

BCWMC: Street Sweeping Prioritization Study



August 15, 2024



Background



Up-tick in studies performed to help prioritize areas for enhanced street sweeping, and to estimate benefits, in recent years.

Street sweeping studies to date:

- Ramsey Washington Metro WD
- Capitol Region WD
- Shell Rock River WD
- Nine Mile Creek WD (targeted subwatersheds)
- City of Richfield

Questions we were trying to answer:

- What are municipal partners doing currently?
- Where should we prioritize street sweeping efforts?
- How much should we be sweeping?
- Inform street sweeping grant program
- *What about MnDOT and Hennepin County?*
- *What about chlorides?*



Project Approach



Task 1: Survey of street operations

Tasks 2/3: Model development & evaluate existing conditions

Task 4: Seasonal efficiency & cost benefit comparison

Task 5: Prioritization mapping

Task 6: Chloride & street sweeping coordination

Task 7: Plymouth street sweeping data review

Task 8: Reporting

Municipality	Response: street sweeping program summary
Little Canada	3 times/year. Spring, summer, and fall
Maplewood	Goal of 5 times/year. 2 in spring, 3 in fall.
North St. Paul	6-7 times per year. 2 in spring, 2 in summer, 3 in fall.
Oakdale	At least 3 times per year (one in each season)
Roseville	4-6 full city sweeps per year. 1 in spring, 2-4 in summer, 1 in fall.
Shoreview	4-6 citywide sweeps per year. Sweeping starts after snow melt in spring and continues until snow starts in fall.
St. Paul	Most swept in spring and fall. Arterial streets swept 4-8 timesper year
White Bear Lake	We do a complete sweep of the entire city twice a year Spring & Fall. During that time we are able to sweep all the city streets at least once sometimes twice. Also throughout the summer we sweep high



Examples: Study Outcomes



Survey of municipal partners, example Qs:

- Current street sweeping frequency?
- Types of sweeping equipment utilized?
- Annual street sweeping budget?
- Goals of street sweeping program?
- Barriers / challenges to additional sweeping?

Bassett survey:

- Incorporate questions related to chloride use and recovery

Appendix A – RWMWD street sweeping survey responses.

