

City of Madison and USGS Leaf Management Study Summary 2013- 2023

BPW 12/18/2024

Presenter: Phil Gaebler -City of Madison Engineering



Study Team

- USGS
- Streets department
- Engineering Operations
- UW Madison BSE department
- Badger volunteers
- WDNR staff
- Madison residents

Why Study Leaf collection?



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

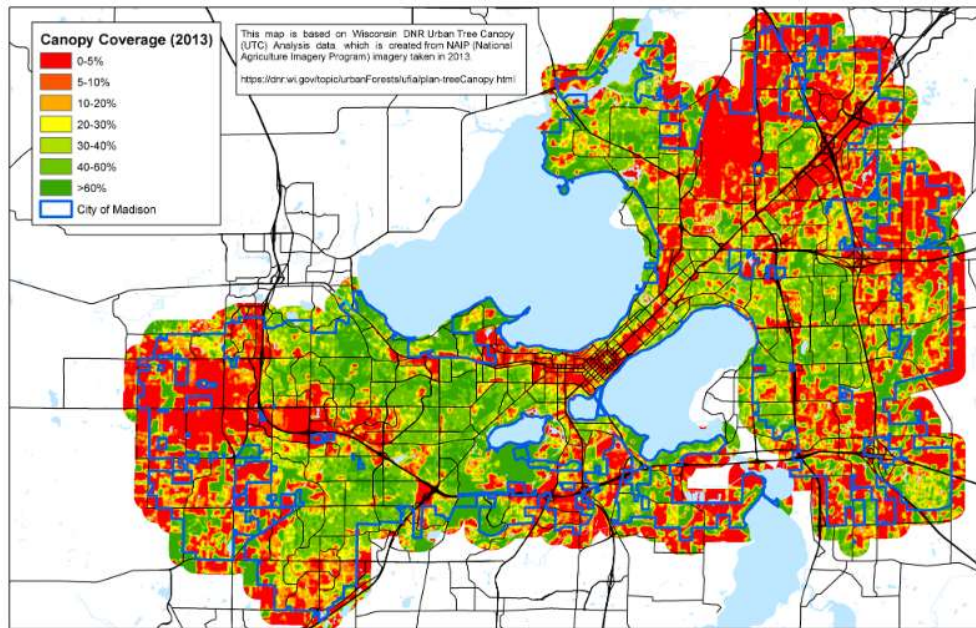
Madison leaf Management

- **Existing Costs:**
- **Between 2014 and 2023**
 - \$2.2 million average cost/year for leaf collection and composting
 - Average of 16,069 tons/yr of leaves collected
- **Public Perception**
 - Skepticism that current practices were beneficial
 - Request to switch to vacuum collection
- **Important research for phosphorus reduction**

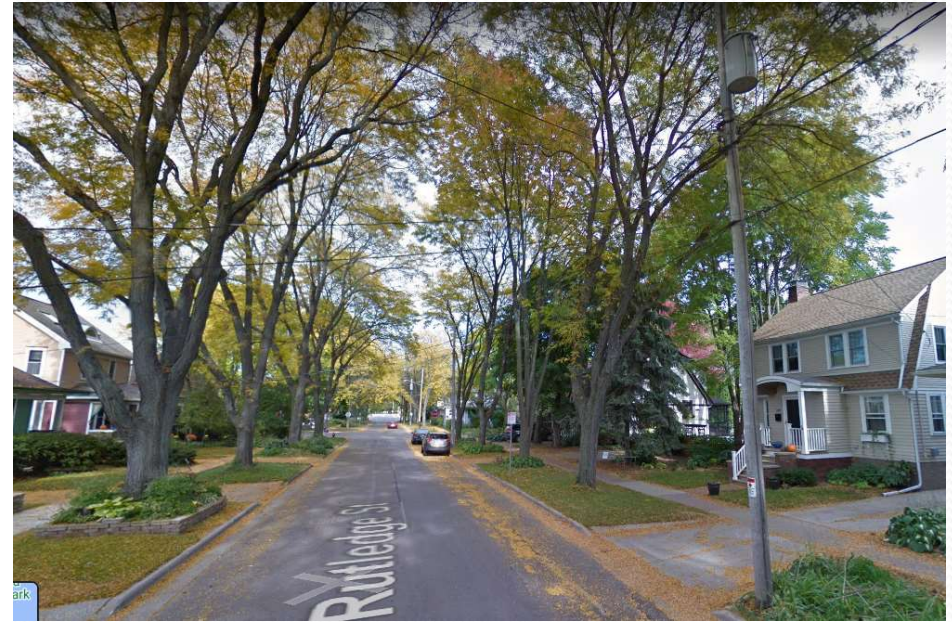


- 3-4 pick ups a season plus mechanical sweeper .

