

City of Madison Leaf Management and Citizen Action to Reduce Phosphorus Loading to Lakes

Lakes and Watershed Commission 04/03/2024

Presenter:

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Madison leaf Management

- **Existing Costs:**
- **Between 2014 and 2023**
 - \$2.1 million average cost/year for leaf collection and composting
 - Average of 16,267 tons/yr of leaves collected
- **phosphorus credit given:**
 - **Originally:** zero
 - **Now:** 17% reduction in high canopy residential
- **Public Perception**
 - Skepticism that current practices were beneficial
 - Request to switch to vacuum collection
- **Important research for TMDLs across the country**



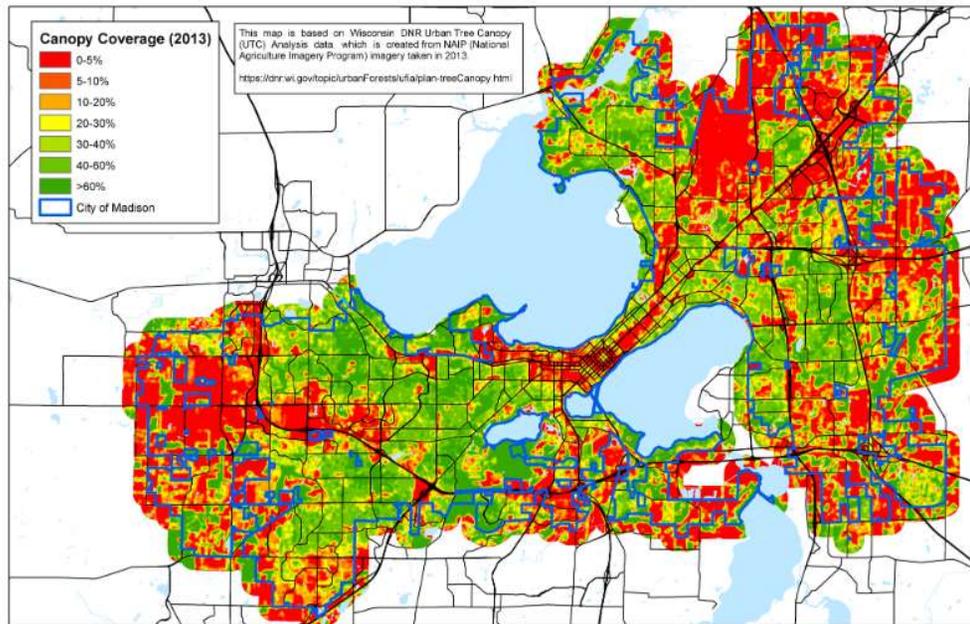
- **Madison Standard Procedure**
 - 3-4 pick ups a season plus mechanical sweeper .

Why Study Leaf collection?

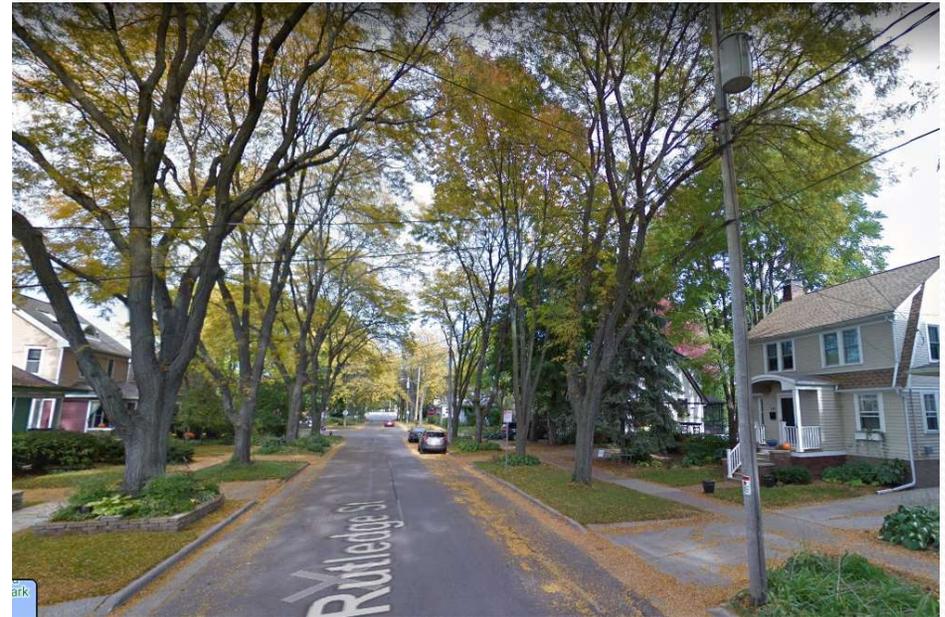


- Vegetation is the most important source of total phosphorus in urban runoff
- Fall is the season with the highest total phosphorus load
- Improved leaf collection and can significantly reduce the annual phosphorus load

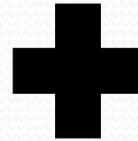
Madison has a goal to increase tree canopy



