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North American Stormwater and Erosion Control Association of Wisconsin
February 21, 2024

Municipal Phosphorus Reduction Credit for Leaf Management Program Analysis Update

Daniel Johnstone, Strand Associates, Inc.®

NASECA WISCONSIN

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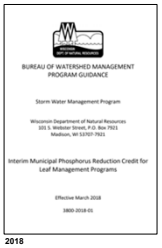
Outline

- Background
  - MS4/TMDL Requirements
  - MS4/TMDL Compliance Options
  - Street Trees and Leaf Collection Studies
- TP Leaf Credit
  - Requirements
  - Analysis Process
  - Analysis Results
- Analysis Challenges
- Lessons Learned



2018

2022

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Background: MS4/TMDL Requirements

- MS4
  - 20% TSS reduction by 2008
  - 40% TSS reduction by 2013 (subsequently rescinded)
- Total Maximum Daily Load (TMDL)

TMDL Basin	EPA Approval	TSS Range	TP Range
Rock River	9/2011		
Lower Fox River	5/2012		
Menomonee, KK, & Milwaukee Rivers	3/2018	48 to 88%	14 to 88%
Wisconsin River	4/2019	NA	68.6 to 81.3%
Upper Fox and Wolf Rivers	2/2020	20 to 80%	44 to 83%
NE Lakeshore	10/2023	20 to 79%	15 to 91%
Fox Illinois River Basin	Pending		

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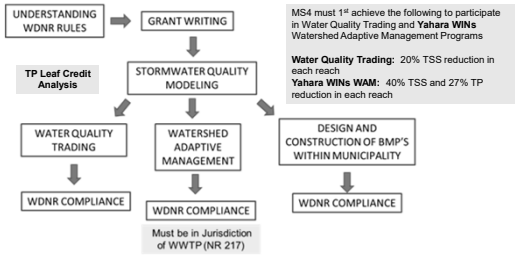
Background: MS4/TMDL Compliance Options



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Background: Street Trees and Leaf Collection Studies

- USGS Study
  - Madison (2013-2018)
- City of Madison
  - 2014 Leaf Bagging Pilot Project
- **WDNR Interim TP Credit Guidance Document (2018)**
- USGS Studies
  - Fond du Lac and Oshkosh (2018 and 2019)
  - March 27, 2020 Presentation
  - Data Set Publication and Additional Studies Published (2022)
- **WDNR Municipal Phosphorus Reduction Credit for Leaf Management Programs (2022)**

Leaves in street create opportunity for phosphorus runoff

Leaf leaches phosphorus into water

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TP Credit Requirements

- Basin and Tree Density Eligibility
  - Basins with <25% TP Reduction (was <17% TP Reduction)
  - All residential land use (no alleys unless they receive the same level of leaf collection and street cleaning as the streets) (was just medium density residential)
  - Curb and gutter drainage
  - 40% canopy over street or 1 mature tree/80 LF curb (was 17% canopy cover over street or 1 mature tree/80 LF curb)

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TP Credit Requirements, Continued

- Leaf Collection Program Eligibility
  - Municipal ordinance prohibiting leaf placement in streets
  - Policy allowing piles or bags of leaves in terrace for collection
  - Municipal ordinance to restrict parking during leaf collection and street cleaning activities
  - Leaf collection occurs 3 and 4 times within late September-November (was 4 times throughout October and November)
  - Weekly Regenerative Air or Vacuum Assisted Street sweeping (was within 24 hours of collection with either Mechanical Broom or High Efficiency Street Sweeper)
  - No leaves are left in the street overnight

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TP Credit Analysis Process

GIS:
WinSLAMM watersheds, land use, curb and gutter, and terrace trees layer

Confirm basin and tree density eligibility

Optimize watersheds to maximize credit

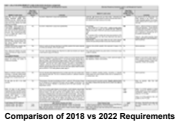
Document leaf collection program eligibility

Submit to WDNR

Iterative Process

- Basins with <25% TP reduction (was 17%)
- Residential land use (was MDR only)
- Curb and gutter drainage
- 1 mature tree / 80 LF curb

- No leaves in street ordinance
- Leaves in terrace/bags policy
- Leaf collection 3 to 4 times in September/October/November
- High-efficiency street sweep weekly
- No leaves in the street overnight



Comparison of 2018 vs 2022 Requirements

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Wisconsin Community Tree Map

https://pg-cloud.com/Wisconsin/

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TP Credit Analysis Process: Initial Basin Eligibility 2018 vs 2022

Whitewater, WI

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TP Credit Analysis Process: Initial Basin Eligibility 2018 vs 2022

Whitewater, WI

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TP Credit Analysis Process: Optimized Eligibility 2018 vs 2022

Whitewater, WI

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TP Credit Analysis Process: Example Optimization 2022

Whitewater, WI

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TP Credit Analysis Process: Example Optimization 2022

Whitewater, WI

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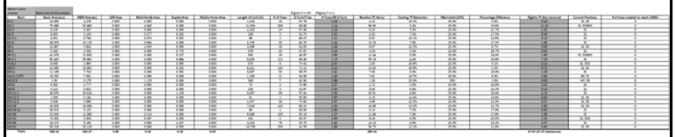
TP Credit Analysis Process: Credit Calculations



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TP Credit Analysis Results

47.07 lb/year (original credit: 19.1 lb/year; additional credit: 27.97 lb/year).