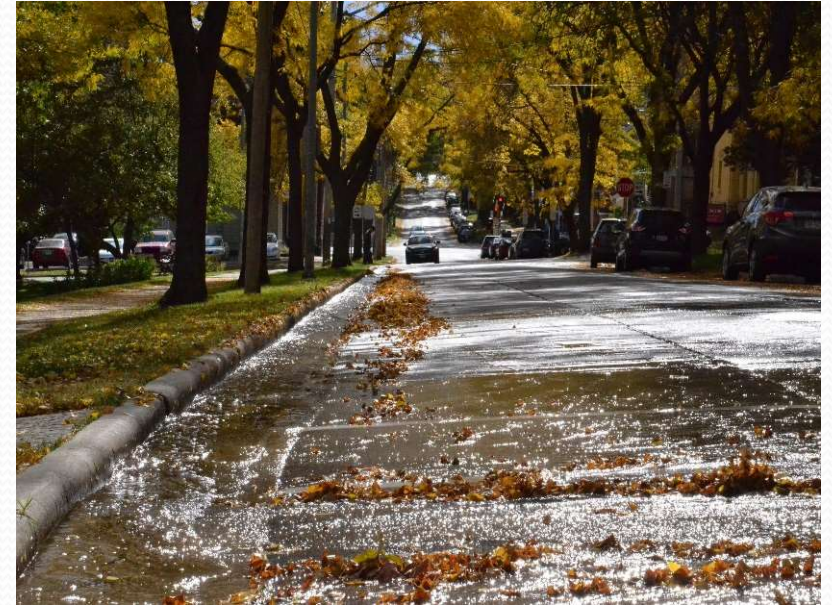
Madison has a goal to increase tree canopy