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



Current Canopy ~ 23%
Highly variable throughout City



Leaves in
street

Rain



Leaf Tea = Low Particulate, High Dissolved Phosphorus

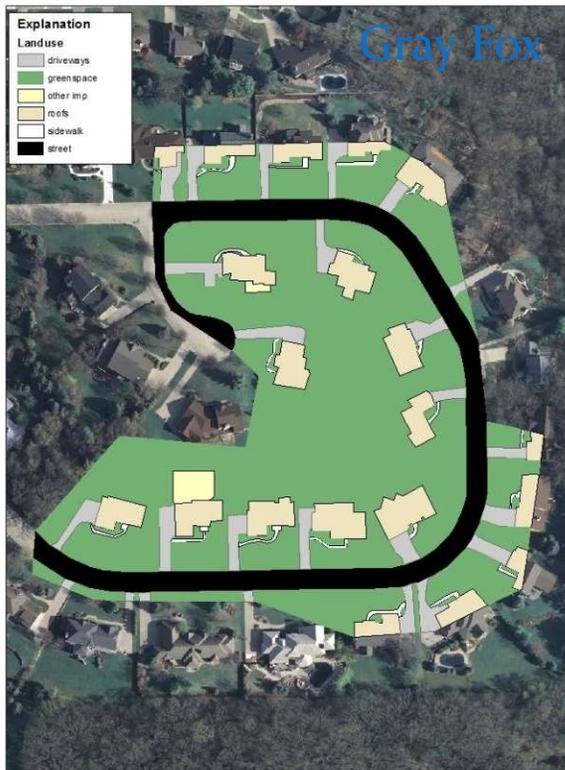
Dissolved Phosphorus Capture



Infiltrate and bind to soil