Municipality	RWMWD street sweeping survey question to municipal partners										
	1. Curb Miles Maintained	2. Sweepings per year	3. Certain areas more frequent	4. Annual expenses	5. Type and number of sweepers	6. Annual staff hours	7. Barriers	8. Data collected	9. Reasons for sweeping	10. Cost share options	11. Additional comments
Little Canada	18	2 times/year. Spring, summer, and fall	Some areas with trees and lawns and tree seeds are hit twice during each sweeping event.	Not available	Director's V851 sweeper combination mechanical vacuum sweeper	750	1) SWP availability. 2) Timing sweepings to be the most efficient in collecting leaves. 3) Cost of disposal.	Not at this time.	Aesthetics and water quality	Further study of the material that is collected and help offset disposal costs	Roseville: 150 line miles are swept year full sweep. Roseville has a 126 centric mile of road. Roseville also has 1000 lanes, center left turn lanes, etc.) 1,400 = 2,200 line miles annually. Funding the street sweeping program may be difficult, but we could likely look at efficiency and capturing more materials off the road with newer equipment. Any funding the city saves in street sweeping could be used to add swept curb basins with brush rollers to help capture what we don't pick up from the streets, before it gets to our surface waters.
Maplewood	275	Goal of 3 times/year. 2 in spring, 1 in fall.	Sweeping takes and ponds more frequently because of the immediate drainage into them. Possible additional clean up after storms.	2022 budget: \$118,000	2 Elgin Mechanical	1734. Includes haul truck	1) Timing of areas to dispose of material and cost of disposal. 2) Staff because they fiddle with the ditches and can't always get the sweeper out when they would like.	No, material is screened and disposed of.	To remove trash, sand, leaves, and debris from our roadways to help prevent these things from entering storm drains, lakes, and ponds.	2) Assist with staffing costs to increase sweeping in priority areas. 3) Disposal costs.	2023: collected approximately 400 yards of leaves and 350-400 tons of street sweepings (sand, road debris).
North St. Paul	91	6-7 times per year. 2 in spring, 2 in summer, 3 in fall.	Some areas are swept 4-6 times per year due to leaves and other organic debris. They are swept more frequently for appearance as well as water quality.	Approximately \$150,000	1 Elgin Pelican mechanical street sweeper	1,100	1) lack of staffing. 2) lack of funding.	We need to track miles swept more than amount of material collected, but we have a good idea of amount collected as we are charged per yard to dump.	Water quality and appearance/visibility, also safety for bicyclists and motorists.	Assist with staffing costs to increase sweeping.	
Oakdale	200	At least 3 times per year. Spring sweeping is done in late March and April. Summer sweeping is more random but done from late May into July. Fall sweeping is done in mid to late October into November or as long as weather allows.	Some areas are swept 4-6 times per year due to leaves and other organic debris. They are swept more frequently for appearance as well as water quality.	Approximately \$75,000	1 Elgin Pelican mechanical sweeper, 1 Times 500X regenerative air sweeper	1,600	1) lack of staffing. 2) lack of funding.	We need to track miles swept more than amount of material collected, but we have a good idea of amount collected as we are charged per yard to dump.	Water quality and appearance/visibility, also safety for bicyclists and motorists.	Assist with staffing costs to increase sweeping.	
Roseville	350	4-6 full city sweeps per year. 1 in spring, 2-4 in summer, 2 in fall.	Residential areas (adjacent to lakes, wetlands, etc.) & critical areas (drainage/flooding issues), potential for smaller clean up areas throughout the year due to construction, weather, accidents, etc.	Approximately \$350,000	2 Pelican sweepers, 1 regenerative sweeper/vacuum	1,850	1) On street parking. 2) disposal of material. 3) staff time. 4) budget.	Roseville currently collects the material, tests it, and then hires a contractor to haul the material to be re-used and/or landfilled depending on the type.	Improve and protect water quality, reduce drainage/flooding issues, and help keep the city looking clean.	2) Upgrade equipment. 3) purchase another sweeper. 3) pay staff. 4) purchase a screen so we can reuse more material (granules for the city, etc.	
Shoreview	110	4-6 citywide sweeps per year. Sweeping starts after snow melt in spring and continues until snow starts in fall.	Yes, permeable pavement areas, especially snow per month. Regular additional sweeping to maintain permeability.	\$60,000	1 mechanical sweeper, 1 regenerative air sweeper. Both sweepers are used throughout the city, but the mechanical sweeper will be used in areas where there is larger material or more leaves and the regenerative air is used for the permeable pavements.	400	1) Maintenance of equipment. 2) availability of staff time. 3) distance to dispose of material during the fall when collecting mainly leaves. Typically take swept up leaves directly to the compost site.	Yes, we screen the swept up material and the screened material is sent to the landfill and used as daily cover. The material that is removed by the screen is landfilled. The weight for both types of material is determined when taken to the landfill. Material is also tested annually to determine if a special disposal of the material is required.	Water quality and reduce maintenance required for city BMPs.	Potentially use to hire company to complete additional sweeping in high priority areas.	
St. Paul	2,000 curb miles, 2000 miles	Most swept in spring and fall. Aerial robots swept 4-6 times per year	Higher volume traffic areas	\$4.5 million	15 Elgin Pelican and 1 Elgin Crowder	30 FTEs	parking and staffing	track loads per shift	Clean streets of debris and trash, fulfill the City's MSA permit requirements	open to discuss opportunities.	
White Bear Lake	183	We do a complete sweep of the entire city twice a year Spring & Fall. During that time we are able to sweep all the city streets at once (one time each). Also throughout the summer we sweep high volume areas every Friday, and track up problems as they occur.	Yes, our downtown area is swept more frequently because of the activities that are a constant in that area. A lot of trees and debris in this area and run-off from much of the area flows to White Bear Lake.	17000	one sweeper it is a Terco 500X regenerative air truck mount on a freightliner chassis.	720	1) Finding places to dispose of material and cost of disposal. 2) weather 3) the main hours to get the job done, it's a very slow time consuming process, the sweeper doesn't pick up sticks so the operator has to get out and move them or in jams the equipment. We do have a follow truck to collect the sweepings, and that helps; they try and pave the way for the operator. 4) Our ditches are always packed on the street so we can't do a thorough job also. 5) Barriers that prevent sweeping from happening more often include the cost to purchase a second sweeper. 6) cost of additional driver and maintenance staff, and finding qualified staff to operate the sweeper. 7) More research would need to be done to determine the need for additional equipment and staff.	Not at this time	Pollution control and preventative maintenance to help maintain street integrity.	2) disposal costs. 3) staffing for additional sweeping in priority areas. 3) additional sweeper. 4) staff for operation and maintenance. 5) hire someone to complete an initial analysis to determine the need for additional sweeping, targeted areas, and timing.	Public Works staff have taken about other options for sweeping streets. For example, is there a sweeping attachment for a 2 ton truck that can be used in smaller priority areas for the entire season? This may reduce the need for specialized training for the driver and mechanic and may allow for