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 is expensive and difficult



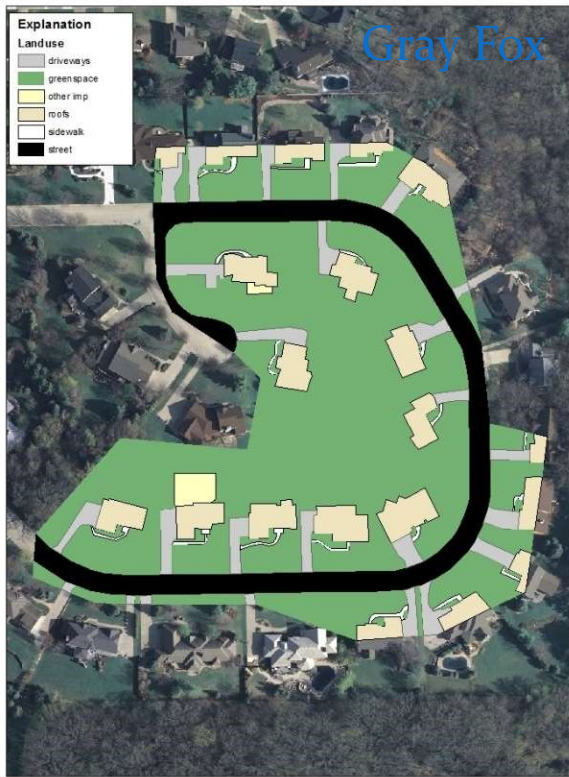
Infiltrate and bind to soil



Iron and Sand Filter



Bind to Aluminum

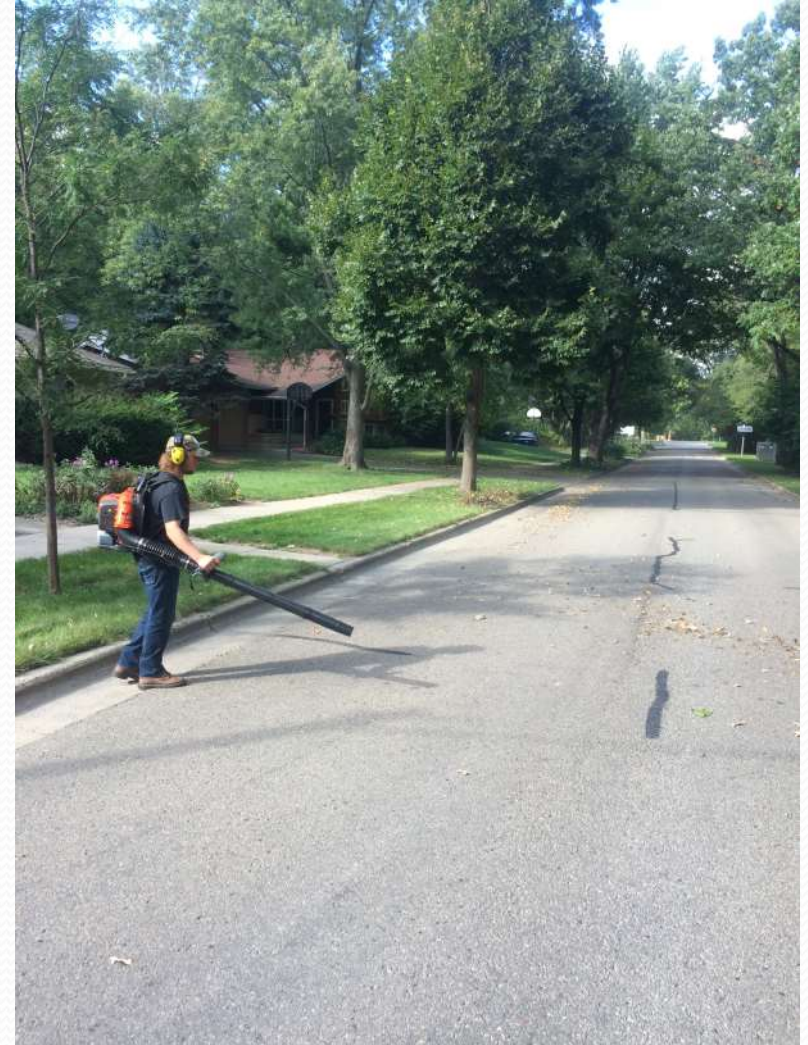