Bind to Aluminum or Iron

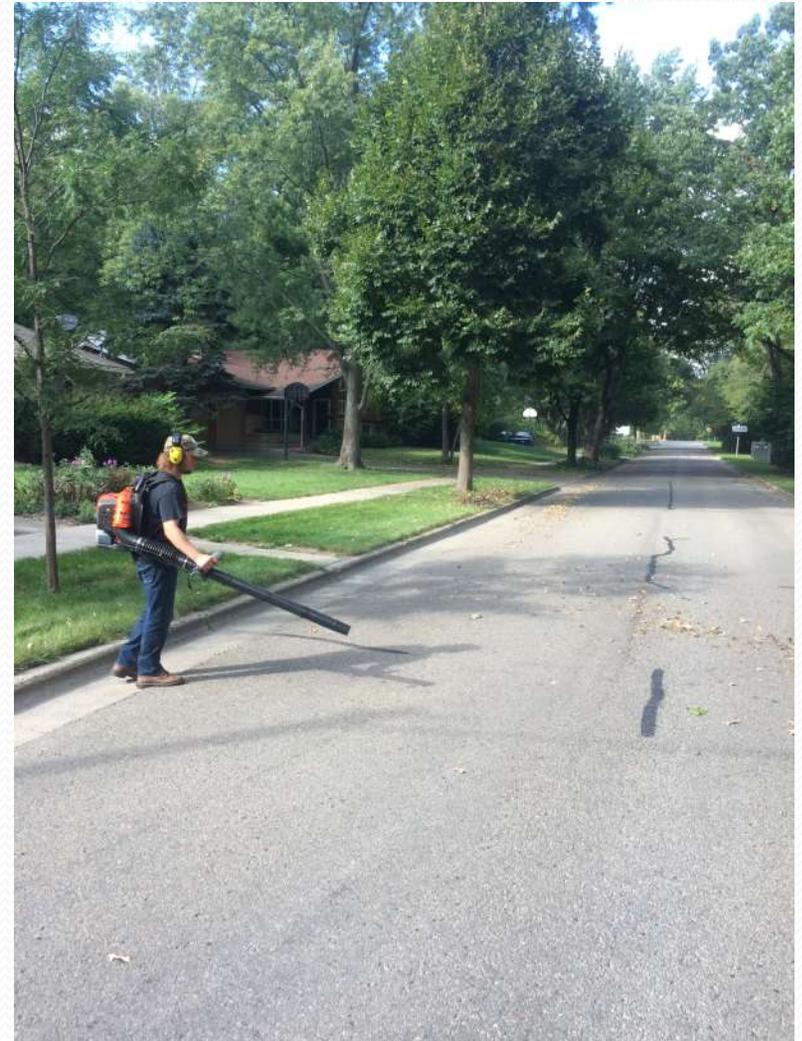


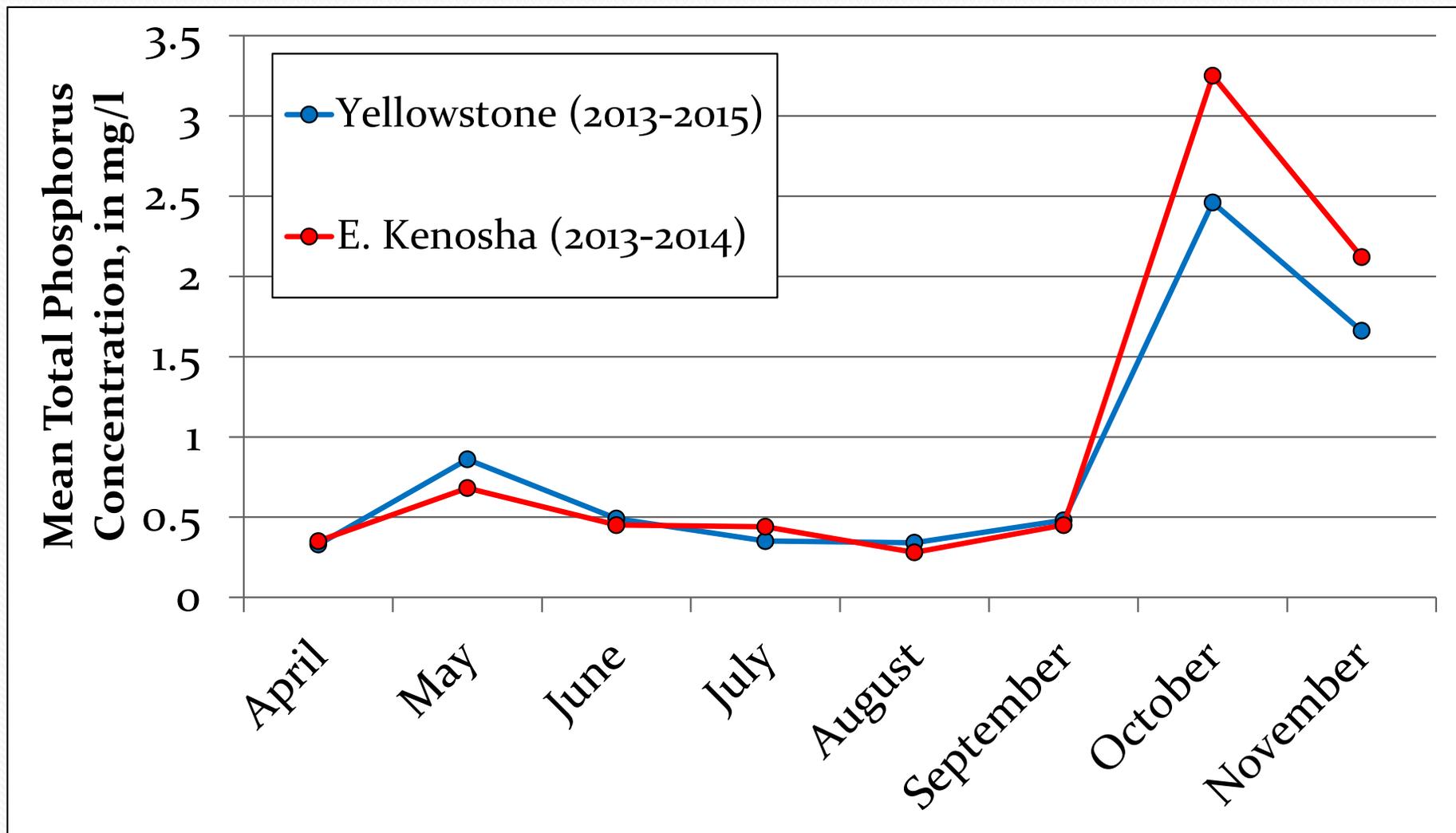
Study Overview

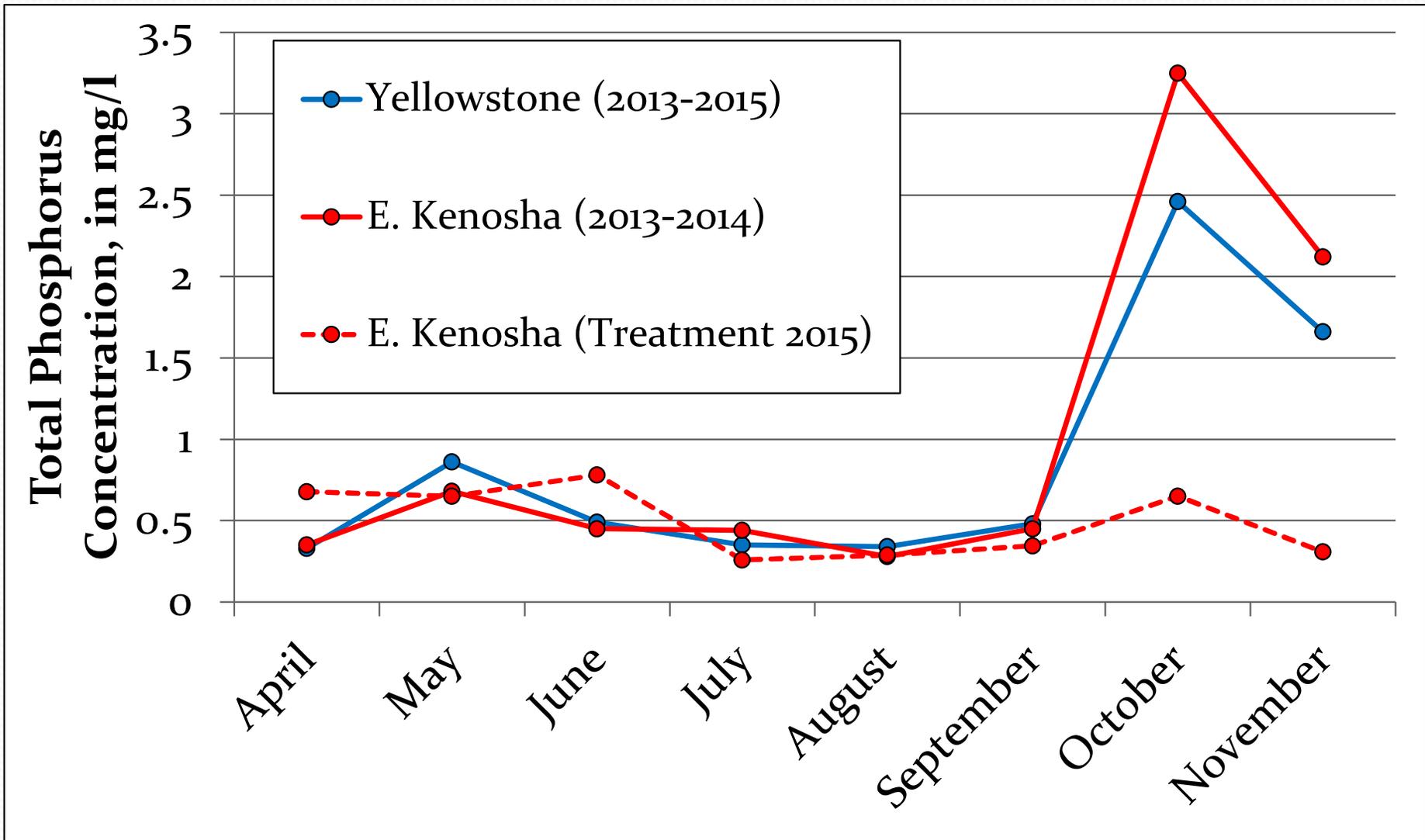
- Paired Basin Study
- 5 years extended to 9 years
- Quantified Extremes of Removal Options
- Filled in the gaps with additional comparisons