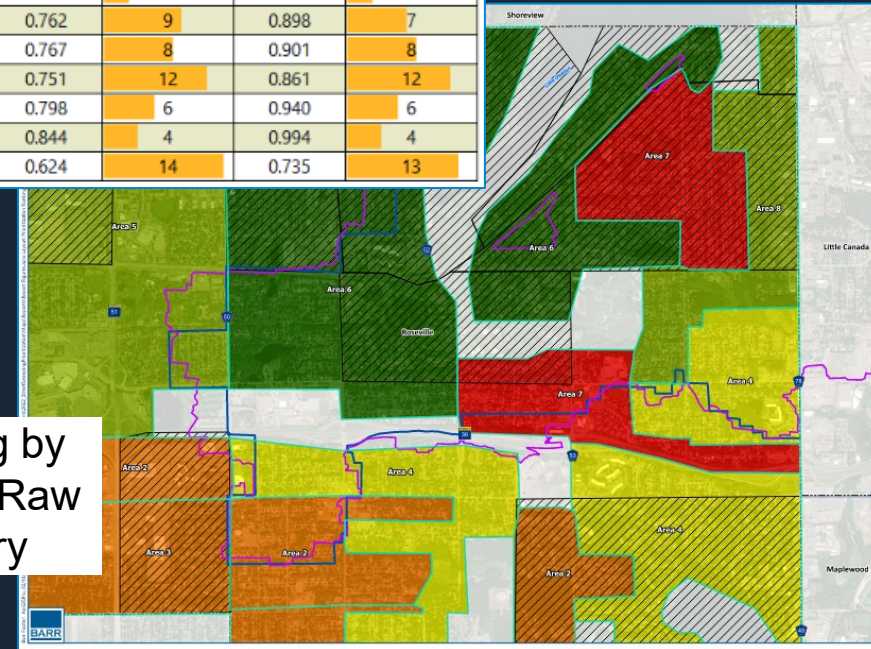
Examples: Study Outcomes



Street sweeping prioritization & mapping:

- Prioritization results can be summarized by any boundary (e.g., major watershed, municipality, street sweeping zones, etc.)
- Prioritization by “recovery” vs. “reduction”
 - Noting areas that are directly draining into priority waterbodies vs. wetlands / ponds / BMPs

Major Watershed	Total Curb Length (miles)	Existing Conditions: Recovery (lbs/curb-mile/yr)	Enhanced Fall Sweeping		District-wide Enhanced Sweeping	
			Recovery (lbs/curb-mile/yr)	Recovery Increase Ranking (#) ¹	Recovery (lbs/curb-mile/yr)	Recovery Increase Ranking (#) ¹
Bruce Vento NSP	3.5	0.661	0.912	-- ²	1.074	-- ²
Hidden Falls	4.0	0.667	0.920	-- ²	1.083	-- ²
Como Lake	108.7	0.593	0.807	7	0.914	11
Crosby	66.1	0.514	0.709	11	0.835	10
Davern	78.4	0.529	0.730	10	0.860	9
Downtown	65.0	0.431	0.595	15	0.700	14
East Kittsondale	139.0	0.609	0.840	5	0.989	5
Goodrich-Western	36.0	0.649	0.896	2	1.055	2
McCarrons Lake	51.1	0.614	0.792	13	0.758	15
Mississippi River Blvd	147.8	0.712	0.982	1	1.157	1
Phalen Creek	102.5	0.634	0.875	3	1.031	3
St. Anthony Hill	184.7	0.553	0.762	9	0.898	7
St. Anthony Park	184.6	0.557	0.767	8	0.901	8
TBI	291.8	0.558	0.751	12	0.861	12
Urban	23.4	0.578	0.798	6	0.940	6
West Kittsondale	66.5	0.612	0.844	4	0.994	4
West Seventh	32.9	0.452	0.624	14	0.735	13