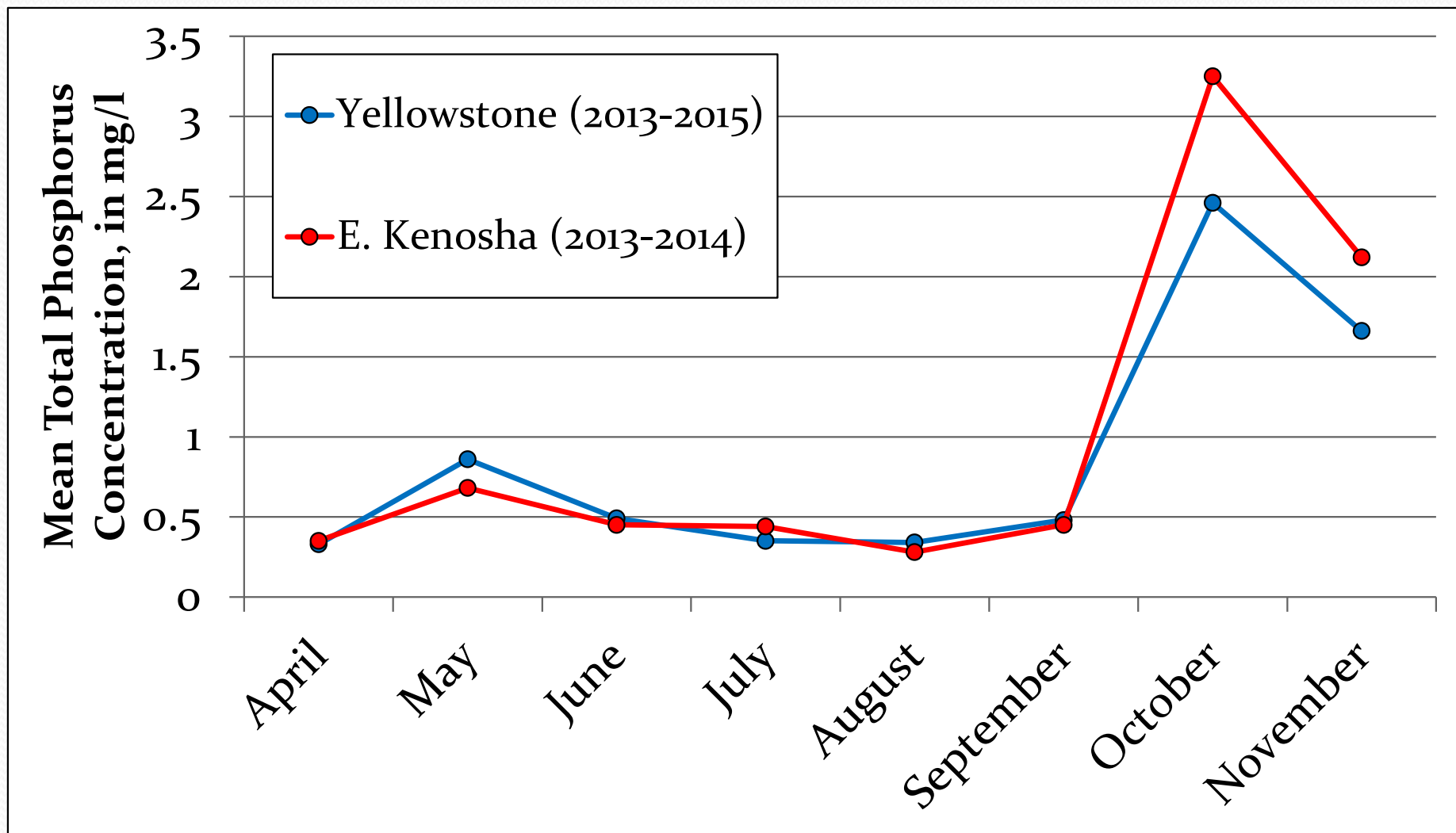
Study Overview

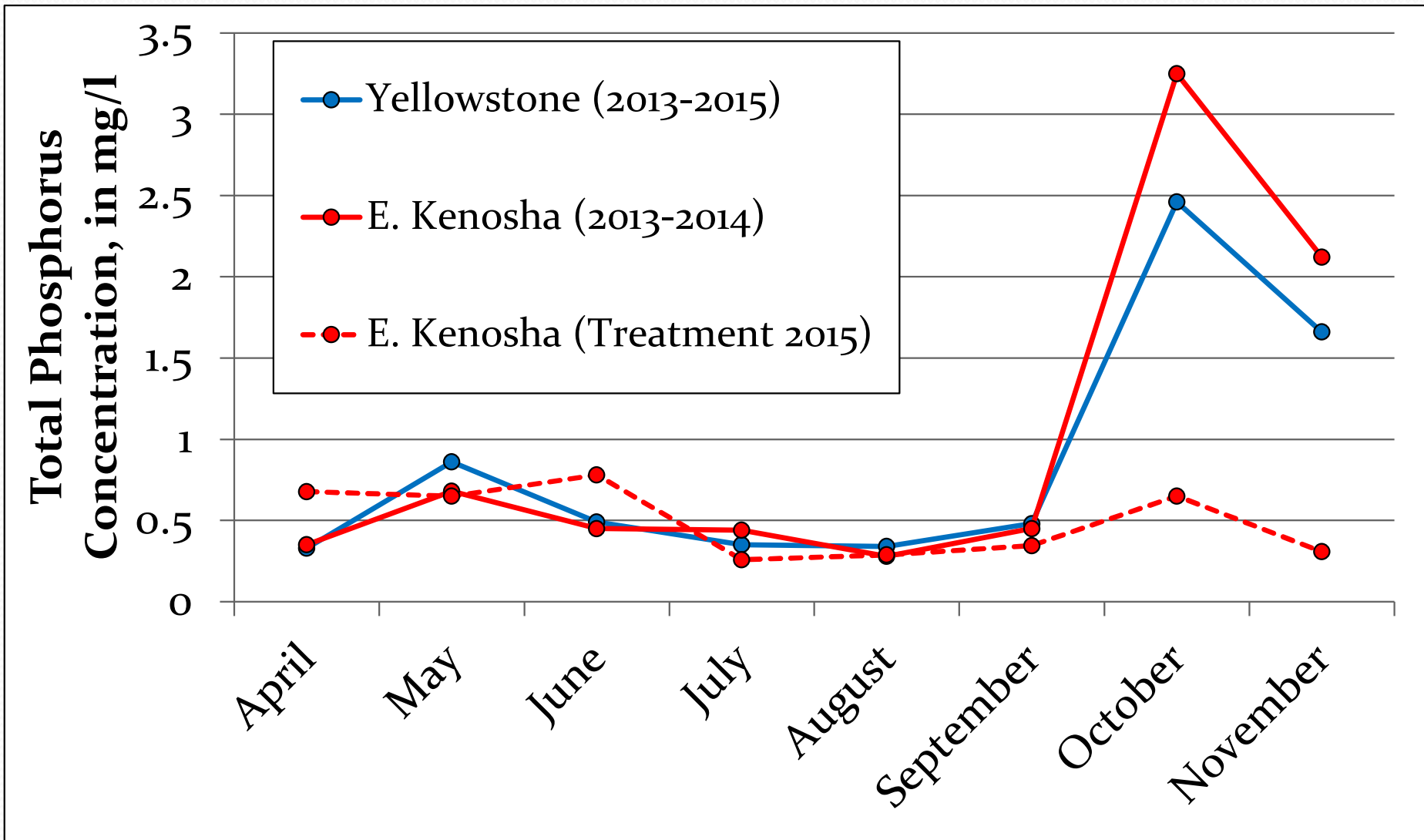
- Paired Basin Study Started in 2013
- 5 years extended to 9 years
- Quantified Extremes of Removal Options
- Filled in the gaps with additional comparisons

