

Lower St. Croix Partnership Enhanced Street Sweeping Program

What is the deal with street sweeping?



POLLUTANTS IN URBAN AREAS

Gross Solids
Sediment
Phosphorous and Nitrogen
Metals
Hydrocarbons
Bacteria

This PowerPoint Slide is from 2002



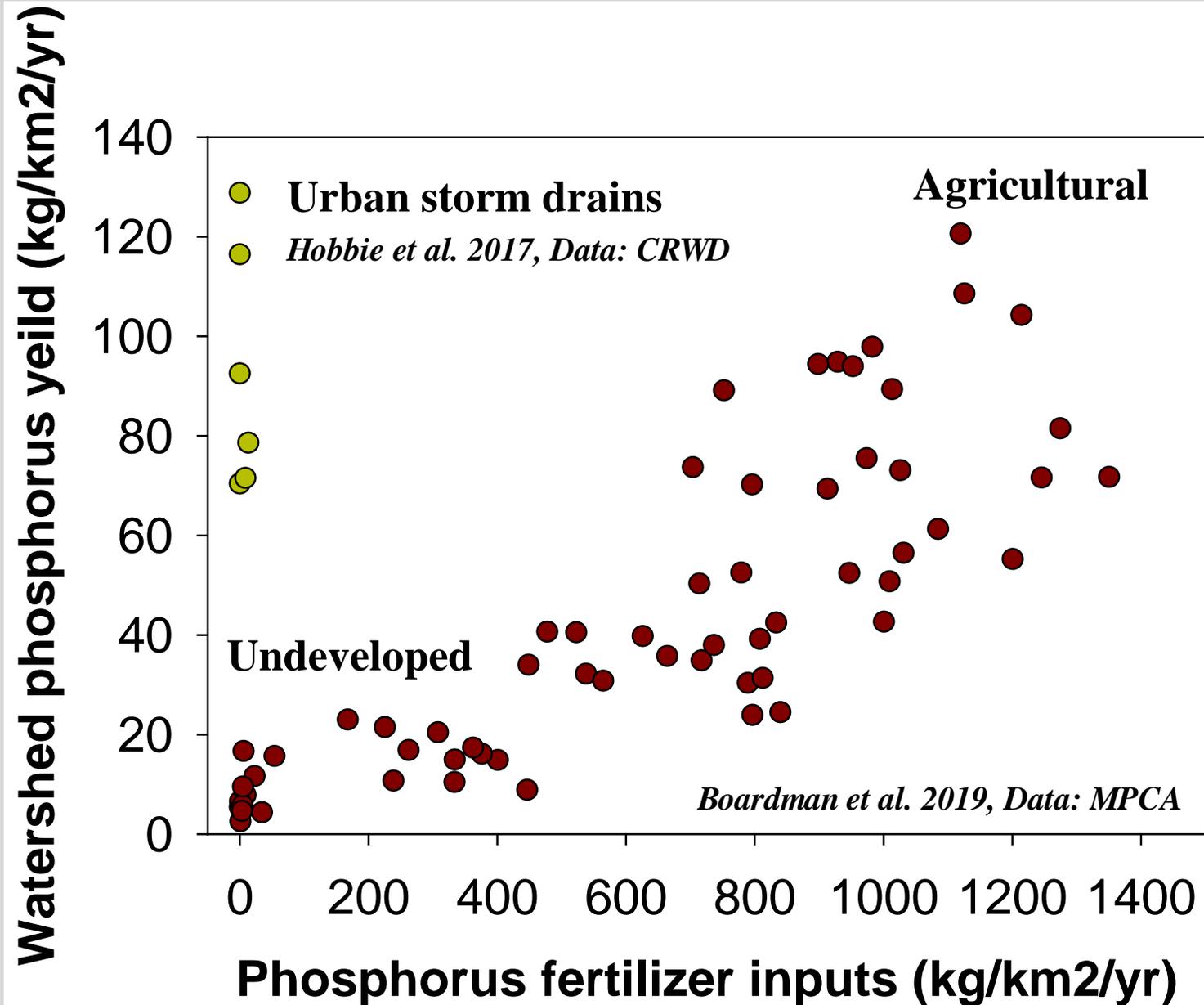
POLLUTANTS IN URBAN AREAS

Urban Stormwater Systems are Direct Conduits to Water Resources

This PowerPoint Slide is also from 2002



Phosphorus in Minnesota's Watersheds



Phosphorus in Minnesota's Watersheds

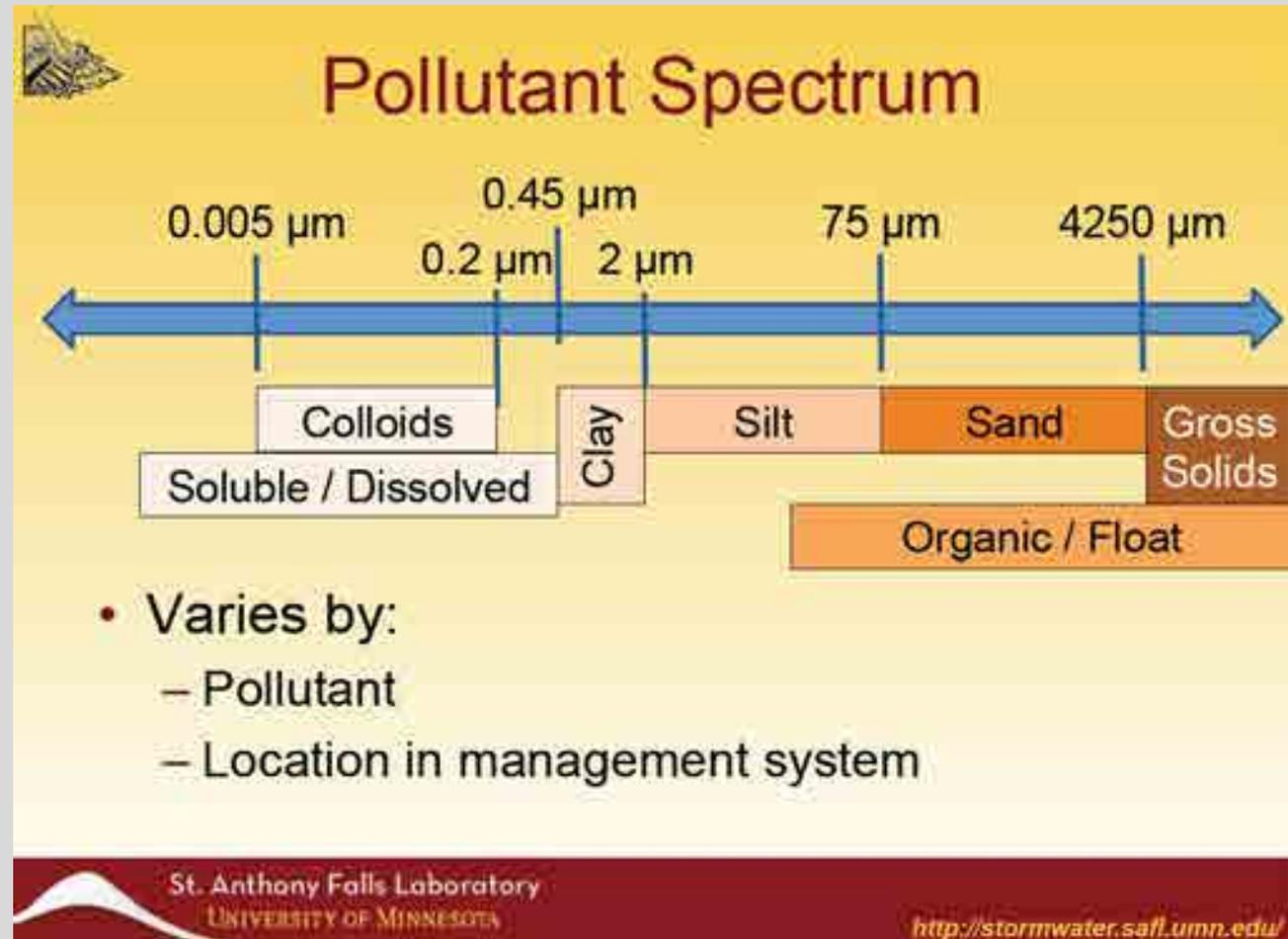
Table 9. Observed leaching rates of urban tree leaves, various studies (laboratory results).

Study	Leaching Time	Observed Leaching Rates (dry mass basis)
Cowen and Lee, 1973	1 hr	54 mg P/kg leaf tissue fallen, intact oak leaves 650 mgP/kg cut up oak leaves (collected as fallen, intact)
Dorney, 1986	2 hr	Range: 38.1 – 259.9 mg P/kg leaf tissue (common urban species, Milwaukee, WI).
Wallace et al., 2008	6 hr	Range 10-400 mg P/kg leaf tissue (Australian and European species).
Hobbie, et al., 2013	0.5 hr 24 hr	Range 9 – 26% loss of total phosphorus mass, leaf tissue. Range 27 – 88% loss of total phosphorus mass, leaf tissue. (Common urban tree species, Minneapolis, MN).

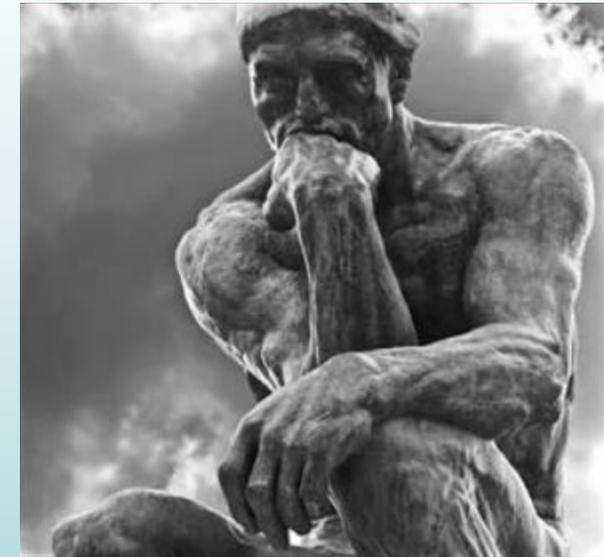
Dissolved Phosphorus

- Up to 5x more bioavailable than particulate phosphorus
- Episodic “pulsed” releases
- Challenging to remove from stormwater
- Critical for achieving water quality goals

**MORE
RESEARCH
NEEDED**



Stormwater practitioners,
managers, engineers and
researchers that advise and
provide direction for urban
stormwater research in Minnesota



Achievements

Rapid Response Projects

23 projects

2017



19

completed

Discovery Projects



- ✓ Equipping cities with downscaled precipitation data for stormwater planning
- ✓ Developing a street sweeping credit for stormwater phosphorus source reduction
- ✓ Dynamics of pathogens and viruses in stormwater reuse systems

For more on any of the specific projects, visit wrc.umn.edu/projects/stormwater

Support more research!

JOIN US as a financial
partner to achieve or
surpass this year's goal

2022 GOAL
\$150K



The Minnesota Stormwater Research Council (Council) in partnership with the University of Minnesota Water Resources Center (WRC) is soliciting funds to complete collaborative applied research to address priority stormwater management needs for Minnesota.

Over the past five years, cities, watershed organizations, and private businesses have contributed and pooled more than \$625K to support stormwater research through the Council. These funds were then leveraged with Clean Water Legacy Amendment funds to support 25 research projects and support the use of that information by professionals, practitioners, and policy makers. This collective and collaborative work helps prevent, minimize, and mitigate the impacts of urban stormwater runoff across Minnesota.

The accompanying **2022 Program Highlights** summarizes the research completed, new research projects commencing this year, and recognizes the partners that have made it possible.

Why contribute?

These investments in research result in discoveries that help Minnesota professionals, practitioners, and policymakers across cities, watersheds, counties, and private businesses:

- ✓ Evaluate and design more effective stormwater practices
- ✓ Manage urban runoff to prevent or reduce impacts to lakes, streams, rivers, and groundwater
- ✓ Minimize government in stormwater infrastructure for continued effective operation.

Your organization's financial contribution to the Council directly supports research important to you.

Pooling resources adds up and provides a mechanism for completing work together.

Join the growing list of watersheds, cities, private businesses, and organizations supporting urban stormwater research. Use the online form [HERE](#) to indicate your organization's financial support by October 31!

