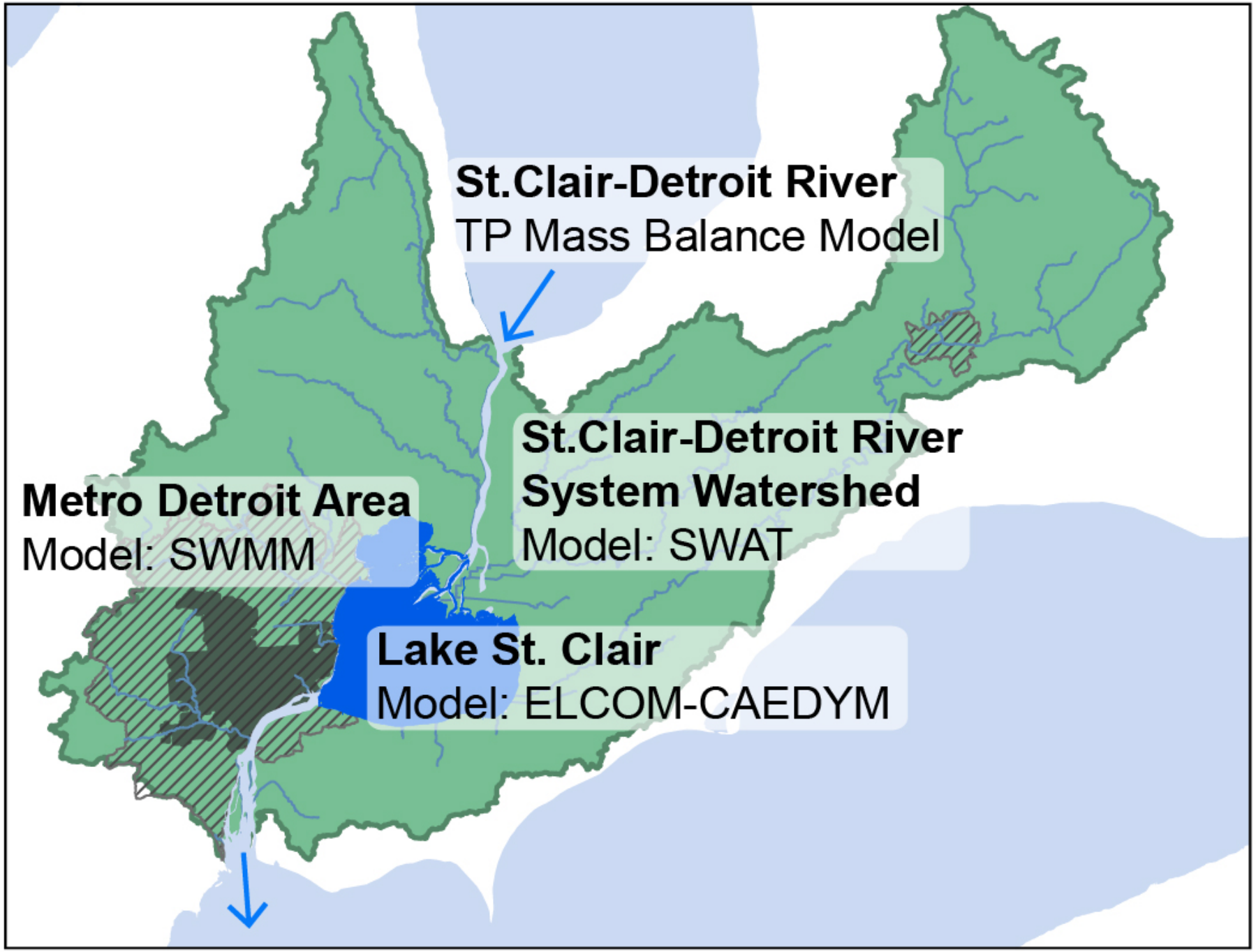
Discrepancy between higher load at the bottom vs the top of the St. Clair River had been noted, but …

- the potential source of that unmeasured load was unknown
- the impacts of that unmeasured load on allocating load reductions was not appreciated