“Escalated” Leaf Management

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

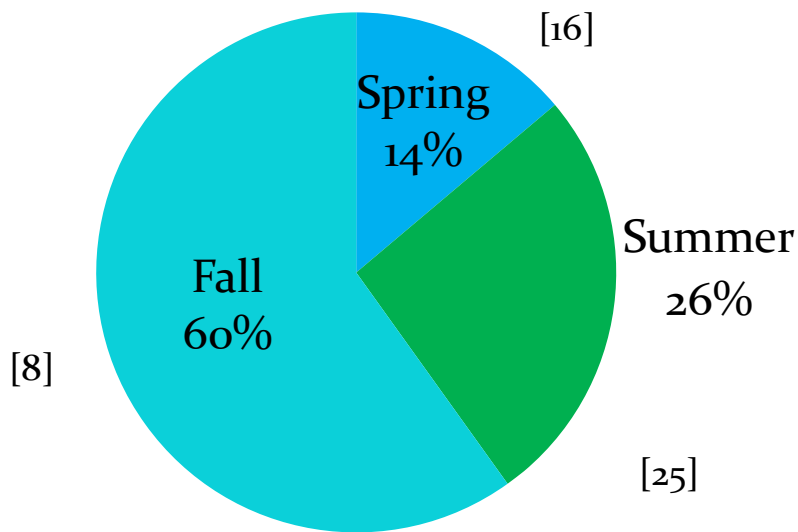




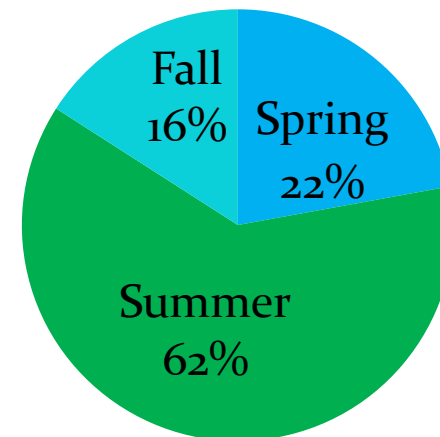


Seasonal Total Phosphorus Load as a Percent of the 2015 Annual Load (winter excluded)

Yellowstone (Control)



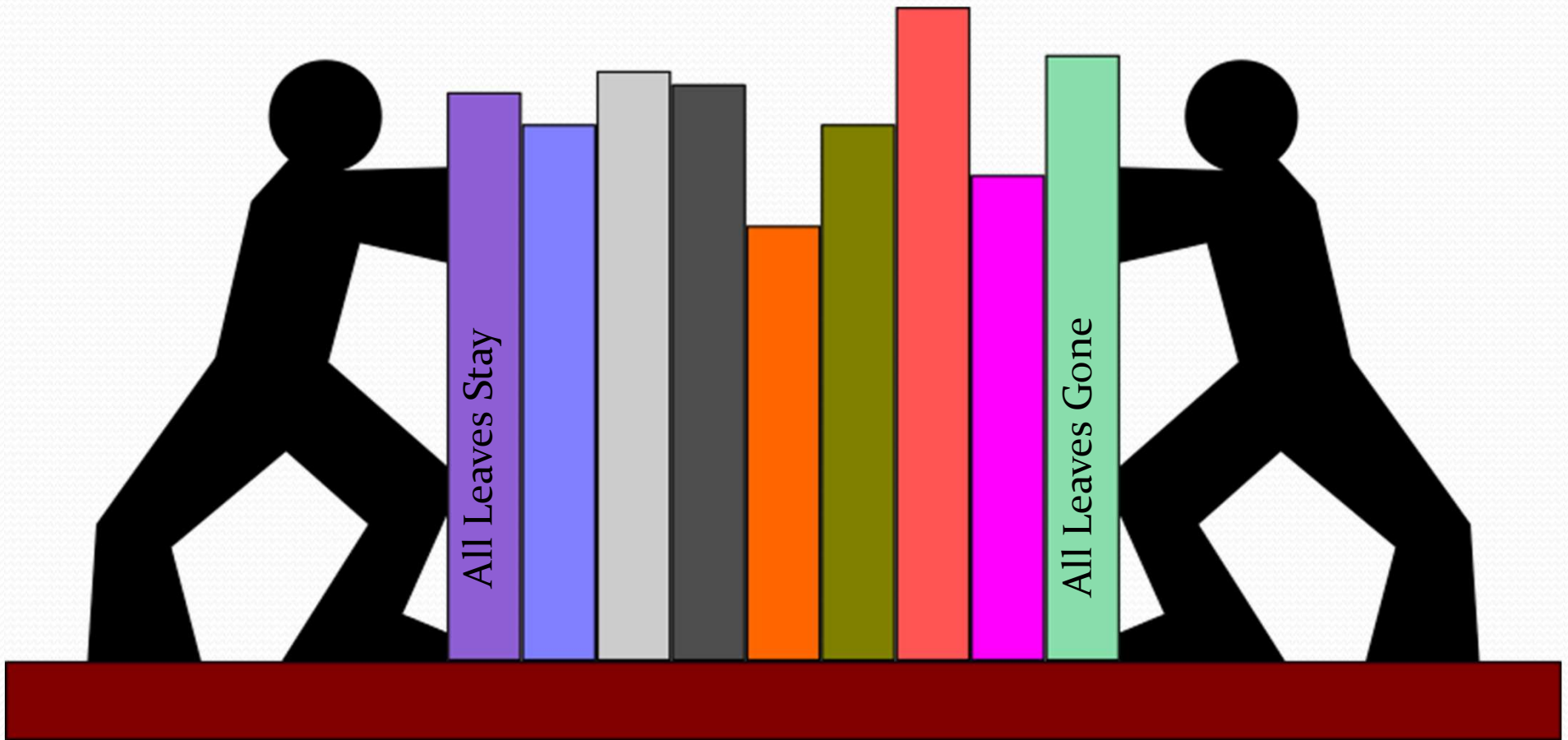
E. Kenosha (Test)



[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
Bagging ²	Biweekly
Transfer	Biweekly