For more information about the Council, visit wrc.umn.edu/msrc

*For more on any of the specific research projects, visit
wrc.umn.edu/projects/stormwater*

*For presentations of completed research projects, visit
<https://www.wrc.umn.edu/projects/stormwater/swseminars>*



Targeted, enhanced street sweeping

April 24, 2023 | Lower St. Croix Policy Committee Meeting

Maggie Karschnia | University of Minnesota Water Resources Center & Minnesota Sea Grant

OVERVIEW

1. Street Sweeping Research

2. MPCA Phosphorus Credit Calculator

3. Conducting a Sweeping Evaluation

- Tree Canopy Assessment Protocol
- Quick Estimating Tool
- Other Tools Available





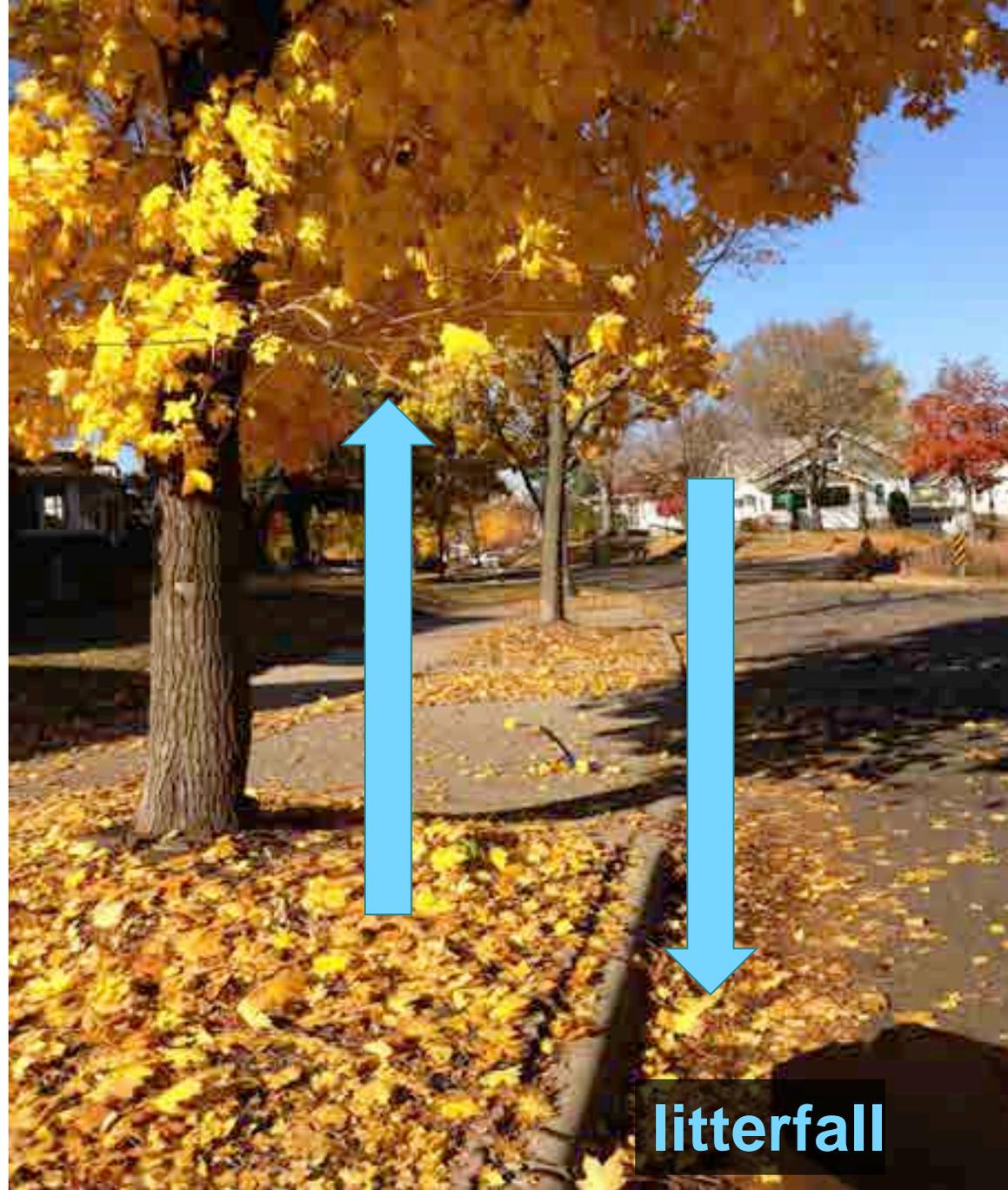
1. Benefits of Street Sweeping

- Street trees contribute significant phosphorus to stormwater
- Street sweeping can be cost-effective for removing phosphorus from stormwater
- Timing and location of street sweepings are important
- Many other benefits of street sweeping



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litterfall

A photograph of a residential street in spring. A concrete curb runs along the edge of a paved road. The curb and the road surface are heavily covered with small, bright yellow flowers, likely dandelions. In the background, a car is parked on the street, and there are green trees and a sidewalk.

Spring

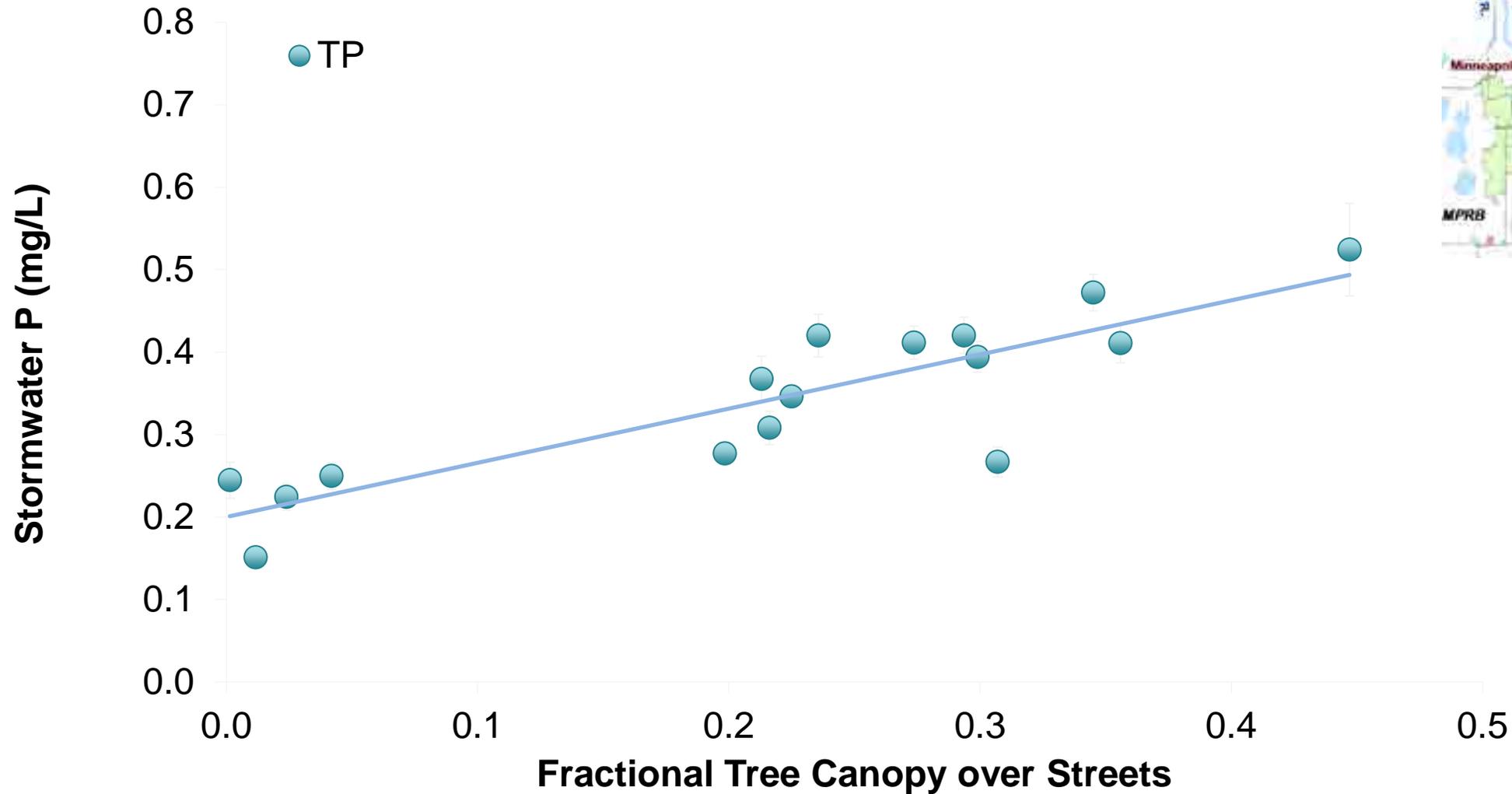
A photograph of a residential street in summer. A concrete curb runs along the edge of a paved road. The curb is heavily overgrown with tall, green weeds. A large, rusted metal pipe or downspout is visible, extending from the curb down towards the ground. The road surface is wet, reflecting the sky and surrounding greenery.

Summer

A close-up photograph of a residential street in fall. The ground is completely covered with a thick layer of fallen leaves in various shades of yellow, orange, and brown. A dark, cylindrical object, possibly a pipe or a trash can, is partially visible, lying horizontally across the middle of the frame.

Fall

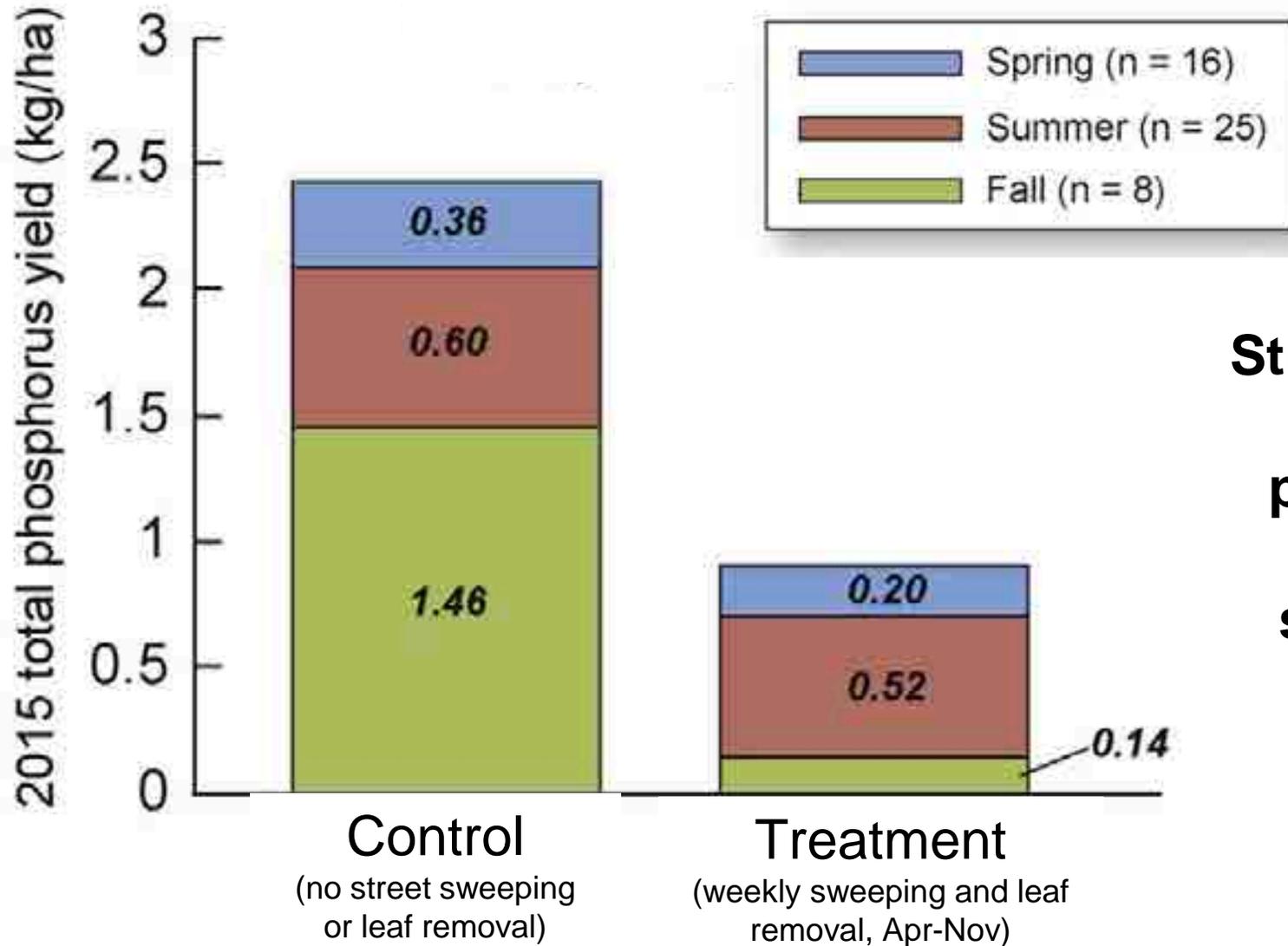
Across 16 metro watersheds, stormwater P concentrations increased with canopy cover



