Urban Leaf Management Practices and Phosphorus Loading in Local Waterways

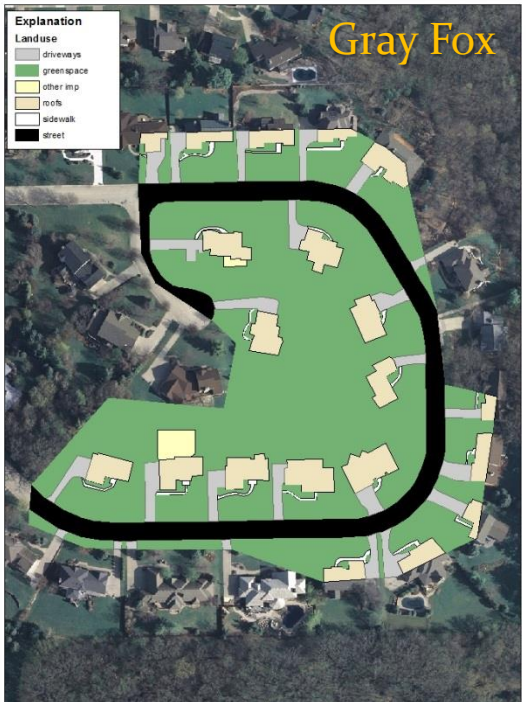
Presenter:
Phil Gaebler -City of Madison Engineering

Madison leaf Management

- **Existing Costs:**
  - $2.3 million for leaf collection and composting
  - In 2016: 15,774 tons of leaves collected
- **Current phosphorus reduction counted towards TMDL:** zero
- **Public Perception:**
  - Skepticism that current practices were beneficial
  - Request to switch to vacuum collection
- **Important research for TMDLs across the country**