“Escalated” Leaf Management

In addition to municipal efforts, USGS field crews would clear all organic debris from street surface prior to rain event

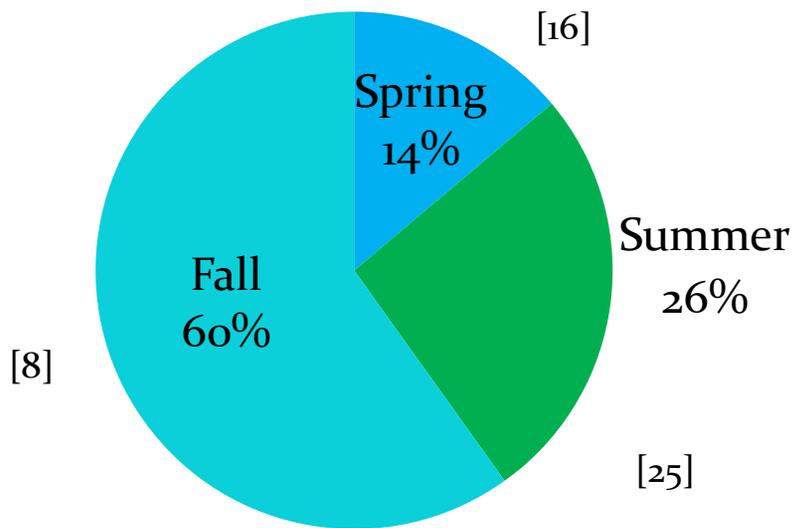




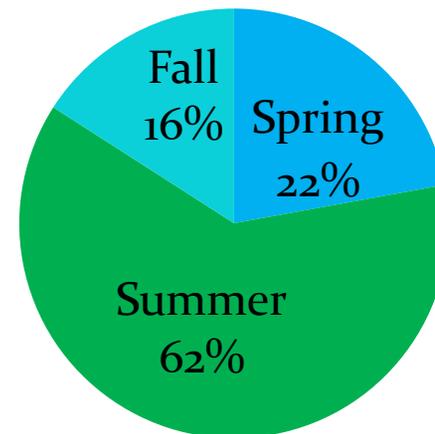


Seasonal Total Phosphorus Load as a Percent of the 2015 Annual Load (winter excluded)

Yellowstone (Control)



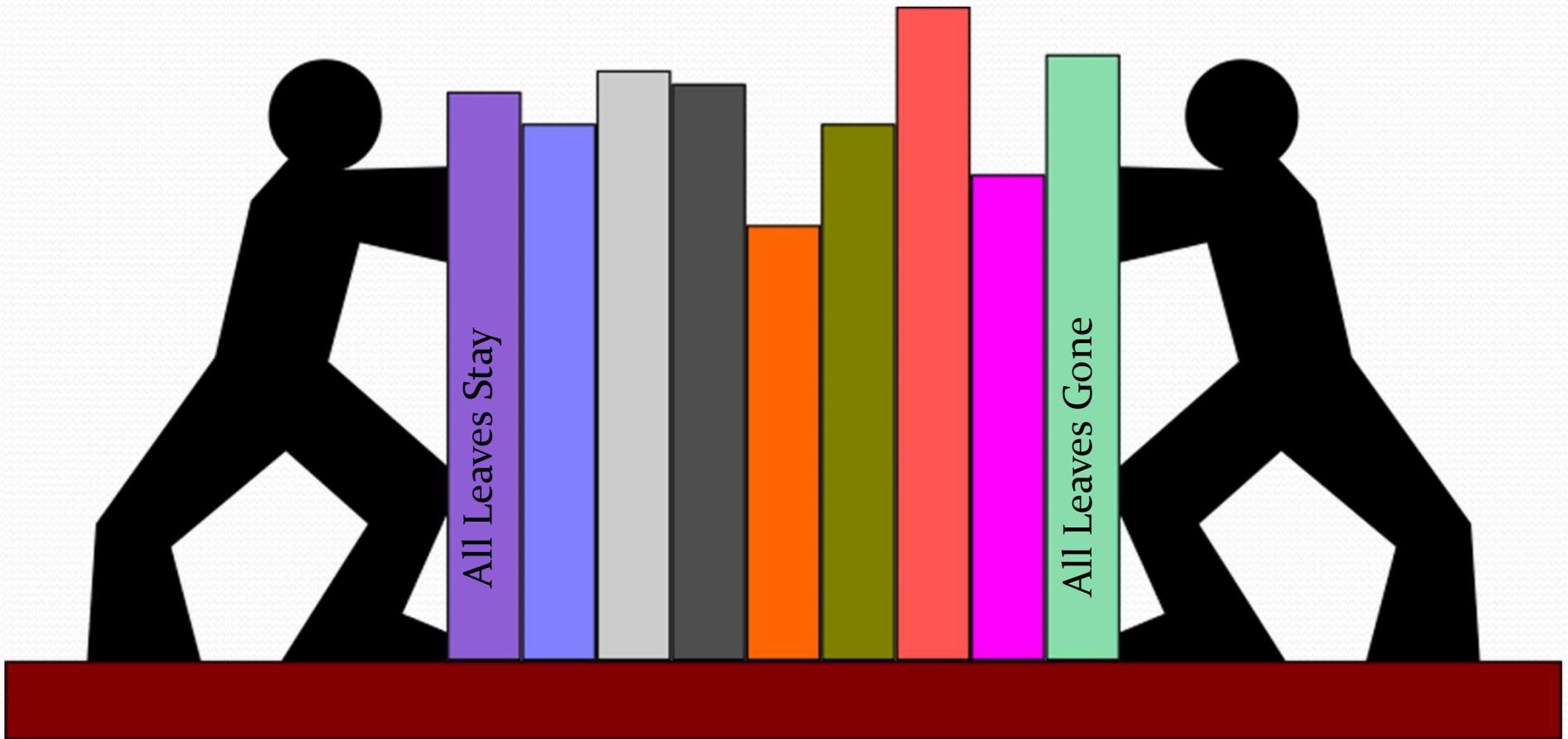
E. Kenosha (Test)