Paired watershed study in Madison, WI

Control
Catchment:
no sweeping or
leaf removal

Treatment
Catchment:
weekly sweeping and
leaf removal



**Street cleaning
reduced
phosphorus
export in
stormwater**



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Prior Lake Street Sweeping Study, 2010-2013



Larry Baker, Ross Bintner, Chris Buyarski, Sarah Hobbie, Paula Kalinosky

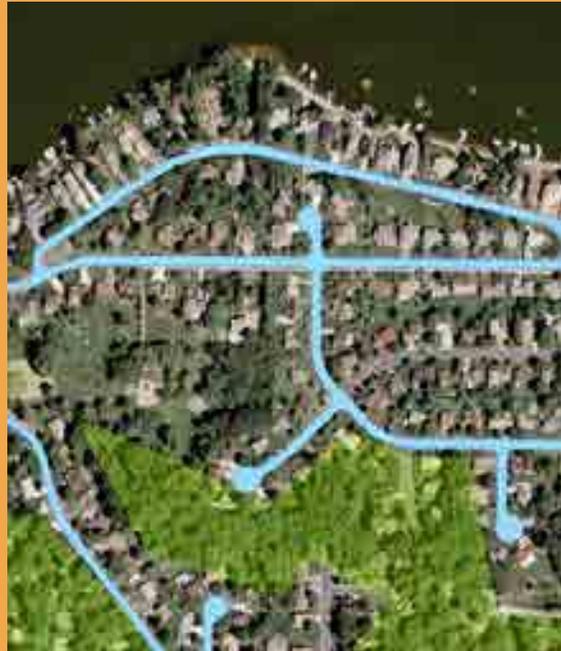
Study Design

Nine Study Routes

LOW Canopy

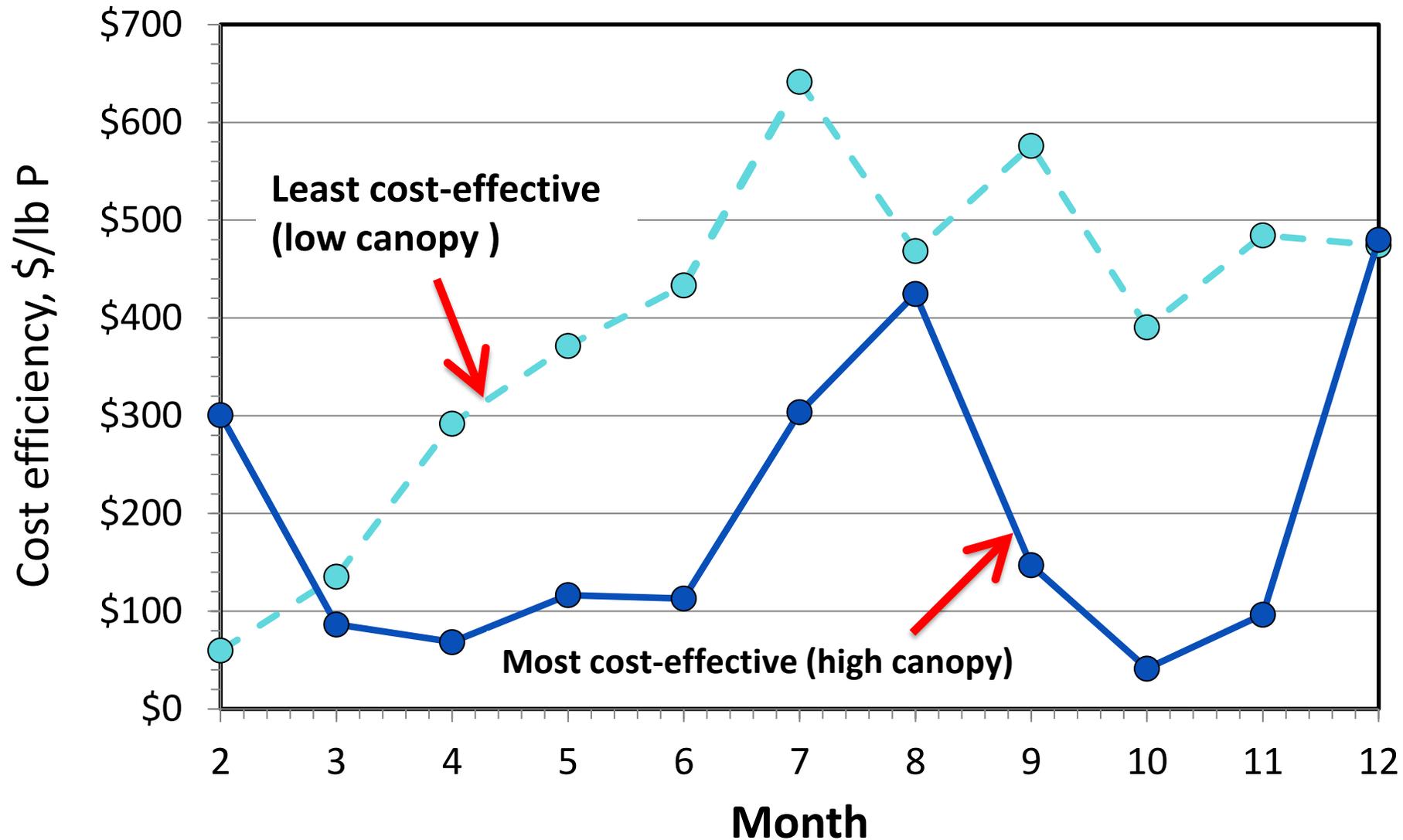


HIGH Canopy



1X, 2X, 4X/month

Prior Lake Street Sweeping Study, 2010-2013



In high canopy areas, P could be recovered for less than \$100/lb (2012 dollars)



1. Benefits of Street Sweeping

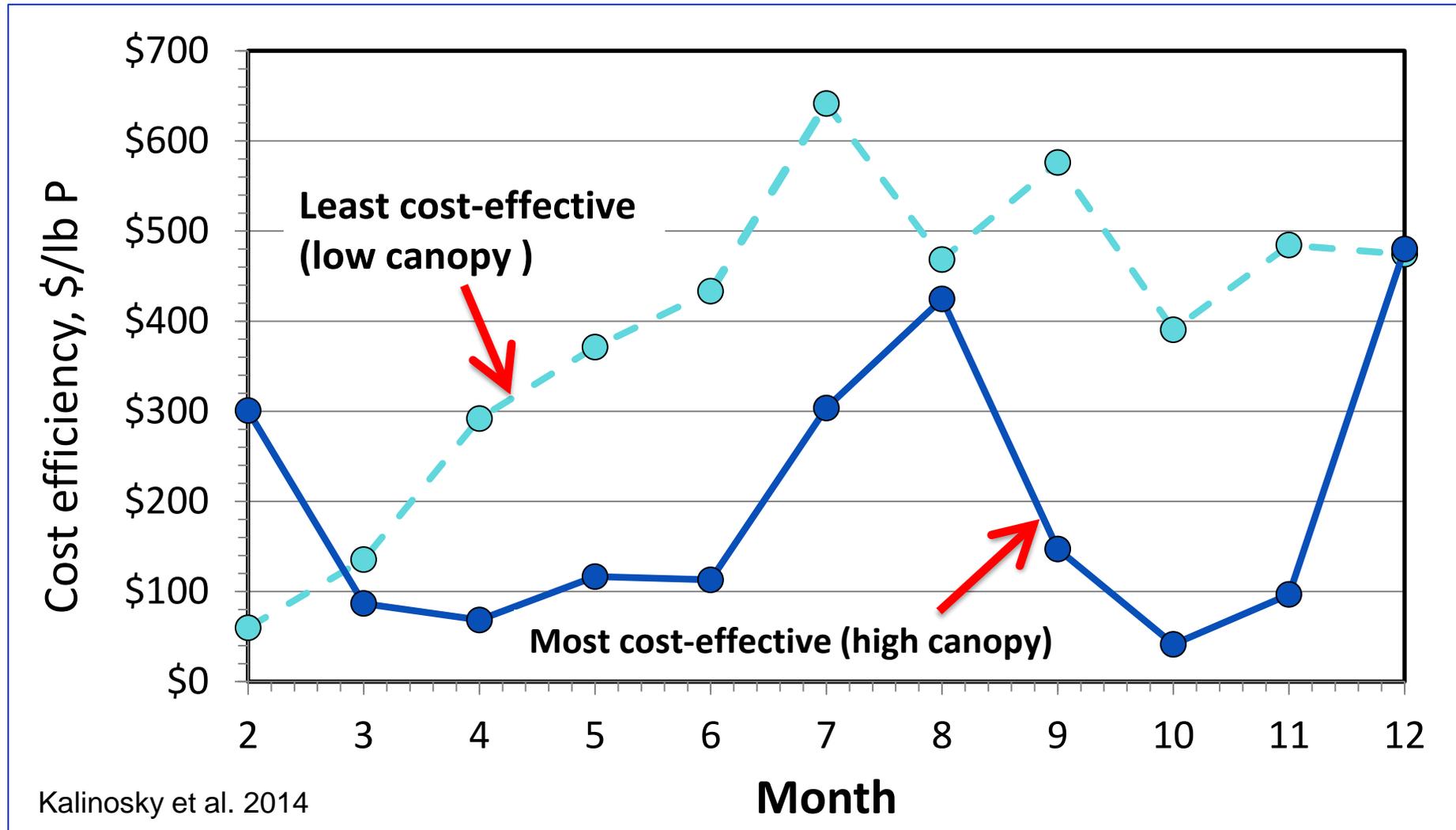
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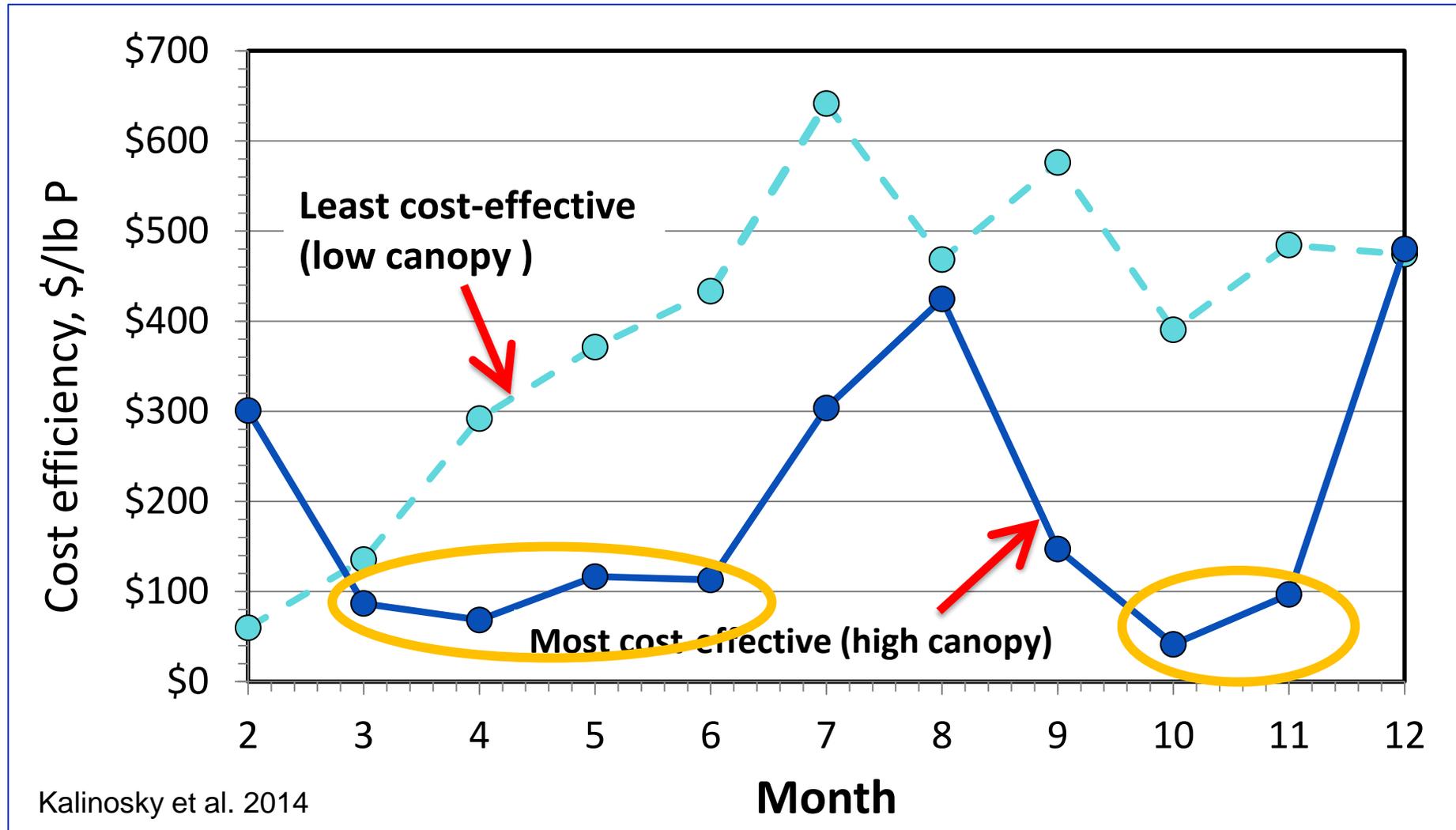
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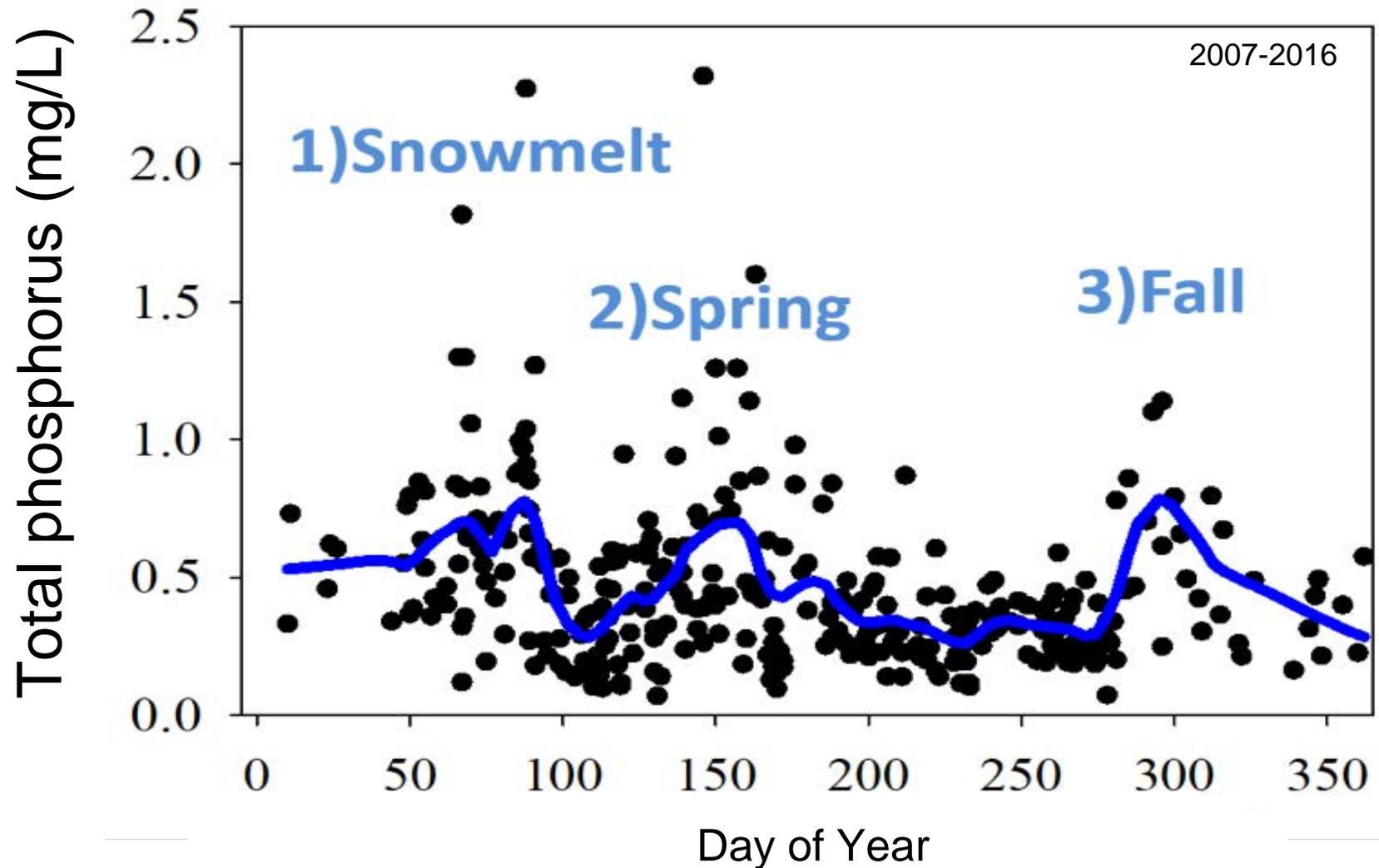