Madison SOP

- Repurposed Garbage Truck
- Broom Pusher
- Vacuum to follow

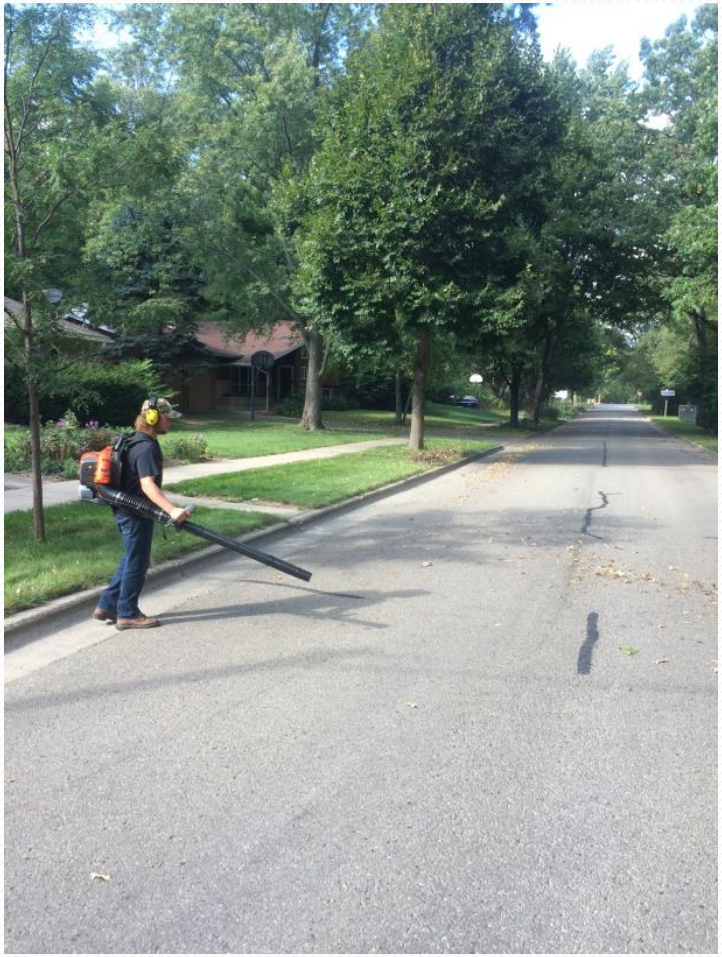


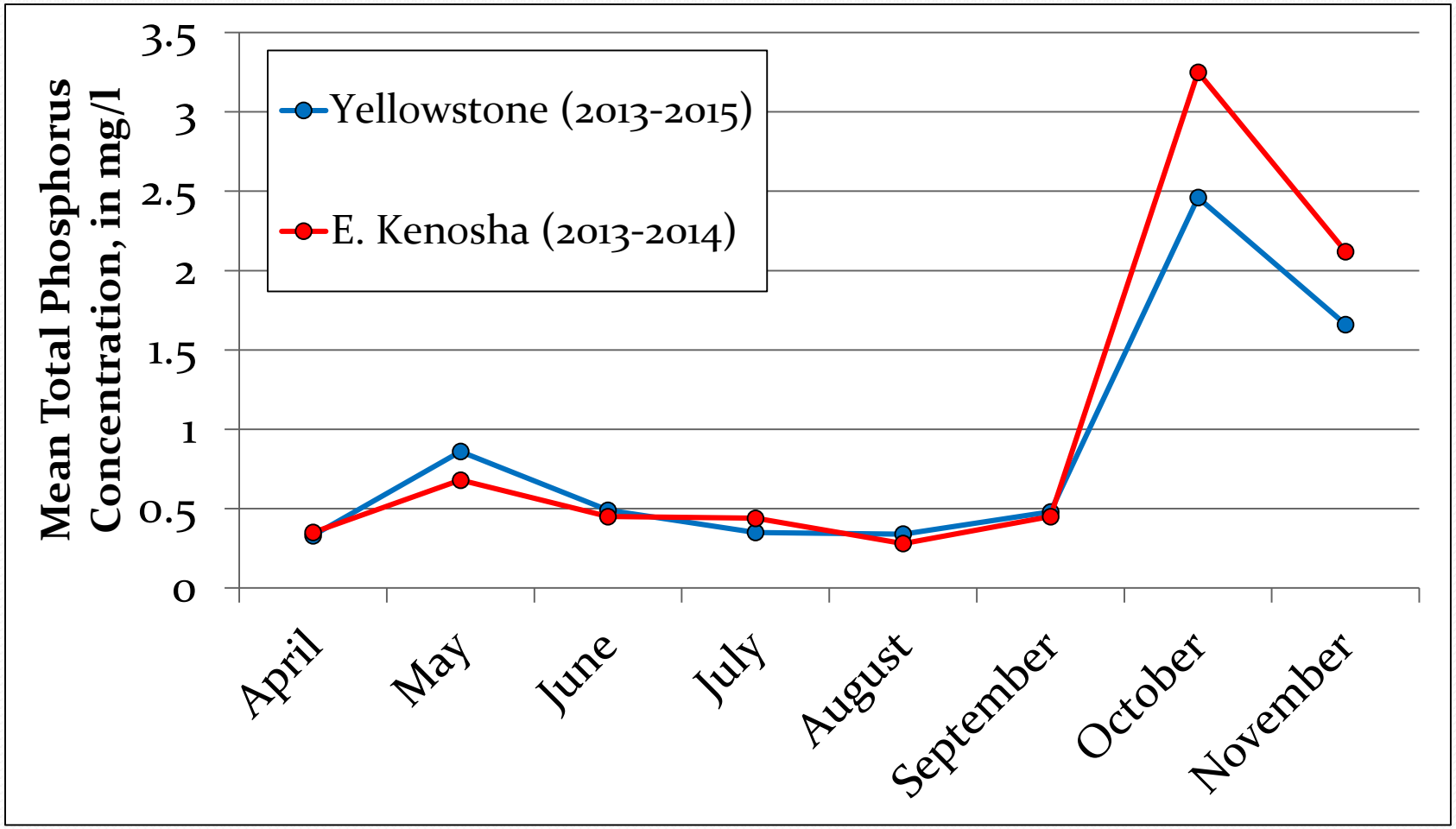
Study Overview