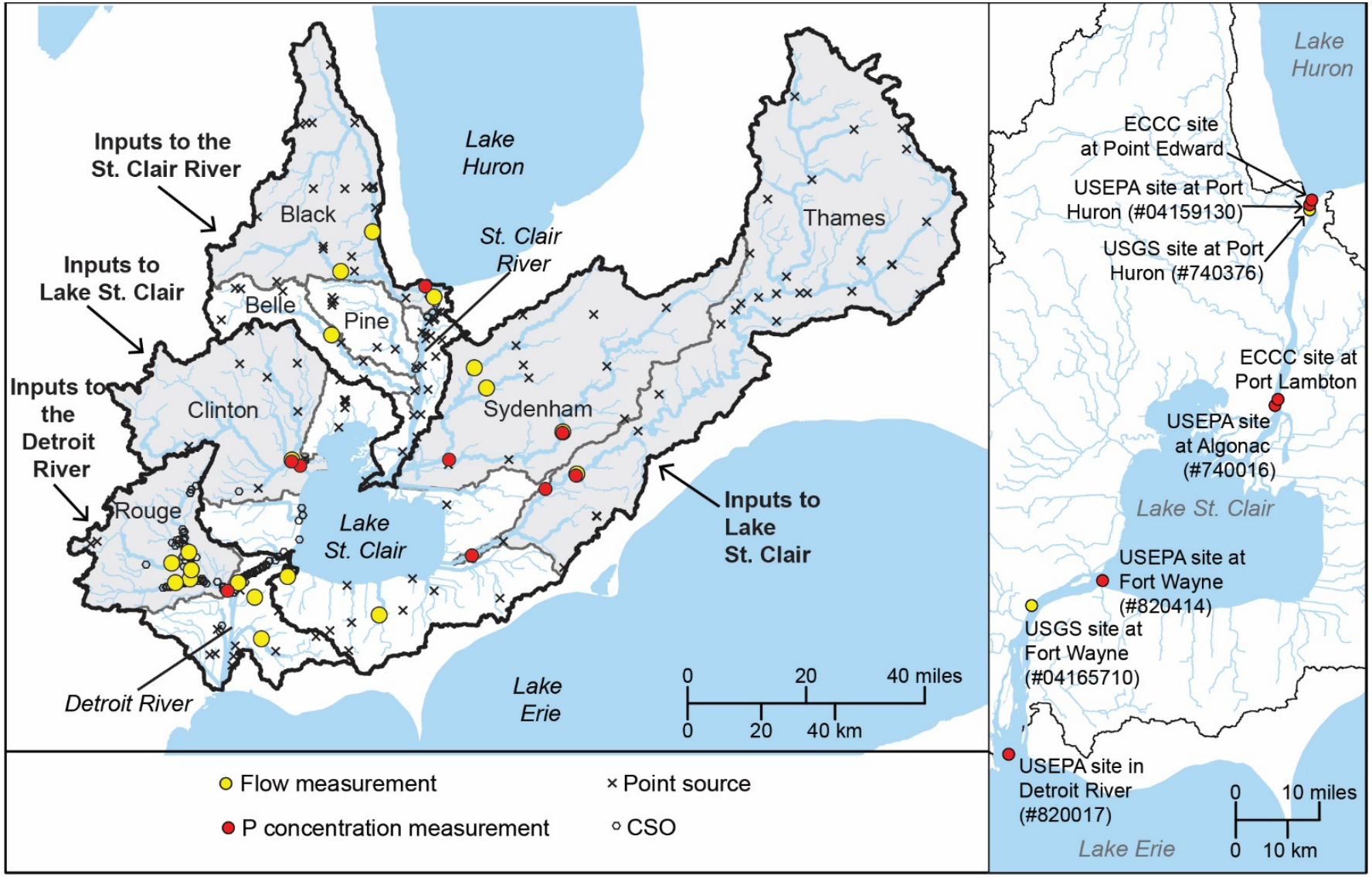
Study area: the St. Clair-Detroit River System