[3] = Number of events

Impact of Collection on Phosphorus

0% ← Phosphorus Reduction → 80%



Leaf Collection

Method	Frequency
Transfer	Weekly
Transfer	Biweekly
Transfer	Biweekly
Vacuum	Weekly
Transfer ¹	Biweekly

¹ Medium density canopy

Street Cleaning

Method	Frequency
Mechanical/blower	Pre-event
Mechanical	Biweekly
Regenerative Air	Weekly
Regenerative Air	Weekly
Regenerative Air	Weekly

Year Completed	Title
2015	Upper Maximal
2016	Madison SOP
2017	Madison SOP+
2017	Vacuum Mulch
2018	Madison SOP+



Weekly Vacuum Sweeper Impact



10/5/2017



10/6/2017



10/9/2017

Bagging

- Bagging
 - Asked two neighborhoods to bag all leaves
 - One was given bags
 - One asked to purchase
 - Leaf accumulation assessed
 - No water quality assessment



Bagging Results

- High participation when provided bags
- Low participation when asked to purchase
- Cleaner streets
- High cost to citizens if implemented city wide
 - ~\$5 per house (12-16 bags)
- Bags not idea for composting



Vacuum Collection Trial

Test:

- Weekly Vacuum Collection + Weekly Sweeping

Results:

- Streets noticeably cleaner
- **Cost doubled**
- Transport costs would increase
- TP reduction
- Would not be able to complete 4 collections

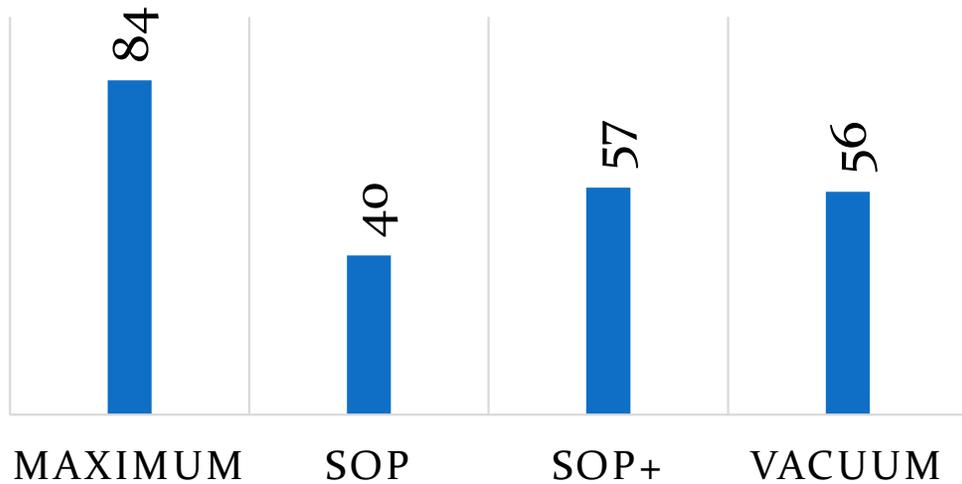


City of Madison – Leaf Collection plus Sweeping “Madison SOP, SOP+, and Vacuum-Mulch”

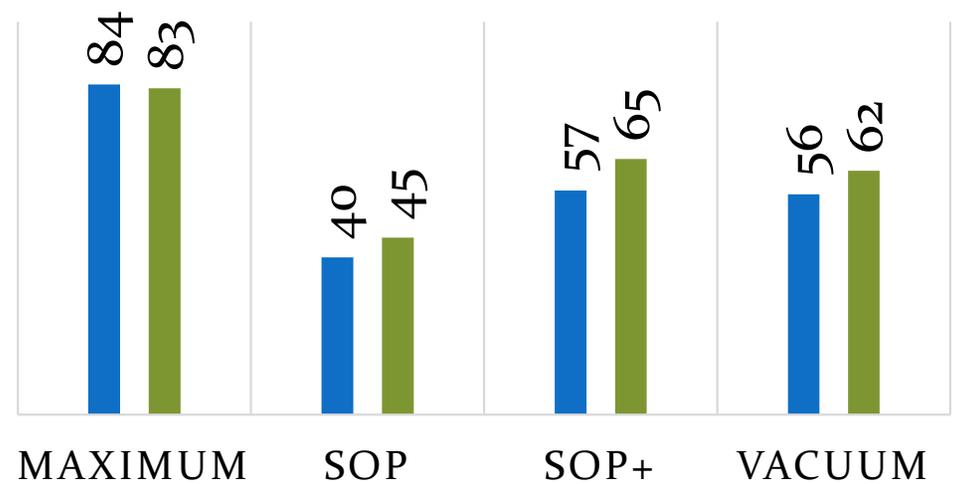
Leaf Collection		Street Cleaning		Year Completed	Title
Method	Frequency	Method	Frequency		
Transfer	Weekly	Mechanical/blower	Pre-event	2015	Upper Maximal
Transfer	Biweekly	Mechanical	Biweekly	2016	Madison SOP
Transfer	Biweekly	Regenerative Air	Weekly	2017	Madison SOP+
Vacuum	Weekly	Regenerative Air	Weekly	2017	Vacuum Mulch
Transfer ¹	Biweekly	Regenerative Air	Weekly	2018	Madison SOP+