¹ Medium density canopy
² Qualitative

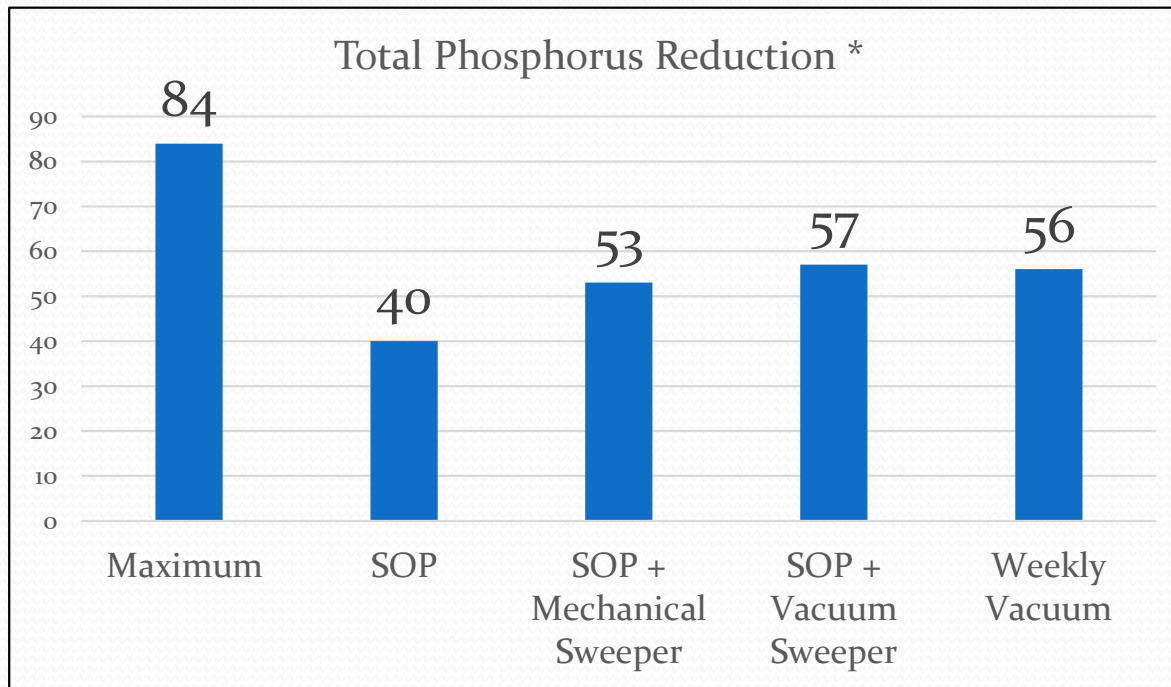
Street Cleaning

Method	Frequency	Year Completed	Title
Mechanical/blower	Pre-event	2015	Upper Maximal
Mechanical	Biweekly	2016	Madison SOP
Regenerative Air	Weekly	2017	Madison SOP+
Regenerative Air	Weekly	2017	Vacuum Mulch
Regenerative Air	Weekly	2018	Madison SOP+
Mechanical	Biweekly	2019	Madison SOP
Mechanical	Weekly Sweep	2020-2022	Madison SOP+ Pond Impact