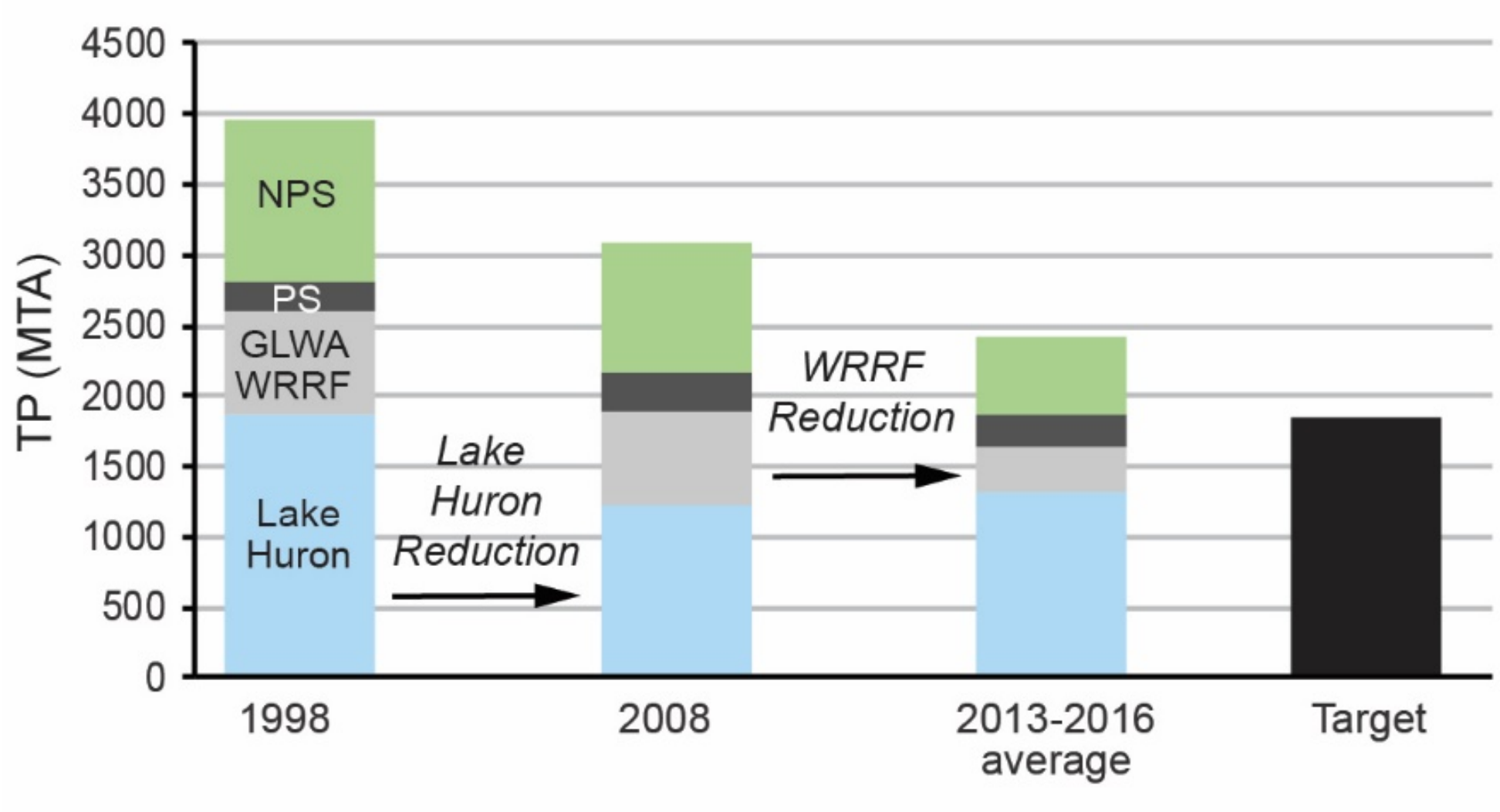
Study approach



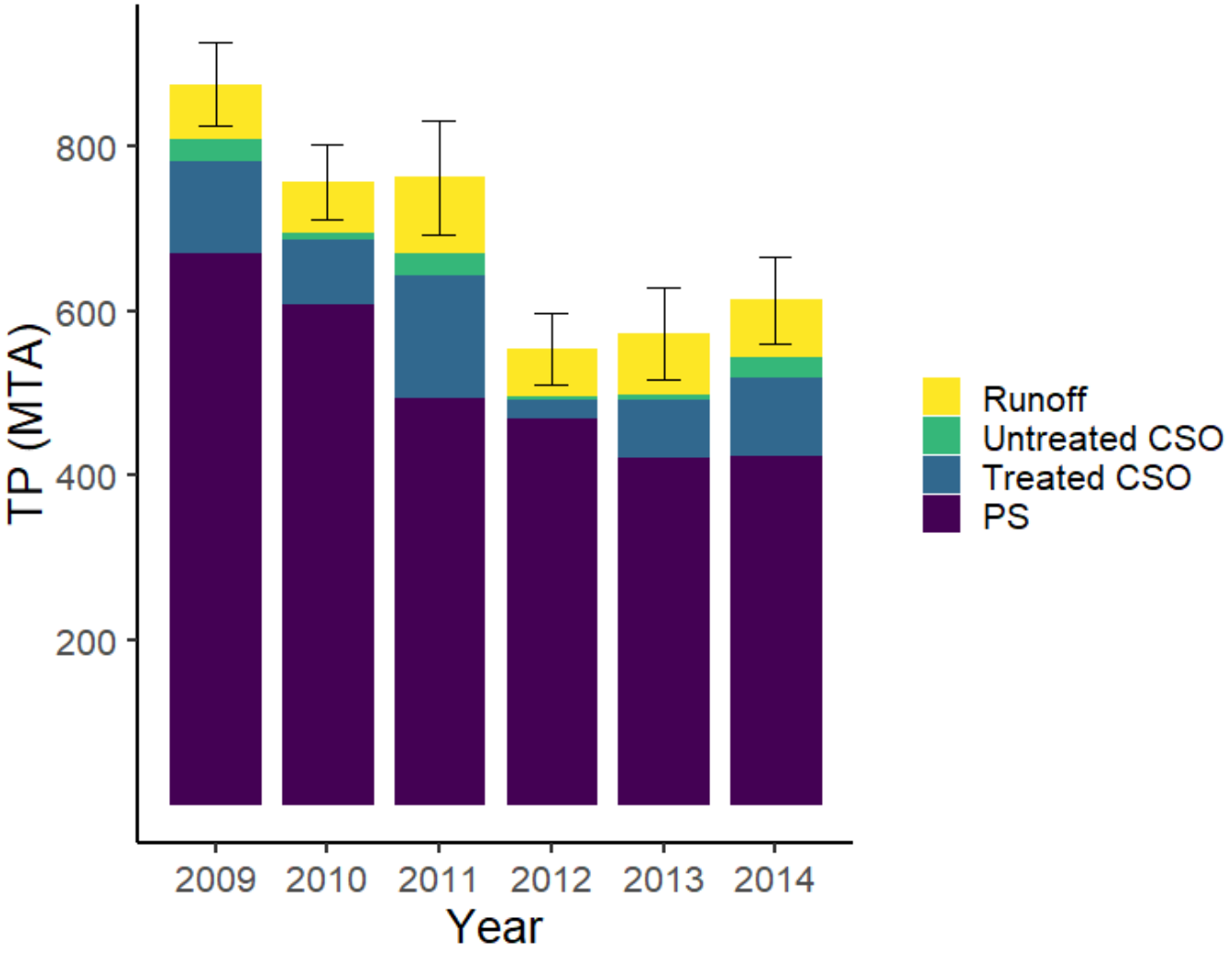
Mass Balance: Estimating total phosphorus contributions