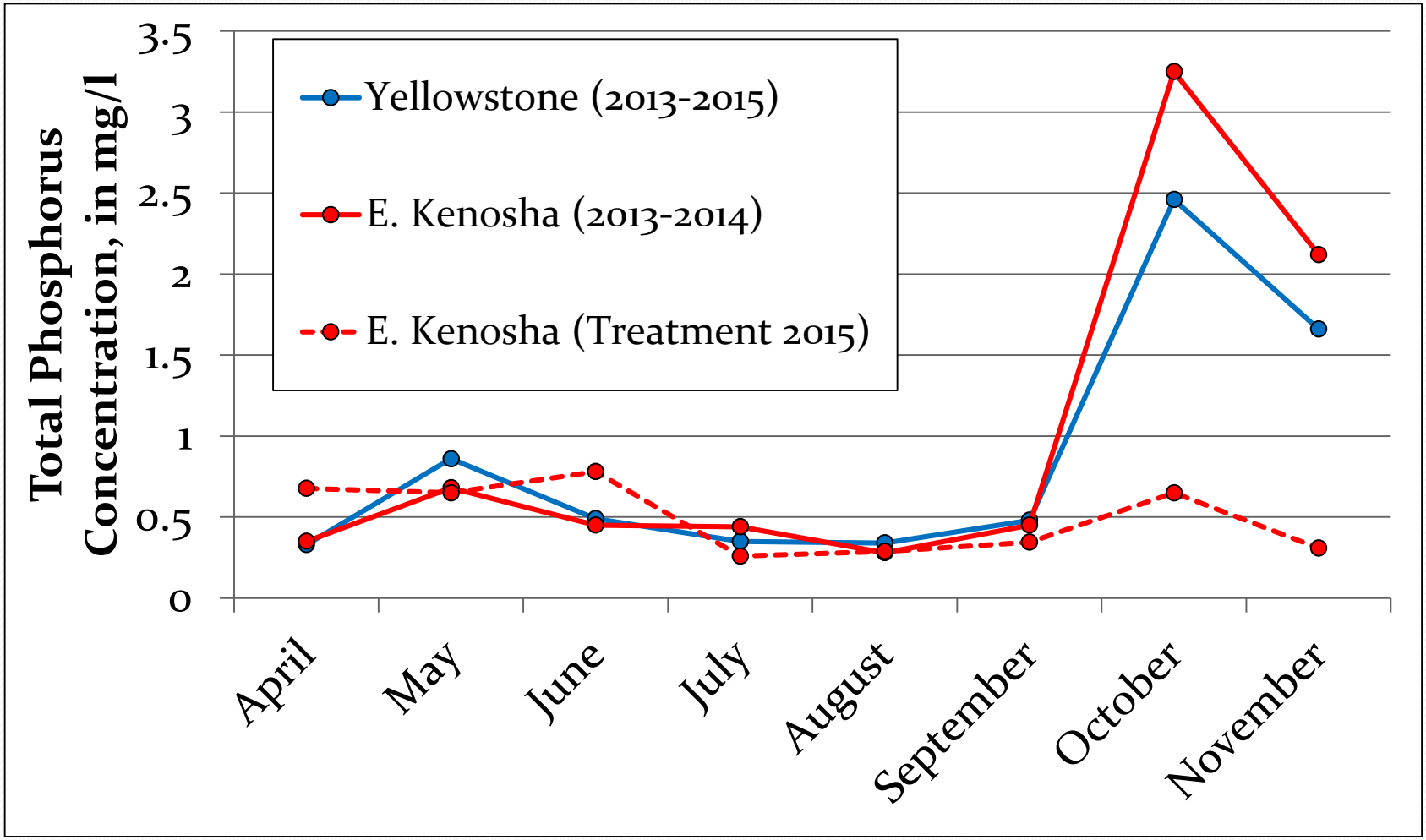
- Paired Basin Study
- 5 years
- Quantified Extremes of Removal Options
- Filled in the gaps with additional comparisons