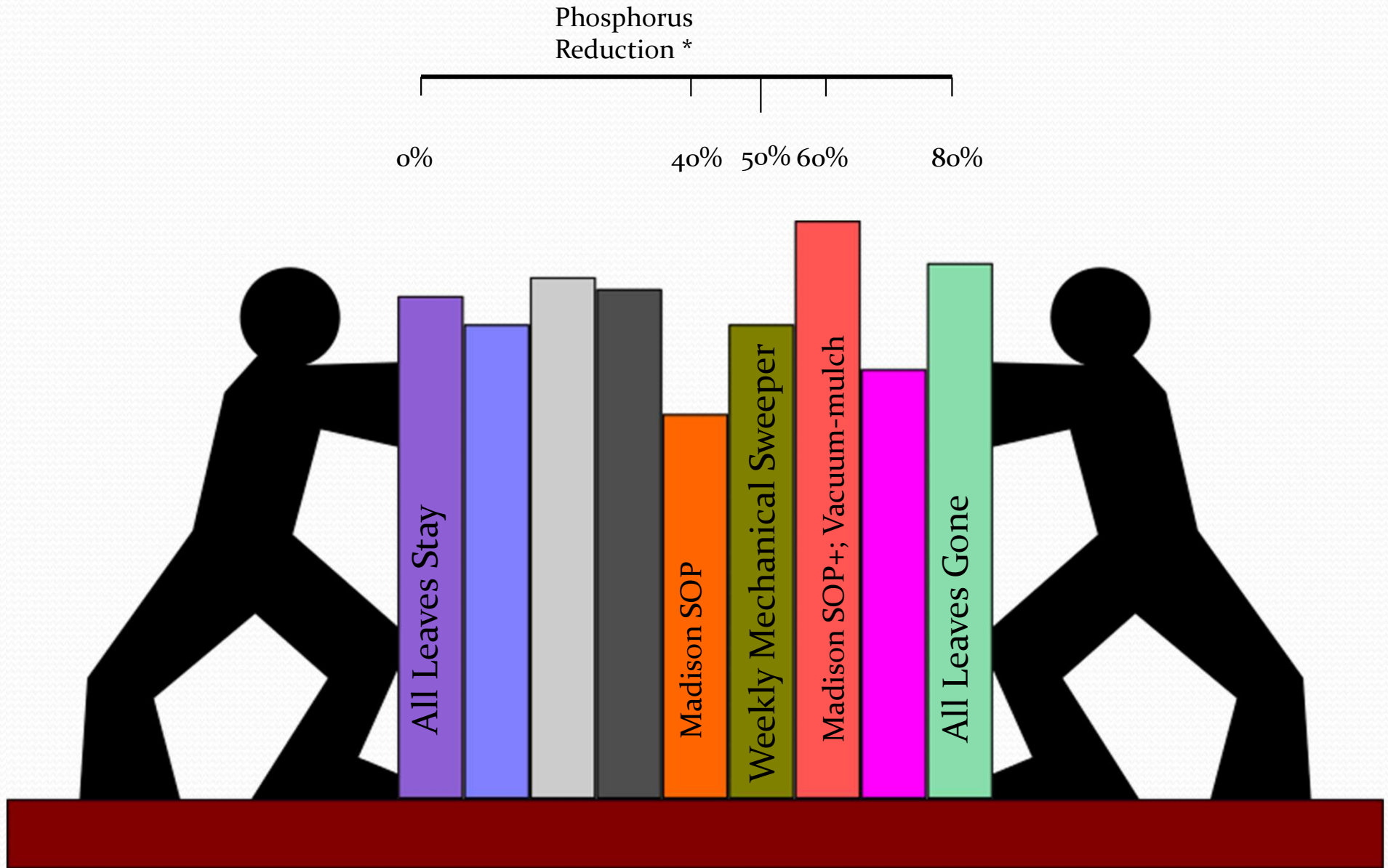
Leaf Collection		Street Cleaning		Year Completed	Title
Method	Frequency	Method	Frequency		
Transfer	Weekly	Mechanical/blower	Pre-event	2015	Upper Maximal
Transfer	Biweekly	Mechanical	Biweekly	2016	Madison SOP
Transfer	Biweekly	Regenerative Air	Weekly	2017	Madison SOP+
Vacuum	Weekly	Regenerative Air	Weekly	2017	Vacuum Mulch
Transfer ¹	Biweekly	Regenerative Air	Weekly	2018	Madison SOP+
Bagging ²	Biweekly	Mechanical	Biweekly	2019	Madison SOP
Transfer	Biweekly	Mechanical	Weekly Sweep	2020-2022	Madison SOP+ Pond Impact

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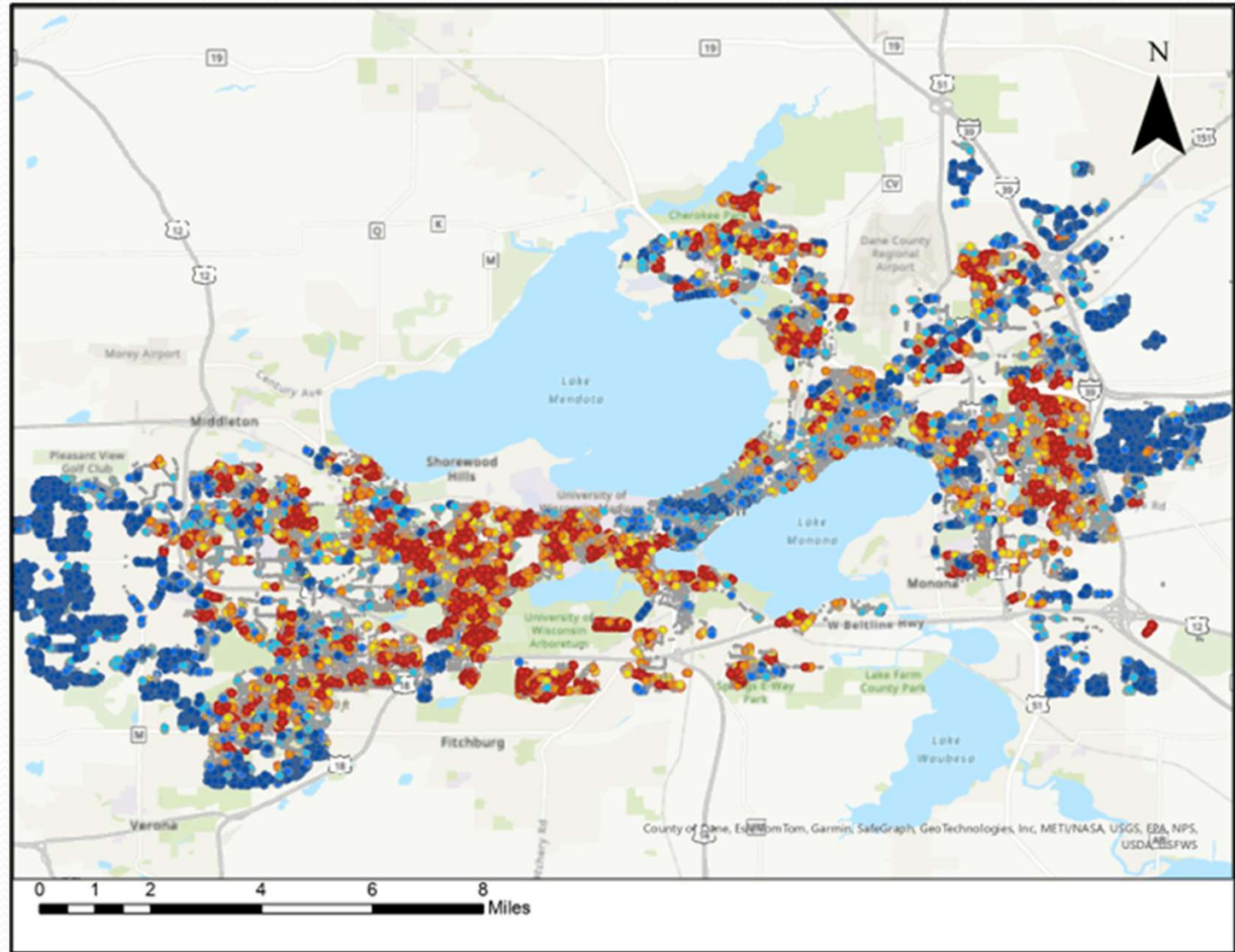
* Phosphorus reductions are a percent reduction of the fall load. The fall load is ~ 60% of the total phosphorus load in Madison