TP contributions to the system – point and non-point -- over time



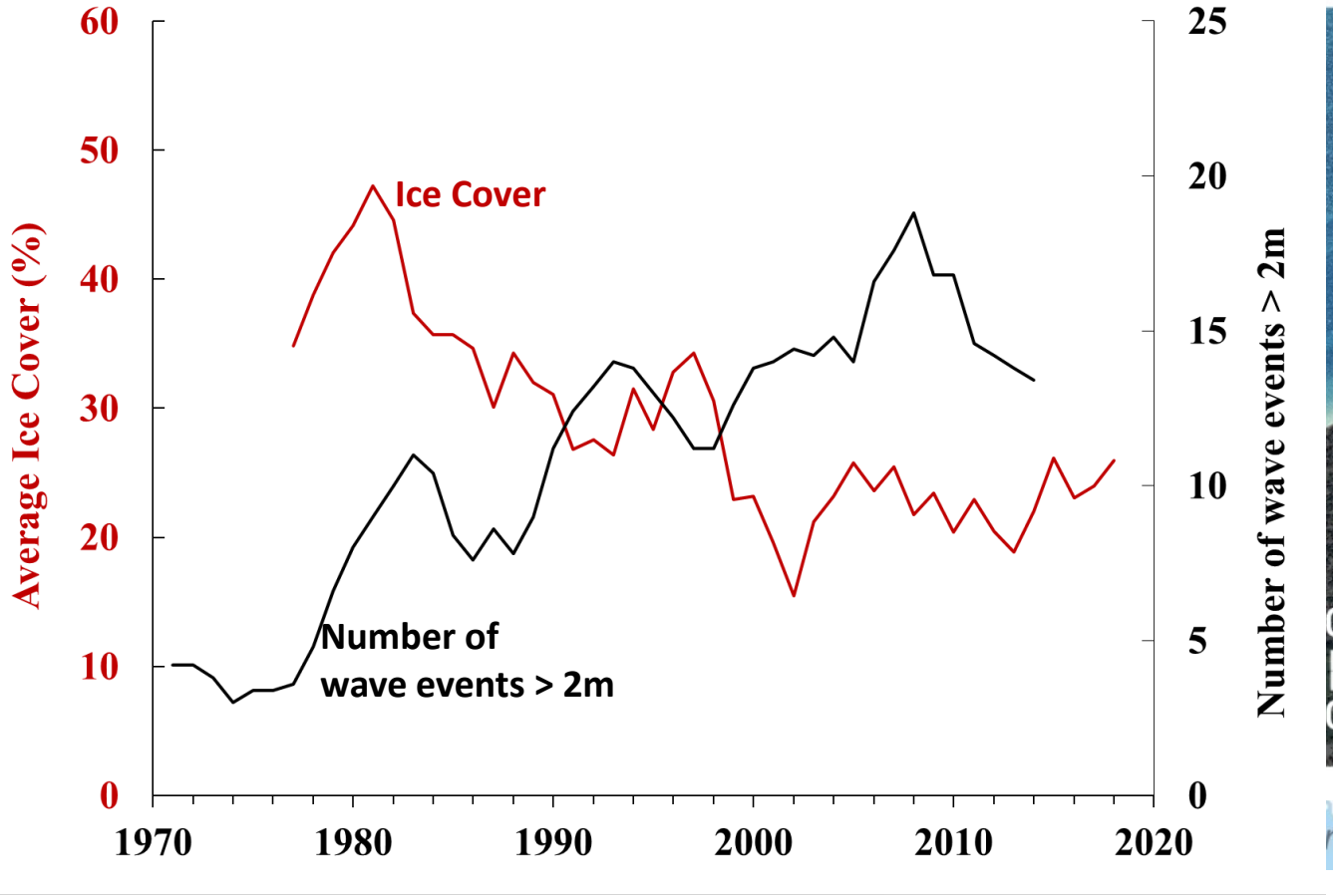
TP loads from all urban areas



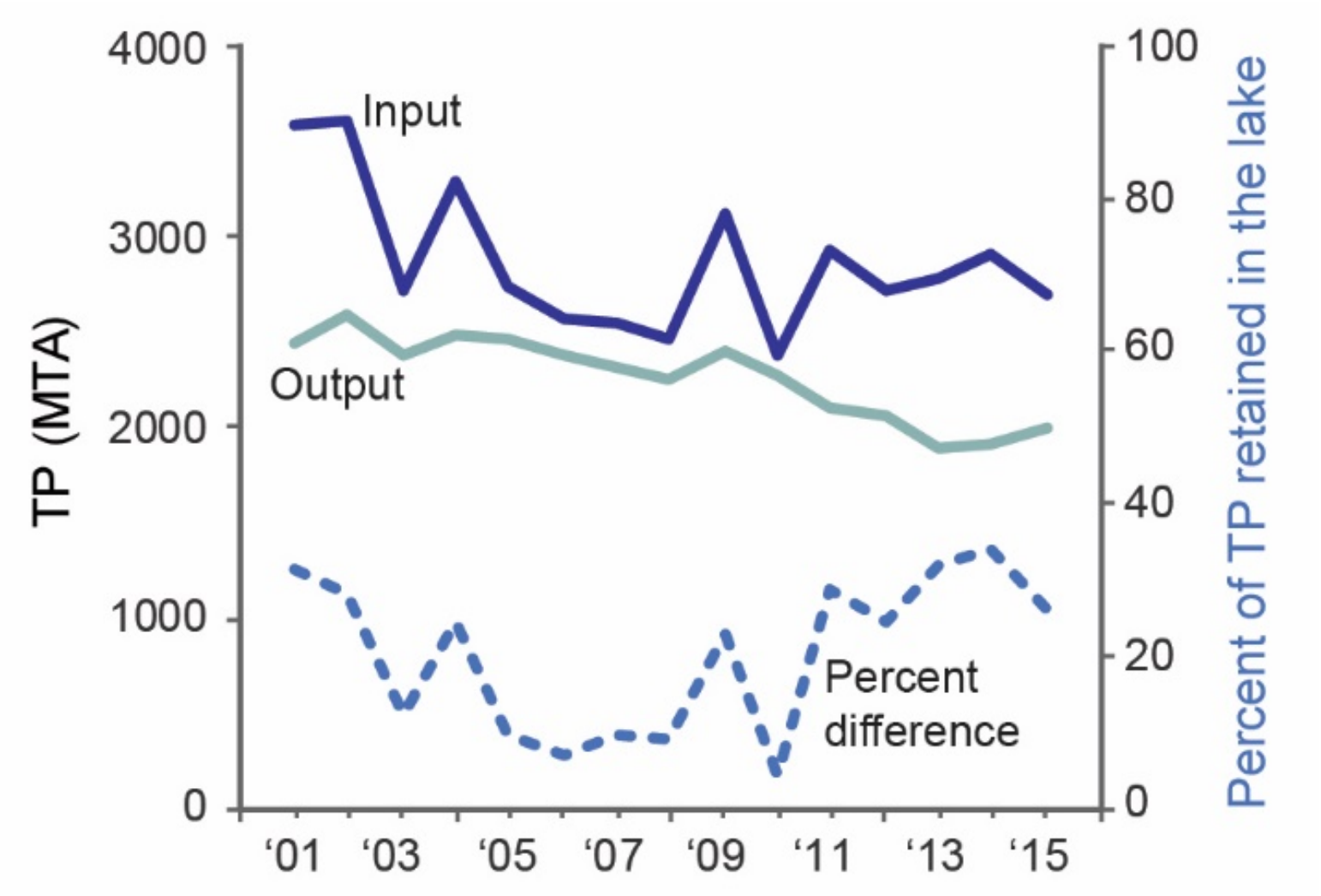
Annual Averages, 2009-2014

	TP Load (MTA)	%
Point Source	**516**	**70 - 81**
Treated CSO	89	12 – 14
Untreated CSO	16	2 – 3
Runoff	16 – 121	3 – 16
Total Urban Load	636 – 742	