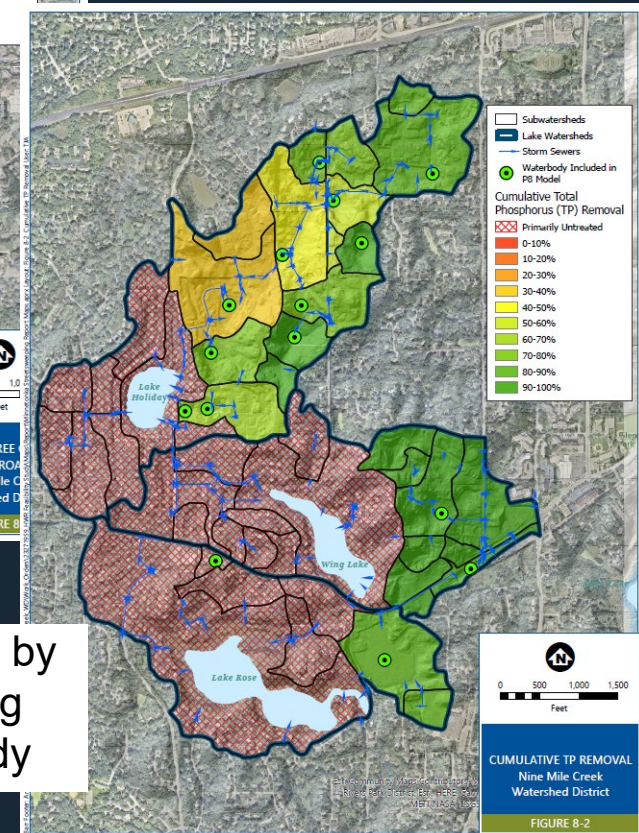
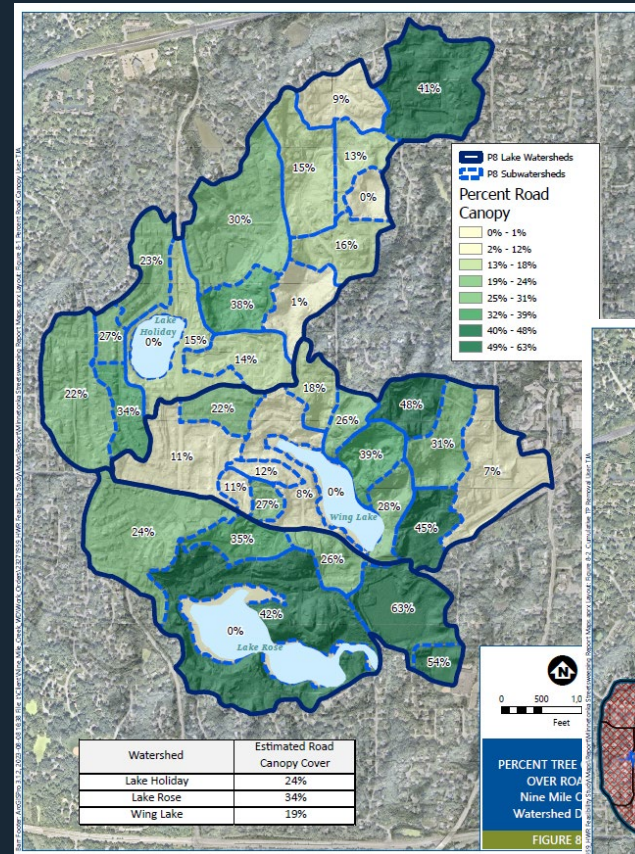


Examples: Study Outcomes



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Prioritizing by Receiving Waterbody

Examples: Study Outcomes



Prioritization has been used to:

- Target areas for “enhanced” sweeping efforts (recovery and/or reduction)
- Prioritize sweeping within impaired watersheds
- Prioritize grant funding efforts
- Inform enhanced street sweeping programs (frequency of sweeping, timing, etc.)