Collection Impacts on Total Phosphorus



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Maximal DRP Release



Summary

- Leaves on the street are the source of fall phosphorus
- More leaves on the street when it rains equals more phosphorus release
- Our current collection reduces fall phosphorus by 40%
 - This is a 24% of annual phosphorus pollution
- Weekly sweeping would increase our annual phosphorus capture to 30-36%. (3,600 lb of TP) {Maximum capture}

Citizen Action

- Leaf piles on grass
- Rake leaves from the street before storm
 - Sign up for Alerts:
 - www.Ripple-Effects.com
- Compost on site
 - Mulch with whole leaves
 - Benefit for insects
 - 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/

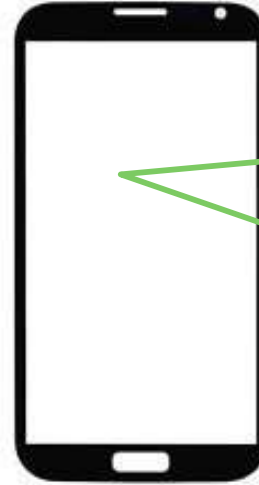
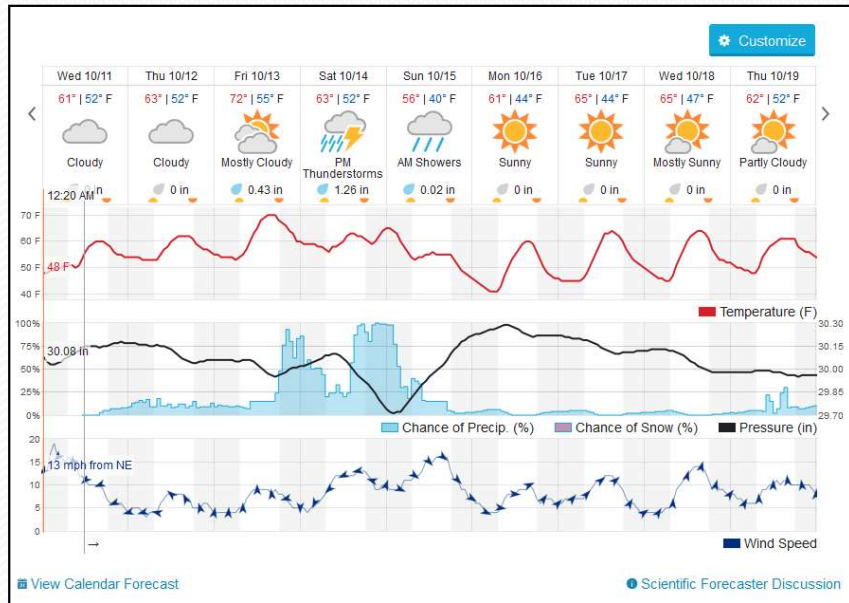


Want an alternative to raking leaves to the curb?

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.

Text Alerts when Rain is Coming



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

~600 residents
signed up so far



Leaf-free Streets
For Clean Waters

www.Ripple-Effects.com



Contact Information:

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