Phosphorus from Lake Huron

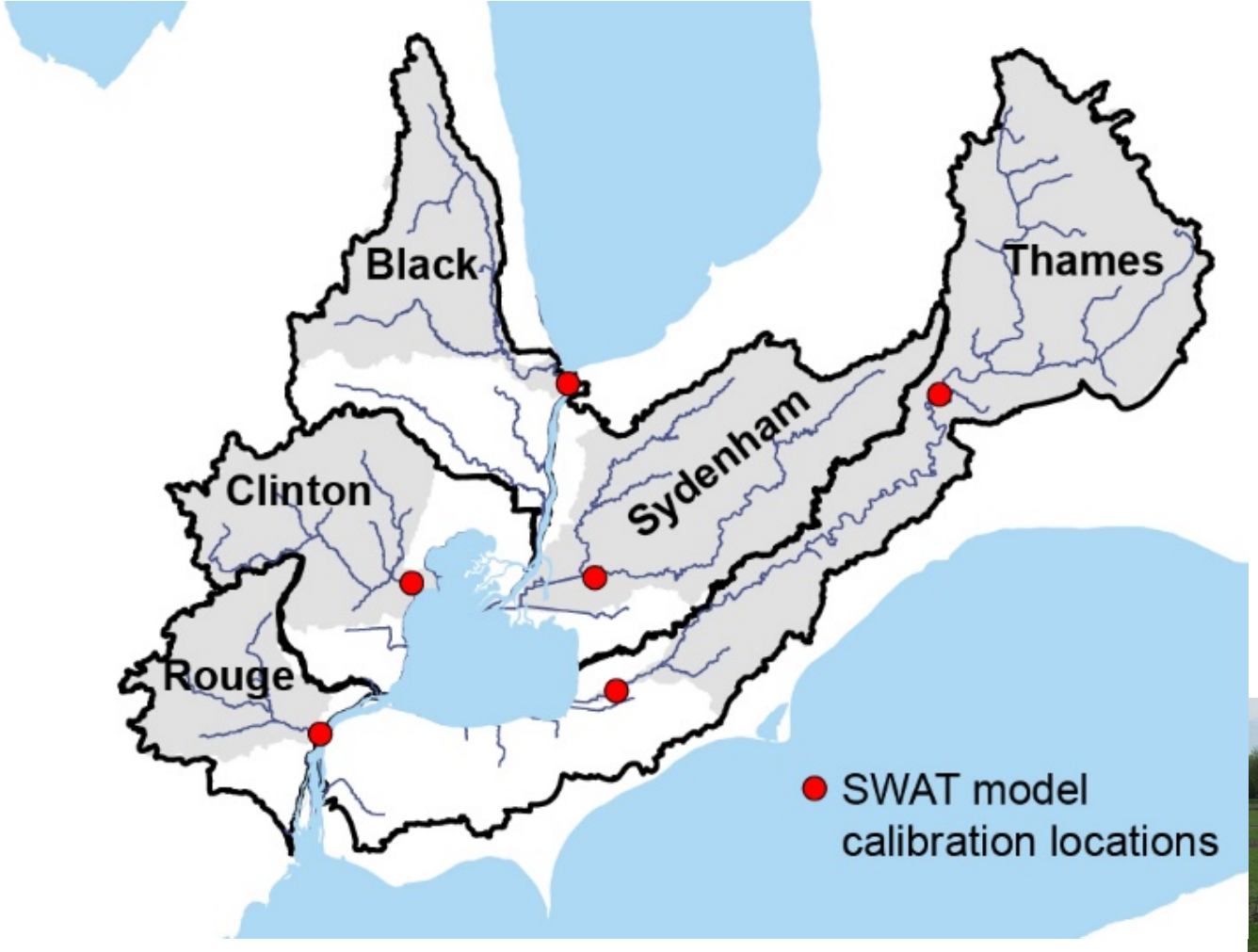


Lake St. Clair is a TP sink



Percent difference line corresponds with right y-axis only, not MTA axis.