¹ Medium density canopy

TOTAL PHOSPHORUS REDUCTION*

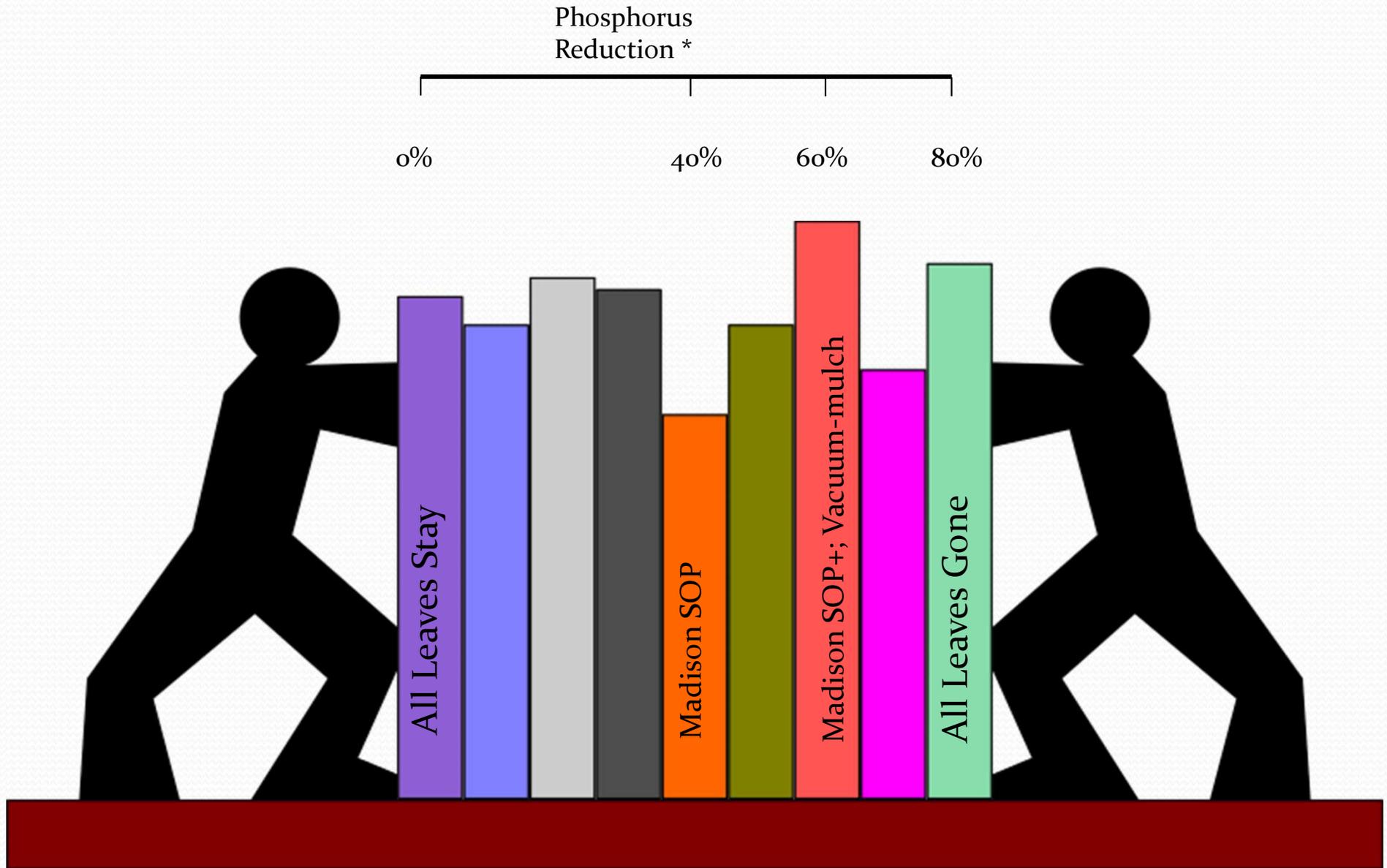


TOTAL AND DISSOLVED PHOSPHORUS REDUCTION*



* Phosphorus reductions are a percent reduction of the fall load. The fall load is ~ 60% of the total phosphorus load in Madison