Kalinosky et al. 2014

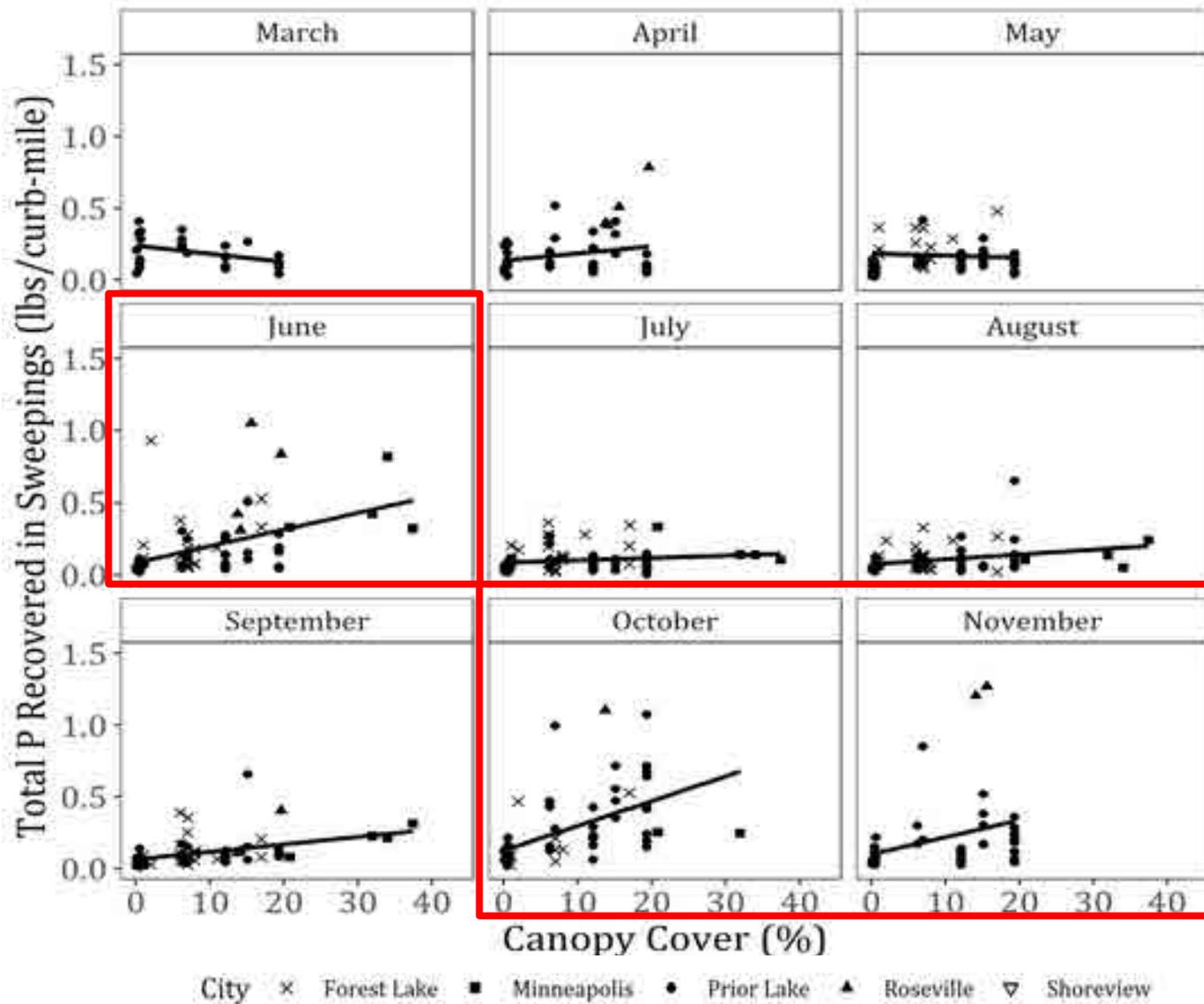
In high canopy areas, P could be recovered for less than \$100/lb (2012 dollars)



Within one watershed, across seasons, stormwater P matched tree phenology



MSRC Street Sweeping Study, 2018-2020



Total P recovered in sweepings was highest in late spring/early summer and fall where canopy cover was high



1. Benefits of Street Sweeping

- Street trees contribute significant phosphorus to stormwater
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- **Timing and location of street sweepings are important**
- Many other benefits of street sweeping



Research Conclusions

- Street sweeping can recover significant phosphorus
 - *in late spring and autumn*
 - *where tree canopy is high*



1. Benefits of Street Sweeping

- Street trees contribute significant phosphorus to stormwater
- Street sweeping can be cost-effective for removing phosphorus from stormwater
- Timing and location of street sweepings are important
- **Many other benefits of street sweeping**

Other Benefits of Street Sweeping

Other Water Quality Benefits:

- Nitrogen Reduction
- Sediment Reduction



Increased BMP Longevity



Reduced BMP Maintenance Needs



Decreased Inlet Clogging



Decreased Outlet Deposition

2. MPCA Credit Calculator



Street Sweeping Credit Calculator

MINNESOTA POLLUTION CONTROL AGENCY

Enter your data in YELLOW spaces based on the type of data you have available. Output units match input units (e.g. per year or per event). Track individual Calculator runs on the "Tracking" tab. If any required data inputs are missing, an error message will occur or output cells will appear blank.

Project or Watershed Area:

Input Data

Option 1: Dry Mass Data	Option 2: Wet Mass Data	Option 3: Curb Miles Swept Data																
<p><i>Required inputs:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Street Sweeping Load Dry Mass (lbs)</td> <td style="width: 30%; background-color: yellow;"></td> </tr> <tr> <td>Season of Data Collection</td> <td style="text-align: center;">Not Applicable</td> </tr> </table> <p><i>Optional input from Laboratory Analyses:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Organic Matter Content (%)</td> <td style="width: 30%; background-color: yellow;"></td> </tr> </table> <p><i>Note: if you have organic matter data, season does not matter.</i></p>	Street Sweeping Load Dry Mass (lbs)		Season of Data Collection	Not Applicable	Organic Matter Content (%)		<p><i>Required inputs:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Street Sweeping Load Wet Mass (lbs)</td> <td style="width: 30%; background-color: yellow;"></td> </tr> <tr> <td>Season of Data Collection</td> <td style="text-align: center;">Not Applicable</td> </tr> </table> <p><i>Optional inputs from Laboratory Analyses:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Dry Basis Moisture Content (%)</td> <td style="width: 30%; background-color: yellow;"></td> </tr> <tr> <td>Organic Matter Content (%)</td> <td style="background-color: yellow;"></td> </tr> </table> <p><i>Note: if user has organic matter data, season does not matter.</i></p>	Street Sweeping Load Wet Mass (lbs)		Season of Data Collection	Not Applicable	Dry Basis Moisture Content (%)		Organic Matter Content (%)		<p><i>Required inputs:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Curb Miles Swept (miles)</td> <td style="width: 30%; background-color: yellow;"></td> </tr> </table> <p><i>Note: if 1 mile of roadway is swept on both curb lines, input 2 curb miles.</i></p>	Curb Miles Swept (miles)	
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Phosphorus Concentration or Removal Rate																		
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2. MPCA Credit Calculator

Dry Mass

- Conduct subsampling within 24 hours of collection
- Requires special equipment or send to commercial lab