“Escalated” Leaf Management

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




Mean Total Phosphorus Concentration, in mg/l
3.5
3
2.5
2
1.5
1
0.5
0
Yellowstone (2013-2015)
E. Kenosha (2013-2014)
April
May
June
July
August
September
October
November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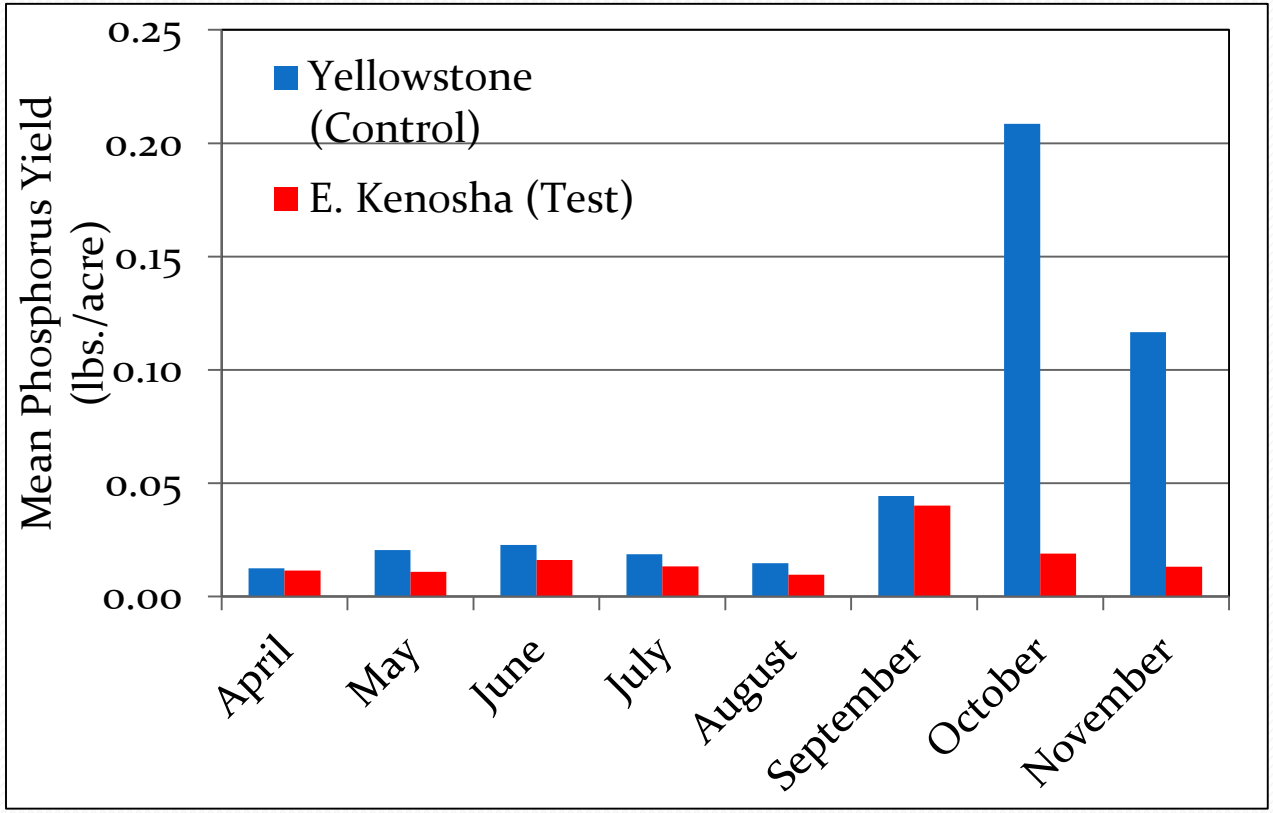
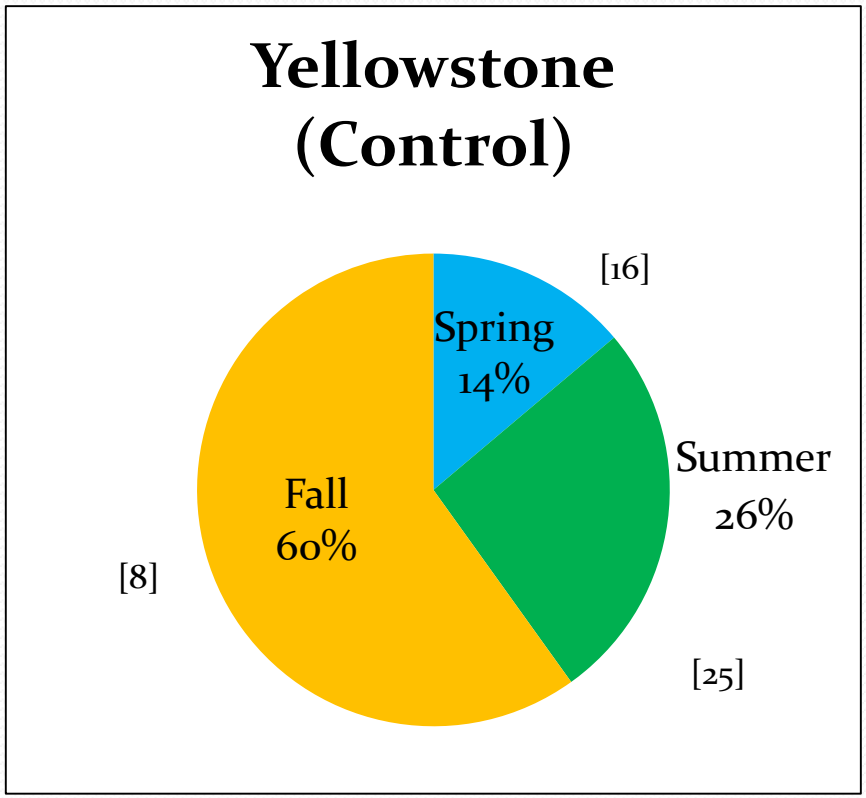
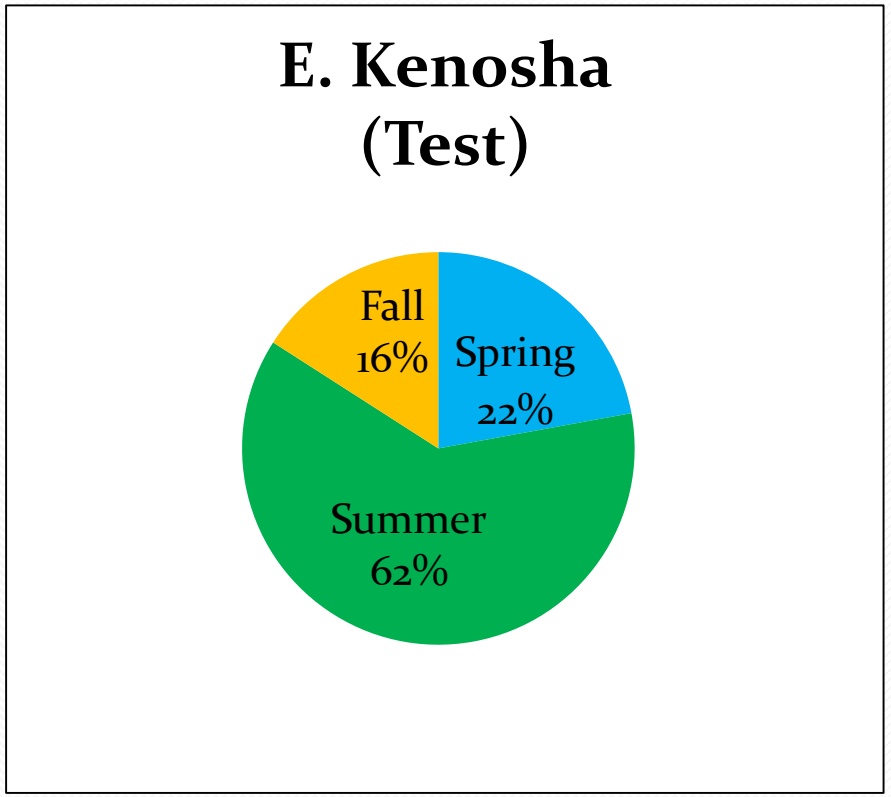
2015 Mean Monthly Phosphorus Yield