City	Requested (\$)	Utilized (\$)	# of Increased Sweepings	TP Recovery (MPCA calculator), lbs
Landfall	\$4,500	\$2,069 (+\$2,431)	1 additional Fall sweeping (contracted)	13.5
WBL	\$29,700	\$13,126 (+\$16,444)	2 additional Fall sweeps (contracted)	TBD (awaiting weights)
Woodbury	\$65,000	\$49,186 (+\$15,184)	Citywide sweeping in July, August, September. Continuous sweeping in October/November.	107.6
Little Canada	\$12,000	\$16,561 (-\$4,591)	2 additional Fall sweeps (contracted)	TBD (awaiting weights)
Oakdale	\$16,930	TBD	2 additional Fall sweeps, one additional sweep in "priority" areas (equipment rental)	89.1
TOTAL	\$128,000	TBD		TBD (+210.2)

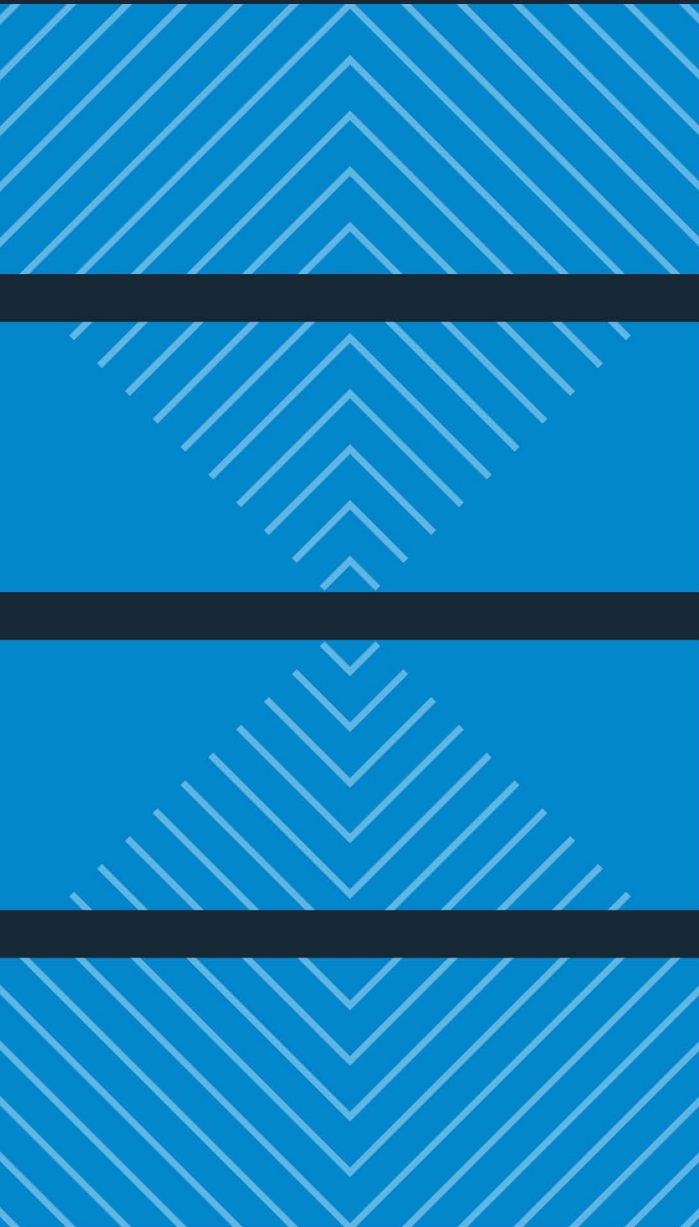
Table 4-1 General Street Sweeping Program Recommendations