+ seasonal information
+ organic matter % (optional)

Wet Mass

- Wet mass of the entire sweeping load must be measured
- Requires internal scales or weighing vehicles before & after + fuel estimation



+ seasonal information
+ organic matter % (optional)
+ dry basis moisture % (optional)

Curb Miles Swept

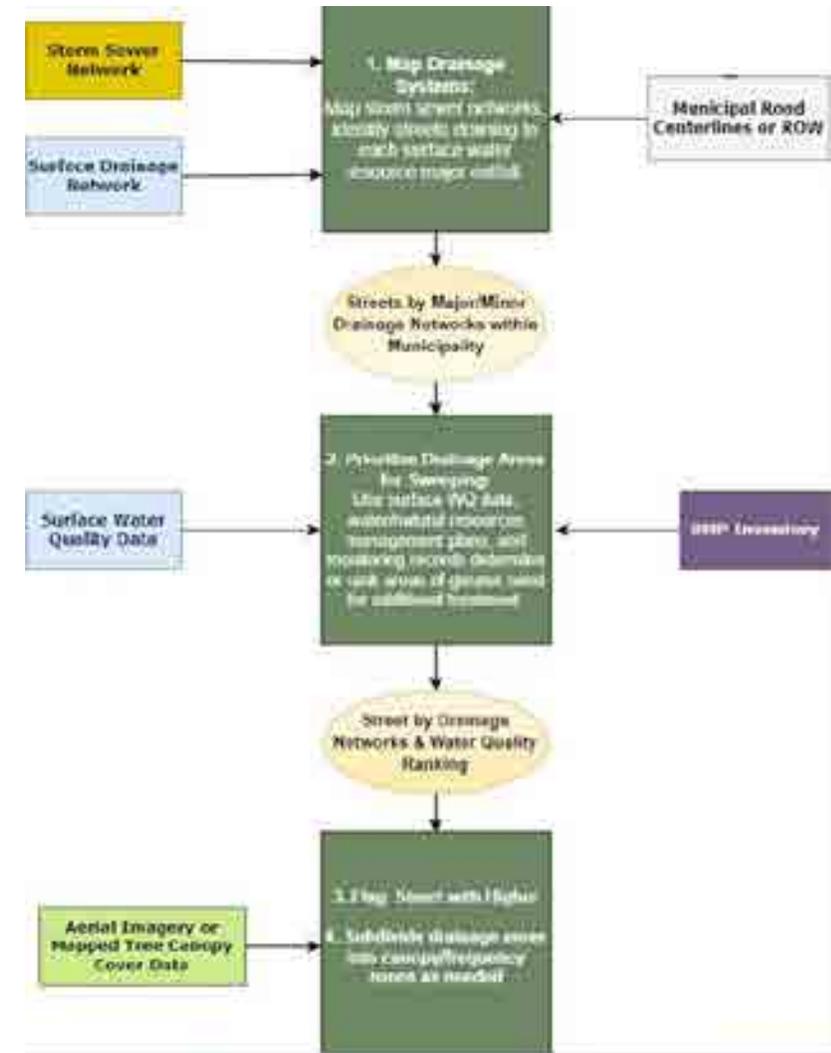
- Simplest method
- Measure the length of the curb miles swept
- 1 road mile = 2 curb miles
- Least amount of credit



3. Conducting a Sweeping Evaluation

Required Information:

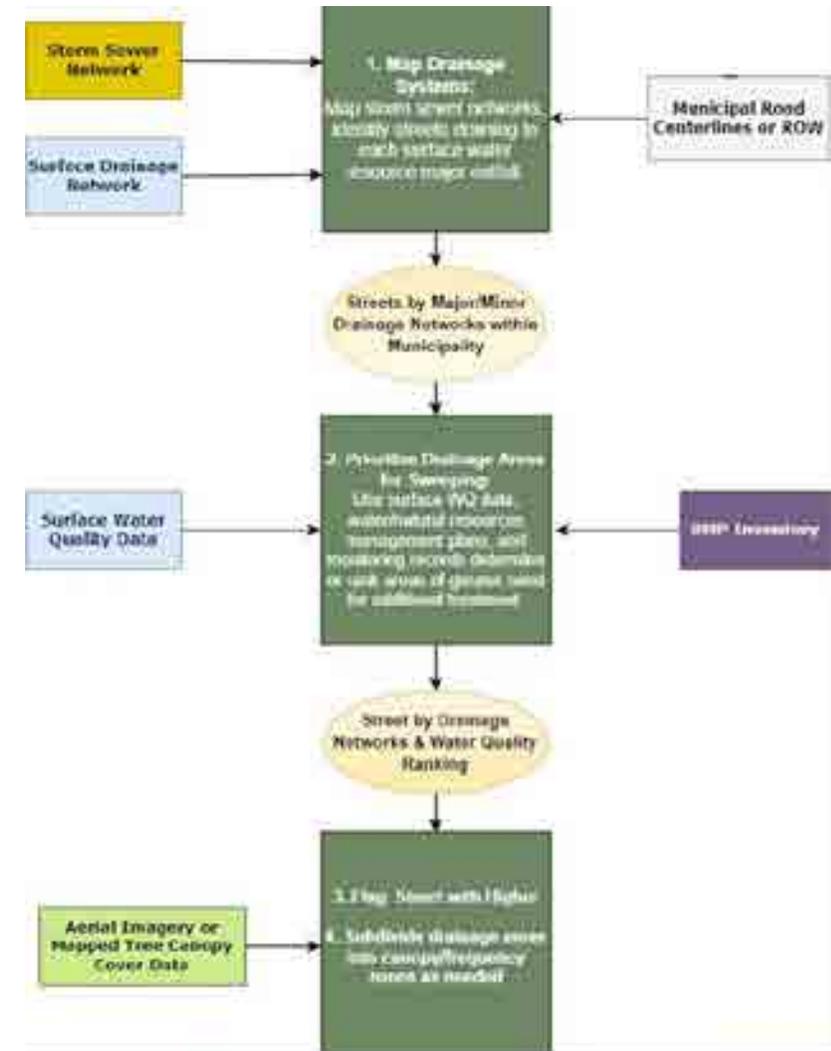
1. Municipal Road Centerlines
2. Mapped Drainage Networks
3. Water Quality Priorities
4. Digital Tree Canopy Data -or- Aerial Imagery
5. Metric for Estimating Removals



3. Conducting a Sweeping Evaluation

Required Information:

1. Municipal Road Centerlines
2. Mapped Drainage Networks
3. Water Quality Priorities
4. **Digital Tree Canopy Data -or- Aerial Imagery**
5. **Metric for Estimating Removals**





3. Conducting a Sweeping Evaluation

Tools to help:

- **Tree Canopy Assessment Protocol**
- **Quick Estimating Tool**
- **Other Tools Available**

LSCWP Tree Canopy Assessment Protocol for Enhanced Street Sweeping Prioritization



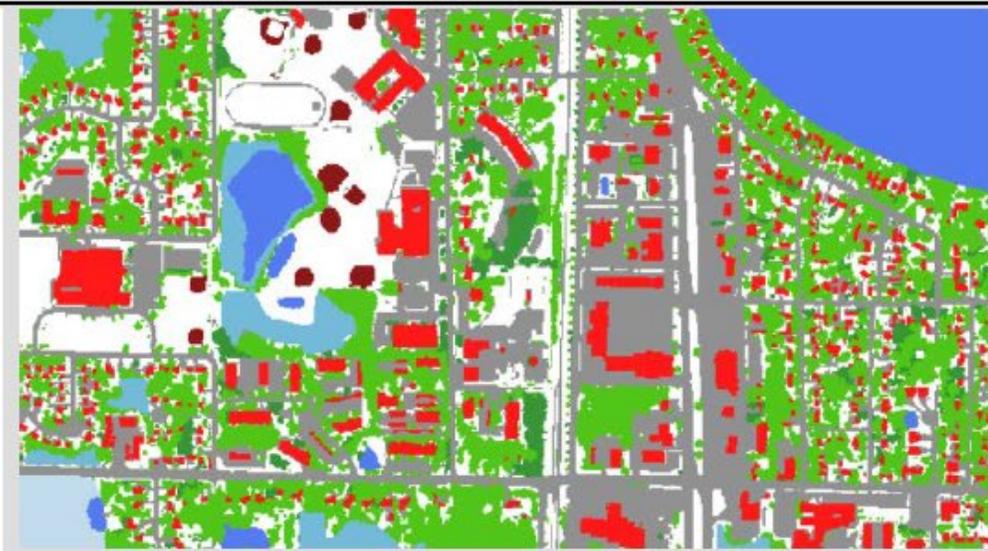
Tree Canopy Data

2015 Twin Cities Metropolitan Area (TCMA) Urban Tree Canopy Assessment, University of MN

Update in the works – Expected Release Date Mid-2023!

tcma_lc_finalv1.tif

- Grass/Shrub
- Bare Soil
- Buildings
- Roads/Paved Surfaces
- Lakes/Ponds
- Deciduous Tree Canopy
- Coniferous Tree Canopy
- Agriculture
- Emergent Wetlands
- Forest/Shrub Wetland
- Rivers
- Extraction



Tree canopy data may be out-of-date in areas developed in the last 15 – 20 years

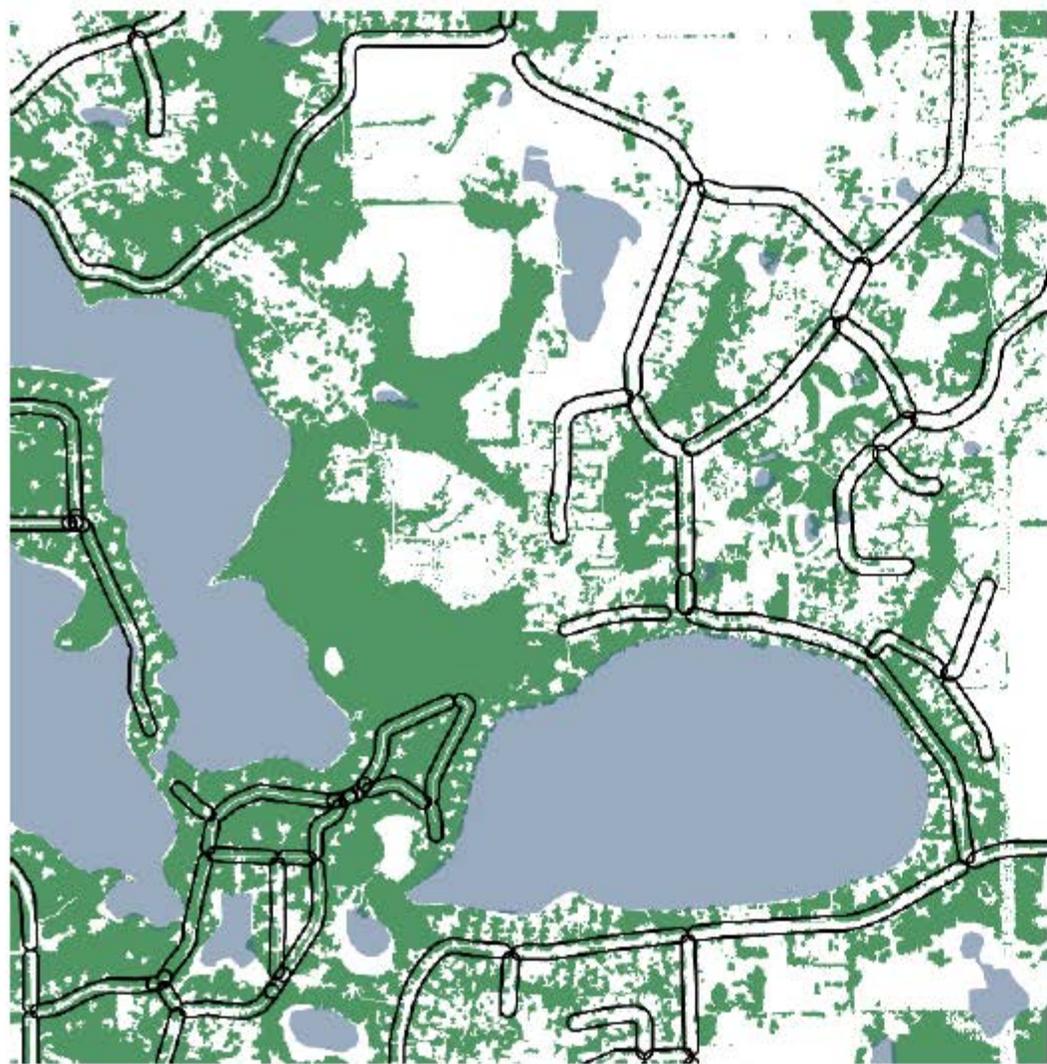
Development
After 2015
Canopy may be
**Over-
Represented**