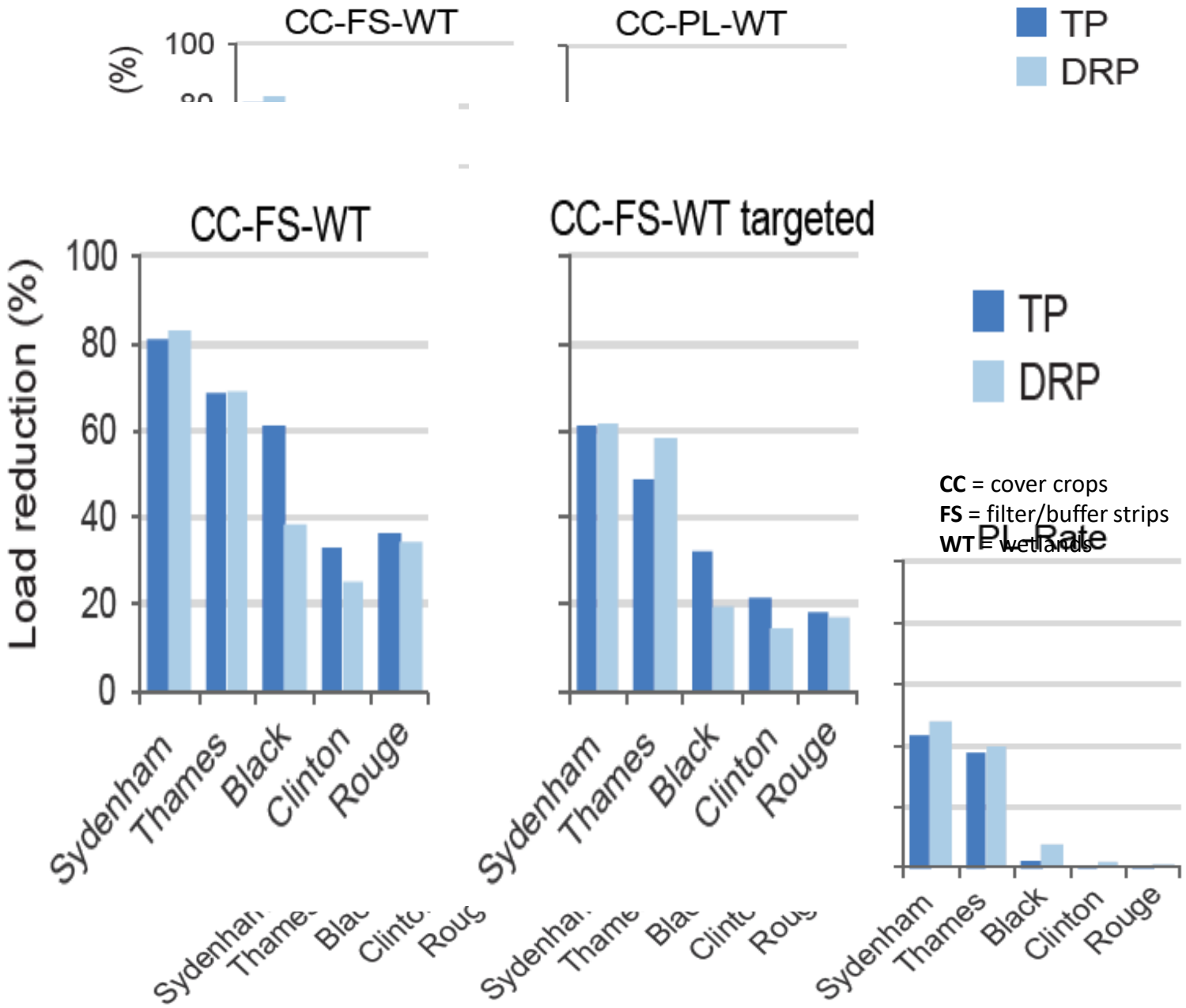
Options for reducing nonpoint sources



1. Reduced fertilizer application rates
2. Subsurface placement of fertilizer
3. Controlled drainage
4. Cover crops
5. Wetlands
6. Filter Strips
7. Grassed waterways

Options for reducing nonpoint sources

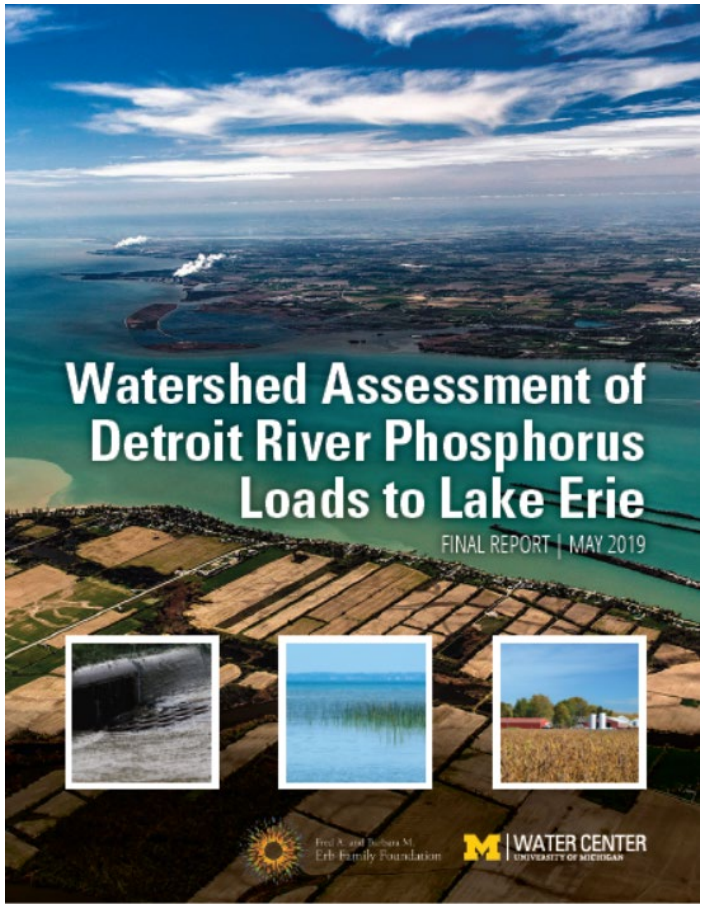
CC = cover crops
FS = filter/buffer strips
WT = wetlands
PL = subsurface placement of fertilizer
Rate = 25% reduction of application rates



Summary of key findings

- Over 50% of the Detroit River TP load comes from **Lake Huron**.
- On average, **Lake St. Clair** retains 20% of the TP that enters the lake.
- Model simulations suggest **bundles of agricultural practices** could be useful in reaching targets, but applying single practices alone is not.
- **Focusing agricultural practices** on just the 55% of land with the highest loss yields is nearly as effective as putting practices on 100%.
- Reaching a 40% load reduction for the Detroit River requires reducing
  - **23%** of all sources (because some reduction has already occurred since 2008)
  - **51%** of watershed sources if Lake Huron is not included
  - **72%** of sources if Lake Huron and the WRRF are not included

Thank you!



Web page: www.myumi.ch/detroit-river

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