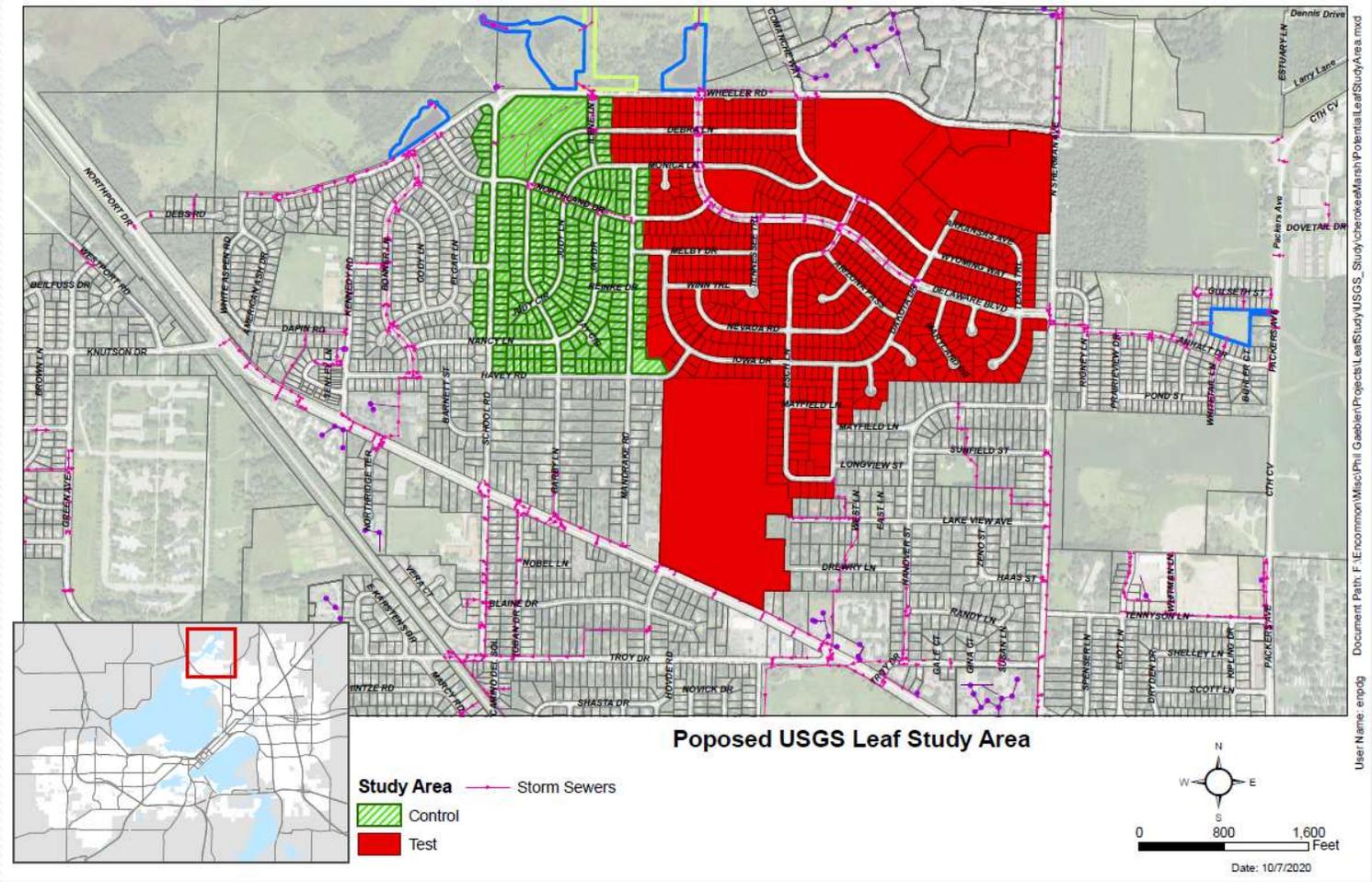
Collection Impacts on Total Phosphorus



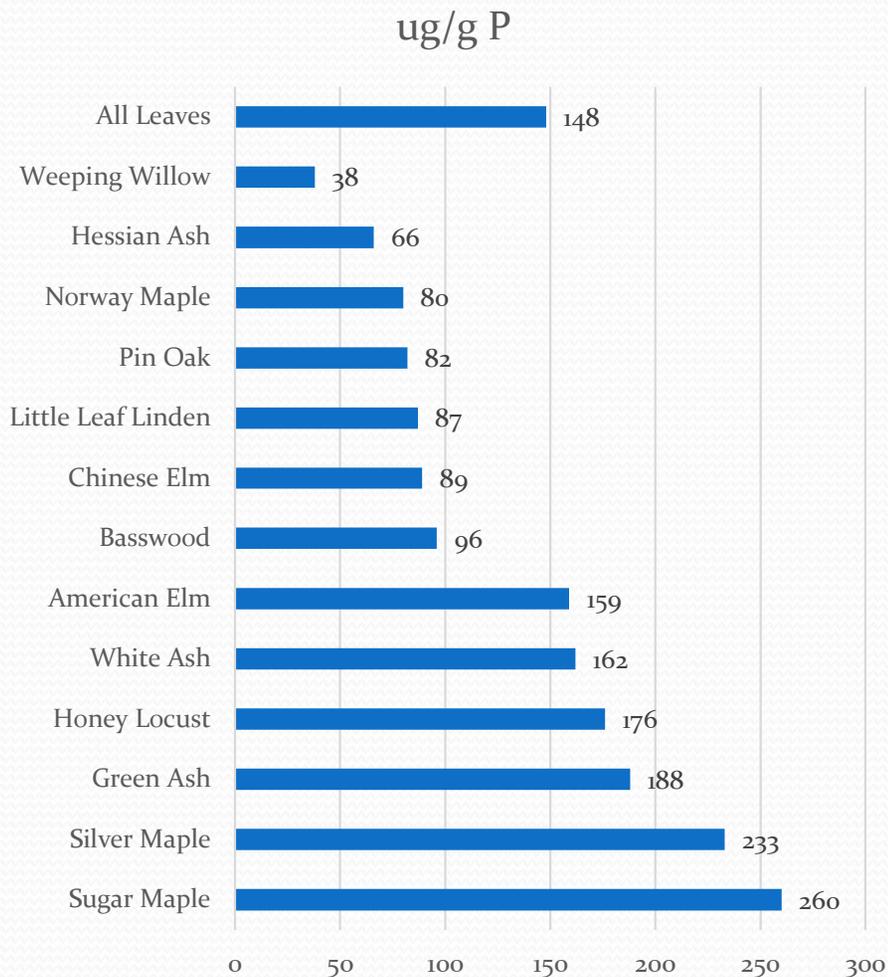
* Phosphorus reductions are a percent reduction of the fall load. The fall load is ~ 60% of the total phosphorus load in Madison

Studied Larger Area

Weekly Sweeping with Mechanical Sweeper
Results in ~50% Fall Phosphorus Reduction



Tree Species Considerations



- Leachable Phosphorus varies significantly by species.
- Leachable P measured by 2hr soak with distilled water.