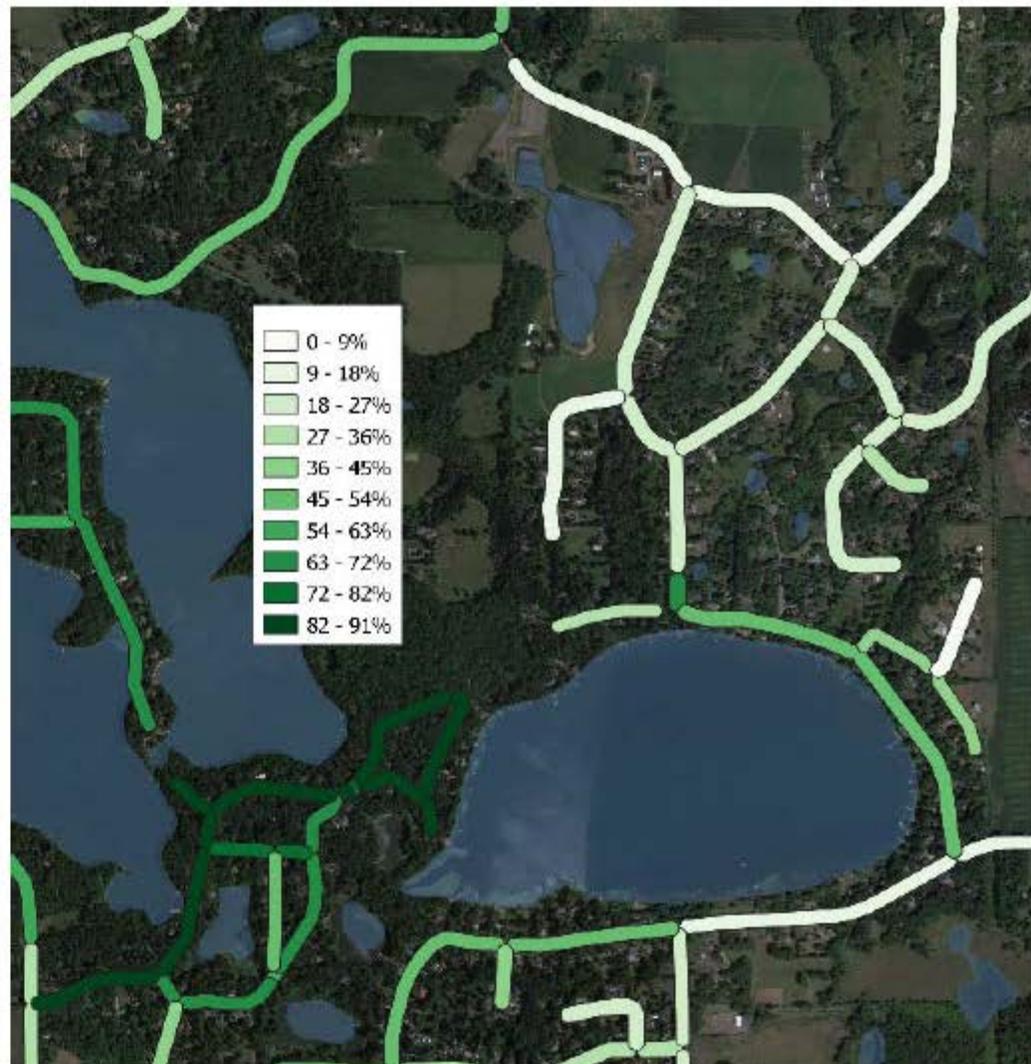
Development
2000 - 2015
Canopy may be
**Under-
Represented**

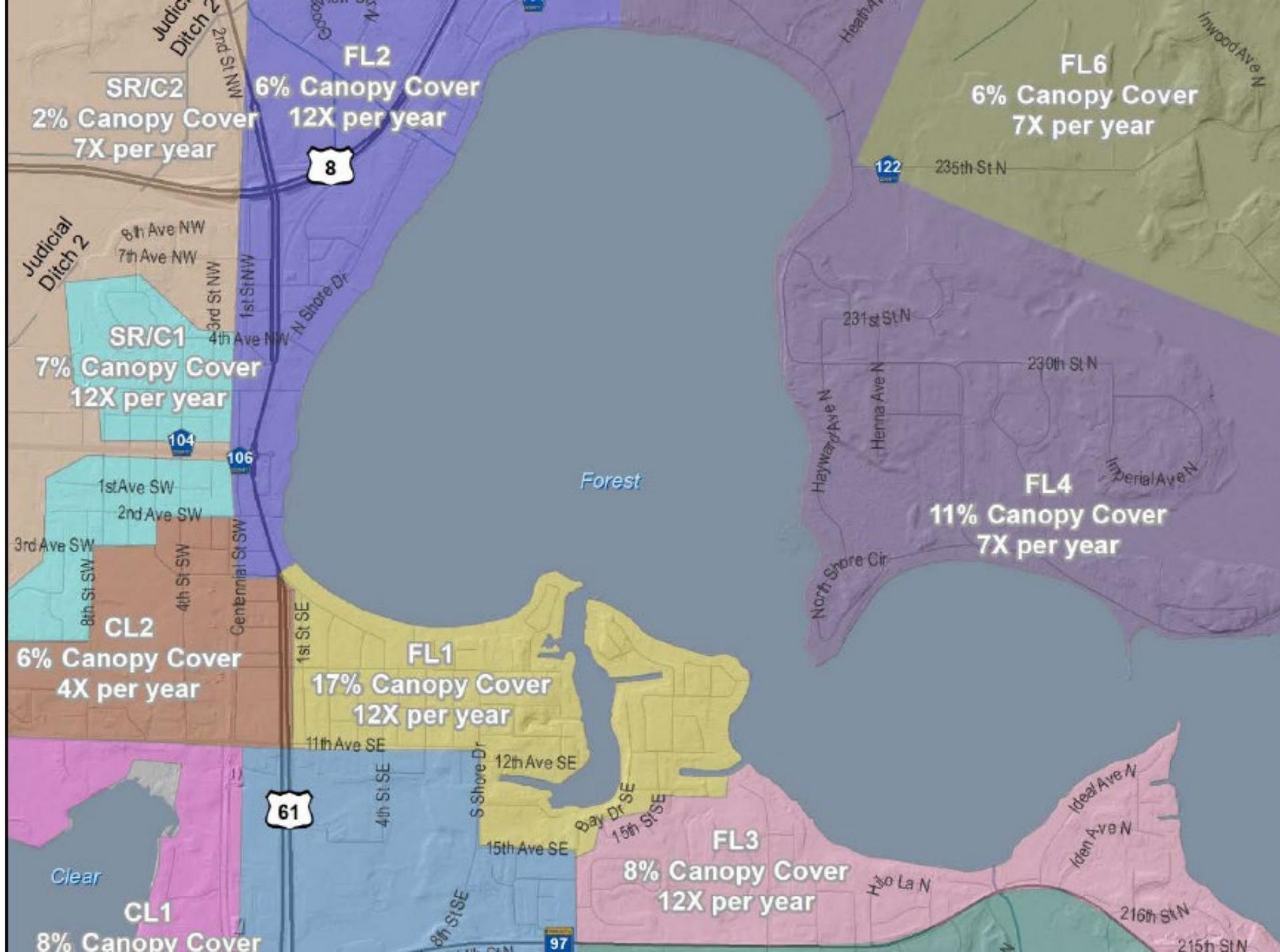


Tree canopy raster produced through raster reclassification (step 7B) overlaid by buffer polygons (step 6C).



Street corridor tree canopy buffer polygons, symbolized to show % tree canopy cover categorically (steps 8 & 9).





Resources:

Quick Estimating Tool



Metrics for Estimate Pollutant Recovery (DRAFT)

By applying average moisture contents for sweepings by season, the metrics can be translated to fresh-weight estimates

Season	Median Solids Recovery (lb/lane-mile, fresh mass basis*)			
	Sweeping frequency: once per month or less frequent		Sweeping frequency: twice per month	
	Right of Way Tree Canopy Cover		Right of Way Tree Canopy Cover	
	0-5% (low)	>5% (all other)	0-5% (low)	>5% (all other)
Spring (Apr - Jun)	228	483	195	358
Summer (Jul-Sept)	180	335	178	300
Fall (Oct-Nov)	218	608	168	488

Metrics can be used to estimate TP Credits by apply TP Concentration used in the MPCA Sweeping TP Credit Calculator

Season	Median Phosphorus Recovery (lb/lane-mile)			
	Sweeping frequency: once per month or less frequent		Sweeping frequency: twice per month or more frequent	
	Right of Way Tree Canopy Cover		Right of Way Tree Canopy Cover	
	0-5% (low)	>5% (all other)	0-5% (low)	>5% (all other)
Spring (Apr - Jun)	0.075	0.160	0.065	0.118
Summer (Jul-Sept)	0.060	0.111	0.059	0.099
Fall (Oct-Nov)	0.117	0.326	0.090	0.261

Estimate Pollutant Recovery Using Solids and Phosphorus Recovery Metrics (DRAFT)

Estimating Solids Recovery for Planning Street Sweeping

1. Quantify the lane-miles in areas of interest. This is typically twice the roadway centerline length but depends on the number of driving lanes.
2. Determine whether streets in areas of interests have low (0-5% cover) or higher tree canopy covers
3. Draft a sweeping scenario, choosing the month/season and frequency of sweeping
4. Identify the appropriate solids recovery metric from Table 1.

Estimated **Total Solids Recovery** =

(Total Lane Mile) X (#Sweeping) X (Solids Recovery Metric by Canopy/Season/Frequency Class)

10	Right-of-Way Canopy Cover		Total Lane Miles	# Sweepings Planned								Spring* (April, May, June)			Summer (July, August, September)			Fall (October, November)		
				April	May	June	July	August	September	October	November	# Sweepings	Median Solids Loading (lb/lane-mile)	Estimated Solids Recovery (lb)	# Sweepings	Median Solids Loading (lb/lane-mile)	Estimated Solids Recovery (lb)	# Sweepings	Median Solids Loading (lb/lane-mile)	Estimated Solids Recovery (lb)
	0-5%	>5%																		
Zone A	X		5.0	1		1		1		1		2	182	1,820	1	144	720	1	136	680
Zone B	X		7.5		1	1		1	1	1		2	182	2,730	2	144	2,160	1	136	1,020
	X			2								1	156	1,170						
Zone C		X	10.0	1	1	1	1	1	1	1	1	3	386	11,580	3	268	8,040	2	380	7,600
Zone D		X	2.5	2	2	2	2	2	2	2		6	286	4,290	6	240	3,600	6	305	4,575
				Subtotal								Spring			Summer			Fall		
												21,590			14,520			13,875		

Estimate Pollutant Recovery Using Solids and Phosphorus Recovery Metrics (DRAFT)