Category	Street Sweeping Recommendation
Sweeping Frequency and Timing	<ul style="list-style-type: none"> • Street sweeping operations should be targeted at the following critical times each year: <ul style="list-style-type: none"> ○ Early spring: immediately following snowmelt to capture sand, leaf litter from the previous season, and other debris materials. ○ Mid-June: following release of summer flowering material and seeds (e.g., maple seeds) ○ Fall: timed with leaf drop to the extent practicable.
Regenerative Air versus Mechanical Sweepers	<ul style="list-style-type: none"> • Regenerative air sweepers are more effective for capturing small particulate but less effective than mechanical sweepers during wet conditions. • Tandem sweeping (one sweeper followed by another, e.g., mechanical sweeper followed by regenerative air) can greatly increase sweeping efficiency. • A recent Minnesota Stormwater Research Council study did not find a statistically significant difference in total nutrient recovery between mechanical broom and regenerative air sweepers (Hobbie et al., 2020).
Operations	<ul style="list-style-type: none"> • Coordinate with street sweeping operators to determine what are the most significant barriers to effective curb sweeping (for example): <ul style="list-style-type: none"> ○ Interruptions caused by on-street parking ○ Distance to storage/disposal facility ○ Asset management/route tracking ○ Timing of street sweeping operations, etc. • Coordinate with operators to (a) adjusting timing street sweeping operations based on seed/leaf drop timing and (b) identify high loading areas. I.e., operators' institutional and on-the-ground knowledge should be leveraged to help maximize sweeping the effectiveness of street sweeping efforts. • Encourage use of Automatic Vehicle Location (ALV) technologies to help track and optimize street sweeping operations.
Policy	<ul style="list-style-type: none"> • Consider enacting policies to discourage tree placement, or set back tree placement, along boulevards. Note: this policy recommendation should be balance against the benefits of canopy cover, including rainfall interception and heat island reduction. • Use off-street signage to inform residents when streets are being swept and remind residents to move vehicles.
Public Outreach	<ul style="list-style-type: none"> • Consider incorporating the following public outreach objectives into a comprehensive street sweeping program: <ul style="list-style-type: none"> ○ Encourage residents to rake/bag June and fall leaf litter. ○ Include a link to MN adopt a drain (i.e., encourage residents to “adopt” and clean debris/clear ice from a nearby catch basin). ○ Consider adding functionality for residents to request street sweeping/report issues (e.g., sediment loading from a nearby construction site, etc.). Information gathered in aggregate can be used to evaluate high sediment/pollutant loading areas.
MPCA Street Sweeping Calculator	<ul style="list-style-type: none"> • Encourage collection and recording of material weights (wet or dry) for pollutant removal evaluation using the recently developed MPCA Street Sweeping Calculator. Material weights are often provided when delivering sweeping material to the disposal site / facility. Alternatively, cities may utilize vehicle weight pads / scales, allowing for weight collection from individual sweeping efforts. <ul style="list-style-type: none"> ○ The calculator utilizes empirical relationships developed from the 2020 Minnesota Stormwater Research Council study (Hobbie et al., 2020) to estimate phosphorus recovery associated with wet or dry weight sweeping mass totals. ○ In addition to material weight, consider testing grab samples of swept material to determine moisture content and organic matter content. This information helps to improve total phosphorus reduction estimates predicted by the calculator but is not required.

Proposed Budget



Street Sweeping Study Task	Cost
1. Kickoff, Municipal Survey, and Data Acquisition	\$7,400
2. Model Development and Evaluation of Existing Street Sweeping Recovery	\$12,700
3. Evaluation of Existing Street Sweeping Pollutant Reduction	\$5,700
4. Evaluation of Seasonal Efficiency and Cost-Benefit Analysis	\$3,100
5. Street Sweeping Prioritization Mapping	\$7,000
6. Chloride and Street Sweeping Coordination	\$6,300
7. Plymouth Street Sweeping Data Review	\$8,800
8. Reporting and Project Coordination	\$9,800
Project Total	\$60,800
Task 7: Funded by City of Plymouth	-\$8,800
Cost to Commission	\$52,000



Questions