Dorney, 86

Citizen Action

- Place leaf piles on grass
- Rake leaves from the street before storm
 - Sign up for Alerts:
 - www.Ripple-Effects.com
- Compost on site
- “Mulch in place”
 - Mowing frequently may be enough for some.

Leaves Out of the Street



Keeping leaves out of the street is one of the simplest ways to help keep **Lake Wingra** clean.

Leaves are a big source of **phosphorus**, a nutrient that feeds **weeds and algae** in our lakes. When they get driven over and rained on, leaves release phosphorus, which gets sent to the lake via the nearest storm drain.

We Need Your Help!

**Keep Lake Wingra clean:
Keep leaves out of the street.**

BE INFORMED

Know when to expect leaf collection in your neighborhood by bookmarking the City web site. Tell your neighbors!

RAKE

Leaves should be raked just before collection so they don't blow into the street.

MAINTAIN

Keep leaves out of the street while waiting for City leaf collection

www.cityofmadison.com/streets/yardwaste/

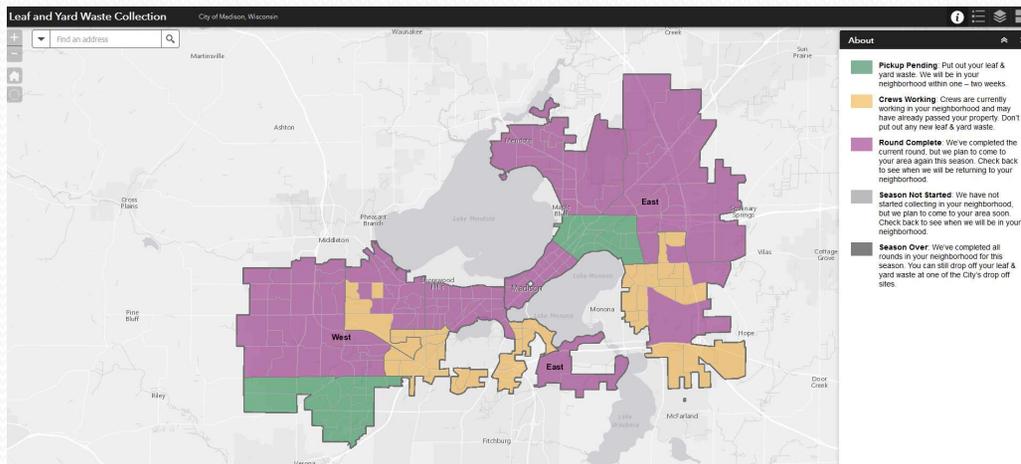


Want an alternative to raking leaves to the curb?

Use your leaves as fertilizer!

You can **mow over** leaves on your grass to grind them up or **compost** them for use on your gardens next year.

Reduced Raking into Street with Improved Collection Guidance



Old Way: Difficult to read maps

#1 critique is the non-defined collection time

LEAF & YARD WASTE COLLECTION

WHEN DO I SET OUT LEAVES & YARD WASTE FOR PICKUP?

Enter your address in the form below to receive the dates when you should set out leaves & yard waste for collection.

Street Number * required

Direction
N, S, E, or W

Street Name * required

Street Type

Unit

Having trouble looking up your address? [Here's a guide to help PDF](#).

New Way: address specific set out window.

<http://www.cityofmadison.com/streets/yardWaste/leaf/>

Curb Line Clear



Leaf Piles on Grass



City of Madison has an Ordinance prohibiting leaves in the street but it is complaint driven

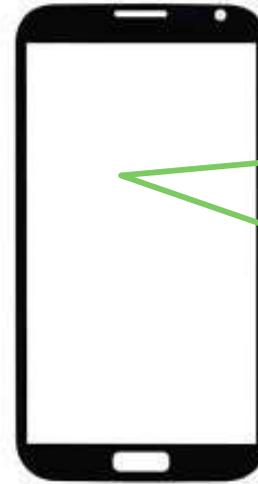
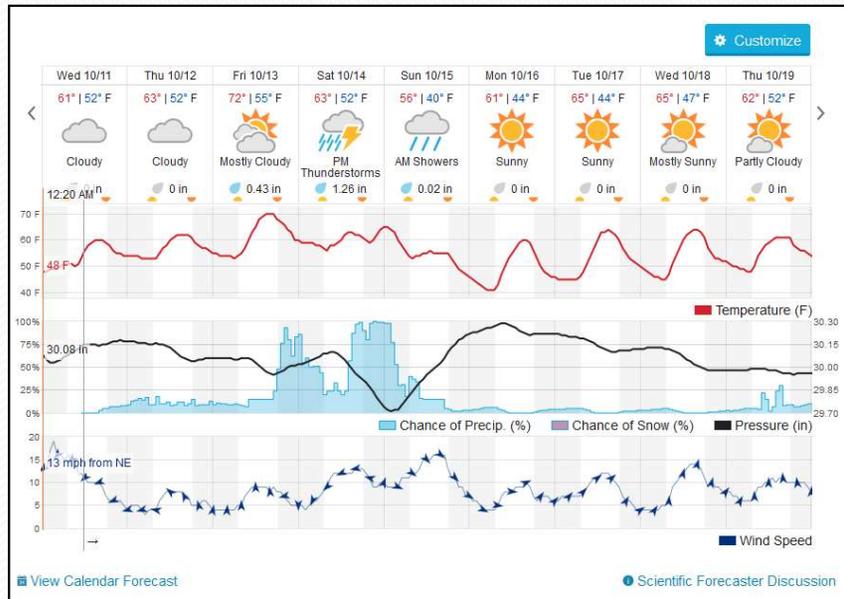
Mulch or Compost



Less work
Less transportation
Good for lawn or garden
Higher frequency of collection could be possible



Text Alerts when Rain is Coming



Rain is predicted.
Time to rake leaves
from the gutter.





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