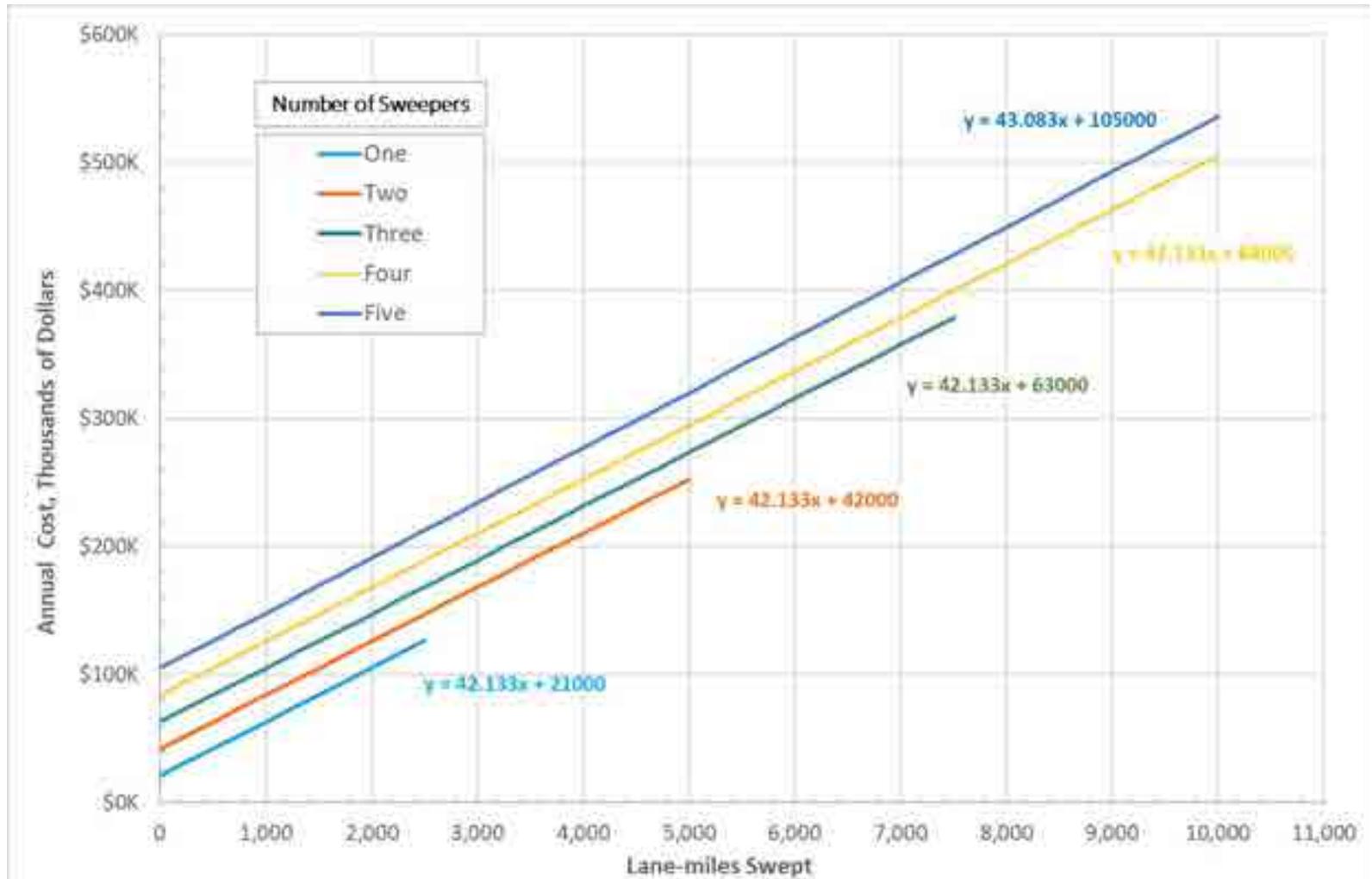
Use Metrics for Total Phosphorus to Estimate Associated TP Credits

10	Right-of-Way Tree Canopy Cover		Total Lane Miles	# Sweepings Planned								Spring* (April, May, June)			Summer (July, August, September)			Fall (October, November)		
	0-5%	>5%		April	May	June	July	August	September	October	November	# of Sweepings	Median Phosphorus Recovery (lb/lane-mile)	Estimated Phosphorus Recovery (lb)	# of Sweepings	Median Phosphorus Recovery (lb/lane-mile)	Estimated Phosphorus Recovery (lb)	# of Sweepings	Median Phosphorus Recovery (lb/lane-mile)	Estimated Phosphorus Recovery (lb)
Zone A	X		5.0	1		1		1		1		2	0.075	0.8	1	0.060	0.3	1	0.117	0.6
Zone B	X		7.5		1	1		1	1	1		2	0.075	1.1	2	0.060	0.9	1	0.117	0.9
	X			2								1	0.065	0.5						
Zone C		X	10.0	1	1	1	1	1	1	1	1	3	0.160	4.8	3	0.111	3.3	2	0.326	6.5
Zone D		X	2.5	2	2	2	2	2	2	2		6	0.118	1.8	6	0.099	1.5	6	0.261	3.9
Subtotal												Spring	8.9	Summer	6.0	Fall	11.9			

Other Resources:

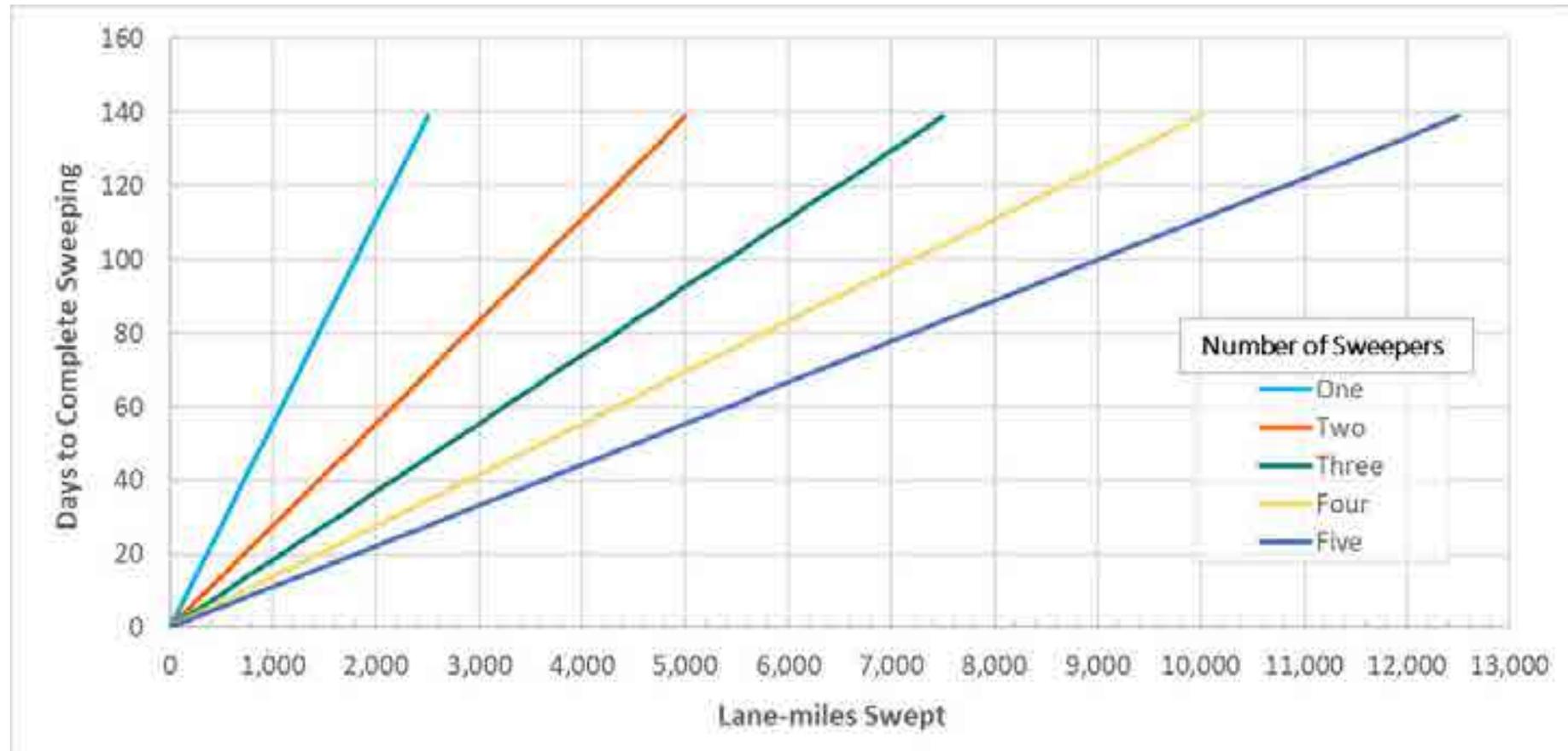
How many sweepers do you need?

How much funding do you need?



Other Resources:

How many days will the sweeper need to be out?





- **Clean Sweep Program Website:**
information, tools & resources
wrc.umn.edu/clean-sweep-program
- **Regional Workshops:**
 - *Rochester on May 15th*
 - *Bloomington on May 31st*
- **Future online training and/or certification courses**

Questions?

CONTACT INFO:

Maggie Karschnia

U of M Water Resources Center & MN Sea Grant

maggiek@umn.edu

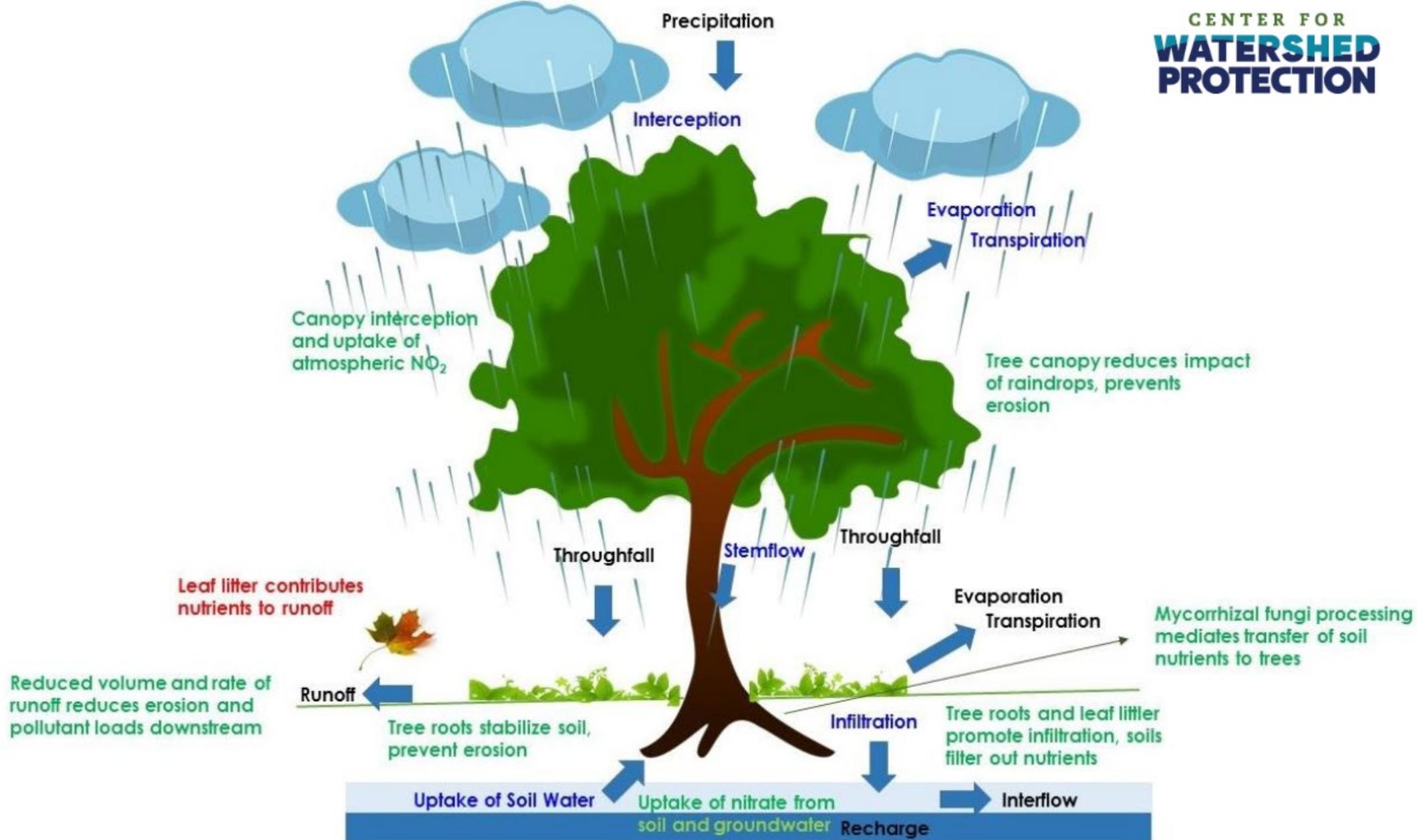




LOWER ST. CROIX PARTNERSHIP ENHANCED STREET SWEEPING PROGRAM

INCENTIVIZING TARGETED SWEEPING TO PRIORITY WATER RESOURCES





Lower St. Croix Incentive Payments based on:

- Canopy cover
- Sweeping frequency
- Timing of sweeping
- And sweeper type

Increasing late spring, early summer, and fall sweepings in catchments with medium or high tree canopy cover significantly reduces phosphorus discharges to priority water resources.


LOWER ST. CROIX WATERSHED
PARTNERSHIP



ENHANCED STREET SWEEPING PROGRAM



Lower St. Croix Watershed Partnership has funding for communities interested in enhancing their sweeping operations to help reduce lake and river pollution.