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TP Credit Analysis Results

Municipality	Draft maximum TP Credit (prior to analysis)	Draft TP Credit (Original)	WDNR-Approved TP Credit (with optimized basins)	Difference between original and optimized basins	Value of TP analysis: $/lb TP (20-year NPW)	Additional TP from 25% update	Value of TP Credit analysis: $/lb TP (20-year NPW)	Original credit performed with 2022 guidance?
Stoughton	66.0	4.9	**37.7**	+32.8 lbs	$29/lb			No
Whitewater	77.1	8.3	**19.1**	+10.8 lbs	$60/lb	28.0 lbs	$24/lb	No
Monona	23.3	1.8	**13.0**	+11.2 lbs	$74/lb			No
Rothschild	9.8	1.4	**8.9**	+7.5 lbs	$99/lb	11.5 lbs (Pending)	$75/lb	No
Schofield	9.2	1.3	**3.5**	+2.2 lbs	$136/lb			No
Weston	12.2	0.0	**11.7**	+11.7 lbs	$48/lb			No
Merrill	6.7	0.3	**2.4**	+2.1 lbs	$799/lb			No
Manitowoc	205.3	5.1	**87.2**	+82.1 lbs	$9.60/lb			Yes
Marshfield	137.0	1.5	**39.4**	+37.9 lbs	$17/lb			Yes

Net Present Worth: (NPW)

Constructed BMPs cost range: $1,000 to $10,000/lb TP NPW (Avg. $3,000)

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Analysis Challenges: Leaf Collection Program Details (Interim Guidance)

Municipality	Stoughton	Whitewater	Monona	Rothschild
Leaf collection 4x in October/November	• Weekly from mid-October to end November • Equivalent to 7 collections	• 1x late October • 2-3x by November 15	• Every 10-12 days in October/November • Equivalent to 4-6 collections	• 2x in October/November • **Change to 4x in September/October/ November (start 9/23)**
Street sweeping within 24 hours of collection	• **Vacuum collection leaving minimal residue** • No sweeper follows	• Sweep 2x in October • Sweep 2x in November	• **Vacuum collection leaving minimal residual** • **Sweeper follows**	• **Vacuum collection (in 2021) leaving minimal residual** • Sweeper to follow
No leaves in street overnight	• Ordinance protocols • Part of the protocol	• Combination of ordinance prohibiting and bagged leaves	• Ordinance prohibits • Part of protocol	• Ordinance prohibits • Part of protocol
Leaf storage location	Terrace	**Bags on terrace**	Terrace	• In street day before collection • **Change to terrace**
Pick up method	Vacuum truck	Load bags in truck	Vacuum truck	• Loader, tracked backhoe, and skid steer, dump truck • **Change to covered trucks**

WDNR has been flexible with eligibility interpretations. If municipality's operations meet the intent of the requirements, WDNR has granted approval for the existing program or with tweaks to the existing programs.

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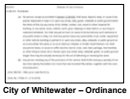
Analysis Challenges: Leaf Collection Program Details

- Ordinances
- Public announcements/schedule
- Leaf Collection Program narrative
- Photos documenting collection/sweeping

City of Monona – Leaf Vacuum

City of Stoughton – Calendar

City of Monona – Narrative



City of Whitewater – Ordinance

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Analysis Challenges: Leaf Collection Method

City of Whitewater – Street Sweeper

City of Stoughton – Leaf Vacuum

City of Monona – Leaf Vacuum

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Analysis Challenges: Leaf Collection Method

Village of Oregon: October 19, 2020

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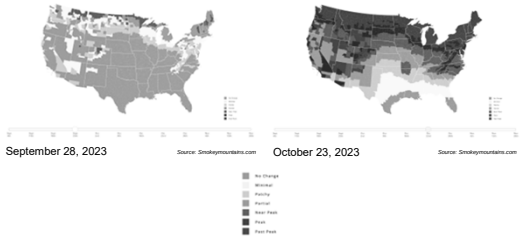
Analysis Challenges: Regional Differences/Timing

2023 Fall Foliage Maps



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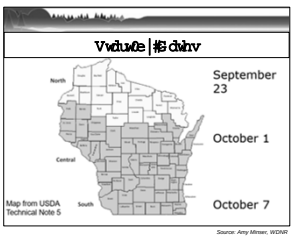
Analysis Challenges: Regional Differences/Timing



Source: Amy Mimier, WDNR

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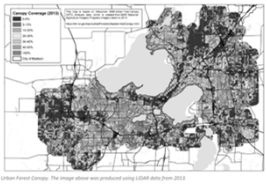
Potential Future Evolution of TP Leaf Credit

- Differences in TP from various tree species
- WinSLAMM modeling functionality
  - Leaf Pick-Up Program quantification
  - Phosphorus seasonality
  - Tree Canopy Toggle



Urban Forest Canopy. The image above was produced using LiDAR data from 2013.

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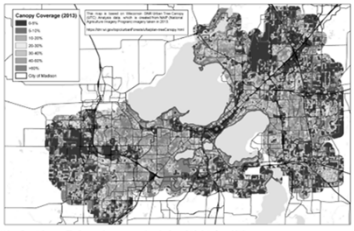
Tree Canopy



Urban Forest Canopy. The image above was produced using LiDAR data from 2013.

- https://dnr.wisconsin.gov/topic/urbanforests/ufia/plan-treecanopy

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Lessons Learned

- Manage expectations
- Iterations are necessary
- Collaborate with WDNR
- Provide complete submittal to WDNR
- Desktop analysis is more cost-effective than constructed BMPs
- Future tree planting areas
- MS4s can internally trade TP Leaf Credit amongst TMDL Reaches
- Revisions can still be cost effective

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Questions

Daniel Johnstone
daniel.johnstone@strand.com
(608) 251-4843

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