Natural debris such as leaves, sediment, and grass clippings can act as significant sources of phosphorus to our lakes, rivers, and streams. Many communities have street sweeping operations that reduce the amount of debris from streets, removing that pollution threat from making its way to our waterways.

The Lower St. Croix Watershed Partnership (LSCWP) has allocated funds to enhance street sweeping operations for interested communities, including increased sweeping in late spring, early summer, and fall in areas with medium to high tree canopy that direct connect and flow to priority water bodies. Participating communities will be responsible for implementing their customized enhanced sweeping plan over three years that will include annual incentive payments adding up to (but not to exceeding) \$5,000 per year.

Reimbursement rates will be as follows:

- Tier 1: \$100/sub-mile/year (complete the MPCA credit calculator based on curb miles swept and provide the report)
- Tier 2: \$125/urb mile/year (complete the MPCA credit calculator based on the tracking of weights, dates, and provide the report)

To qualify for a grant, interested communities must have an approved enhanced street sweeping plan completed by the LSCWP. Plan development will include an evaluation to understand existing sweeping operations, assessing canopy cover in key locations, and developing recommendations of sweeping locations, frequency, and timing. The LSCWP has allocated up to \$40,000 to help develop these plans with communities.

We want to hear from you!

Let us know whether your community would be interested in this program and let us know what resources you already have available to you. Please take a short survey by using the QR code to the right or visiting tinyurl.com/LSCstreetweep



This program was developed from research funded by the Minnesota Watershed Research Council and supported by the University of Minnesota. To learn more about enhanced street sweeping and phosphorus pollution reduction in streams, lakes, and rivers, please see the Minnesota Economic Monitor at www.umn.edu/monitor.

Step 1 Enhanced Street Sweeping Plan

- **Identify existing sweeping operations**
 - Who sweeps, with what type of sweeper, how often, where, etc.
- **Utilize GIS to create an Enhanced Sweeping Plan (paid for by LSCP CWF)**
 - Identifies priority sweeping zones and frequencies and timing based on connectivity to priority water resources and canopy cover



Enhanced Street Sweeping Analysis

City of Scandia



Report Prepared for the City by
Funded by

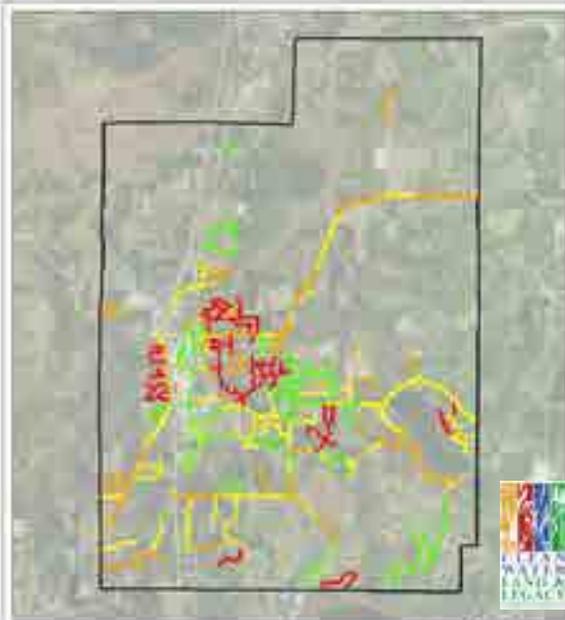


In partnership with



Enhanced Street Sweeping Plan

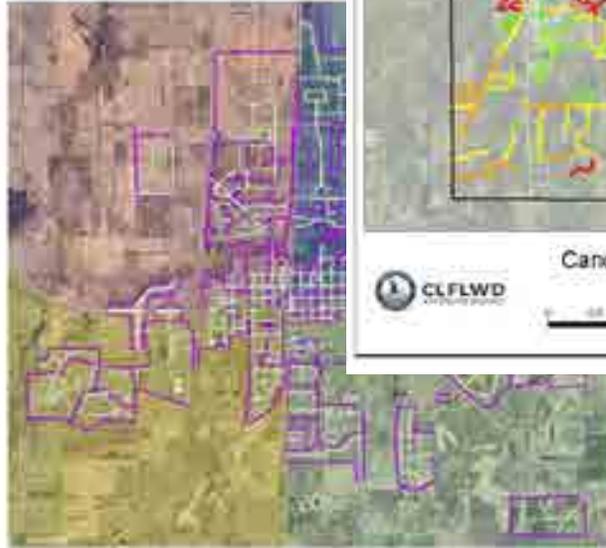
City of Wyoming



Canopy Cover



City of North Branch Enhanced S



Report Prepared for the City of North Branch by



City of Rush City Enhanced Street Sweeping Analysis



Street Sweeping Analysis of Marine on St-Croix



Report Prepared for the City of Rush City by



Report Prepared for the City by
Funded by



In partnership with



Step 2 Apply for a Grant

3-Year Incentive Payment

Up to 50 miles per community per year (not to exceed \$5,000 per year), with a program goal of sweeping 350 curb miles per year.

Tier 1 \$100/curb-mile/year (complete the MPCA credit calculator based on curb miles swept and provide the report)

Tier 2 \$125/curb-mile/year (complete the MPCA credit calculator based on the tracking of weights, dates, and provide the report)



ENHANCED STREET SWEEPING PROGRAM



Lower St. Croix Watershed Partnership has funding for communities interested in enhancing their sweeping operations to help reduce lake and river pollution.

Natural debris such as leaves, sediment, and grass clippings can act as significant sources of phosphorus to our lakes, rivers, and streams. Many communities have street sweeping operations that reduce the amount of debris from streets, removing that pollution threat from making its way to our waterways.

The Lower St. Croix Watershed Partnership (LSCWP) has allocated funds to enhance street sweeping operations for interested communities, including increased sweeping in late spring, early summer, and fall in areas with medium to high tree canopy that direct connect and flow to priority water bodies. Participating communities will be responsible for implementing their customized enhanced sweeping plan over three years that will include annual incentive payments adding up to (but not to exceeding) \$5,000 per year.

Reimbursement rates will be as follows:

- Tier 1: \$100/curb-mile/year (complete the MPCA credit calculator based on curb miles swept and provide the report)
- Tier 2: \$125/curb-mile/year (complete the MPCA credit calculator based on the tracking of weights, dates, and provide the report)

To qualify for a grant, interested communities must have an approved enhanced street sweeping plan completed by the LSCWP. Plan development will include an evaluation to understand existing sweeping operations, assessing canopy cover in key locations, and developing recommendations of sweeping locations, frequency, and timing. The LSCWP has allocated up to \$40,000 to help develop these plans with communities.

We want to hear from you!

Let us know whether your community would be interested in this program and let us know what resources you already have available to you. Please take a short survey by using the QR code to the right or visiting tinyurl.com/LSCstreetsweep.



This program was developed from research funded by the Minnesota Stormwater Research Council and completed by the University of Minnesota. To learn more about enhanced street sweeping and phosphorus pollution reduction in streams, lakes, and rivers please see the Minnesota Stormwater Manual at tinyurl.com/MNstormwater

Eligible Water Resources/Communities

- **Rush Creek** (Rush City)
- **Goose Creek** (Harris)
- **Sunrise River** (North Branch, Stacy, Wyoming)
- **St. Croix River** (Taylors Falls, Marine on the St. Croix, Stillwater, and MSCWMO cities including Afton, Bayport, Baytown Township, Lakeland, Lakeland Shores, Lake St. Croix Beach, Oak Park Heights, St. Mary's Point, Stillwater, and West Lakeland Township)

LOWER ST. CROIX APPLICATIONS FOR 3 YEAR AGREEMENTS

- LINWOOD TOWNSHIP 23.9 LBS TP @ \$3,144 PER YEAR
- CITY OF AFTON 54.0 LBS TP @ \$5,000 PER YEAR
- CITY OF WYOMING 29.6 LBS TP @ \$5,000 PER YEAR
- CITY OF N. BRANCH 27.0 LBS TP @ \$5,000 PER YEAR
- 8 MSCWMO CITIES 139.0 LBS TP @ \$15,000 PER YEAR
- CITY OF MARINE ON ST. CROIX- TBD MAY 2023
- CITY OF SCANDIA- TBD MAY 2023



Step 3 Communities Implement Enhanced Sweeping



How can enhanced street sweeping help your community?


LOWER ST. CROIX WATERSHED
PARTNERSHIP

- Cost-effective way to reduce phosphorus and sediment flowing into lakes, streams, rivers and wetlands
- Increase the lifespan and reduce maintenance costs for stormwater infrastructure
- Claim phosphorus-reduction credits for MS4 permits and TMDL plans
- Reduce the risk of localized street flooding due to clogged storm drains


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PARTNERSHIP

Step 4 Communities Report Sweeping Results

Street Sweeping Credit Calculator 

Enter your data in YELLOW boxes based on the type of data you have available. Output only metric input units (e.g. per year or per event). Each individual Calculator runs on a "Tracking" ID. If any required data inputs are missing, an error message will occur or output cells will show blank.

Project or Watershed Area:

Input Data

Option 1: Dry Mass Data	Option 2: Wet Mass Data	Option 3: Curb Miles Swept Data
Required inputs: Street Sweeping Load Dry Mass (lbs): <input type="text" value=""/>	Required inputs: Street Sweeping Load Wet Mass (lbs): <input type="text" value="0.200"/>	Required inputs: Curb Miles Swept (miles): <input type="text" value=""/>
Season of Data Collection: <input type="text" value="Not Applicable"/>	Season of Data Collection: <input type="text" value="Fall Leaf Collection"/>	Note: If 1 mile of roadway is swept on both sides, input 2 curb miles.
Optional input from laboratory analysis: Organic Matter Content (%): <input type="text" value=""/>	Optional inputs from laboratory analysis: Dry Basis Moisture Content (%): <input type="text" value=""/> Organic Matter Content (%): <input type="text" value=""/>	
Note: If you have organic matter data, season does not matter.	Note: If you have organic matter data, moisture does not matter.	

Phosphorus Concentration or Removal Rate

P Concentration (mg P / kg dry mass): <input type="text" value="Missing input data"/>	Street Sweeping Load Dry Mass (lbs): <input type="text" value="387"/>	Area of Road Swept (acres): <input type="text" value="0.00117"/>
	P Concentration (mg P / kg dry mass): <input type="text" value="807"/>	P Removal Rate (lbs P / ac / pass): <input type="text" value=""/>

Phosphorus Load Reduction

Total Phosphorus Removed (lbs): <input type="text" value="0.02"/>	Total Phosphorus Removed (lbs): <input type="text" value=""/>
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Index	Project or Watershed Name	Event ID or Route Name	Date or Date Range of Sweeping	Season	Sweeping Load Wet Mass (lbs)	Dry Basis Moisture Content (%)	Sweeping Load Dry Mass (lbs)	Organic Matter Content (%)	Curb Miles Swept (mi)	Input Option In Calculator	Total Phosphorus Removed (lbs)
0	City	Route	10/4/2020	Fall	50	N/A	N/A	N/A	20	Option 2	0.02
1	Marine on St. Croix	1		Spring	1,115				3	Option 2	0.36
2	Marine on St. Croix	2		Spring	1,500				5	Option 2	0.49
3	Marine on St. Croix	3,4		Spring	2,200				7	Option 2	0.71
4	Marine on St. Croix	1		Spring	830				3	Option 2	0.27
5	Marine on St. Croix	2		Spring	1674				5	Option 2	0.5300
6	Marine on St. Croix	3,4		Spring	1819				7	Option 2	0.59
7	Marine on St. Croix	1		Fall	1216				3	Option 2	0.55
8	Marine on St. Croix	2		Fall	1616				5	Option 2	0.73
9	Marine on St. Croix	3,4		Fall	2622				7	Option 2	1.18
10	Marine on St. Croix	1		Fall	1009				3	Option 2	0.45
11	Marine on St. Croix	2		Fall	1456				5	Option 2	0.66
12	Marine on St. Croix	3,4		Fall	1795				7	Option 2	0.79
13	Marine on St. Croix	1		Fall	1592				3	Option 2	0.72
14	Marine on St. Croix	2		Fall	1819				5	Option 2	0.82
15	Marine on St. Croix	3,4		Fall	2222				7	Option 2	1
16											


**LOWER ST. CROIX WATERSHED
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STREET SWEEPING EDUCATION & TRAINING PROGRAM

Promoting & advancing enhanced street sweeping programs and use of the MPCA street sweeping calculator.