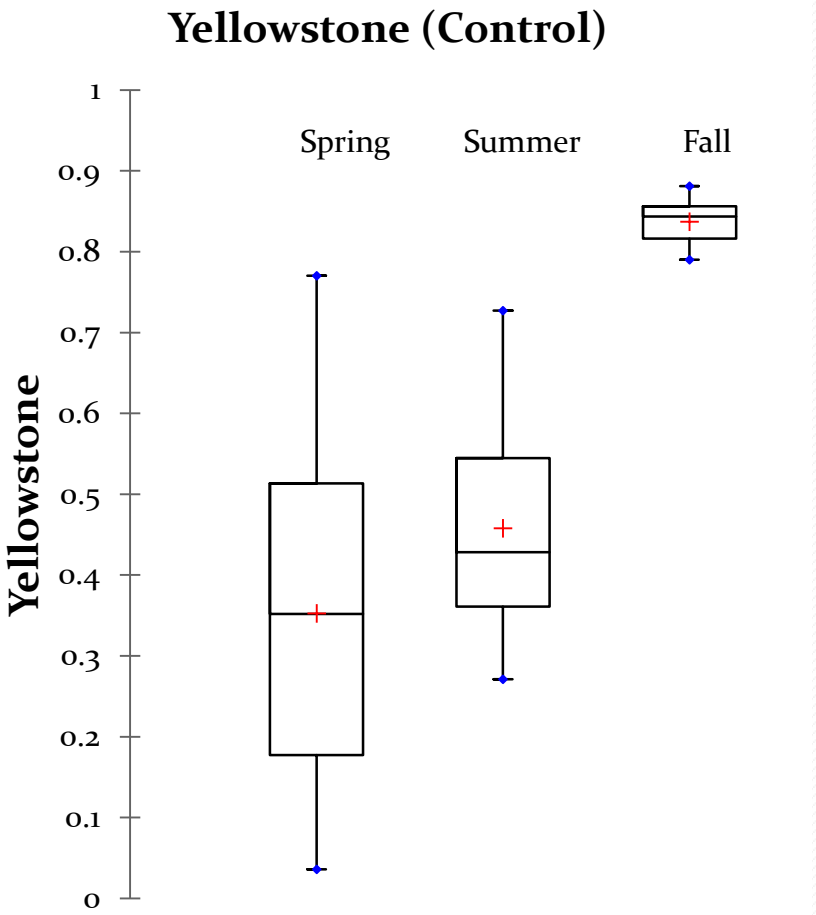
Seasonal Total Phosphorus Load as a Percent of the 2015 Annual Load (winter excluded)

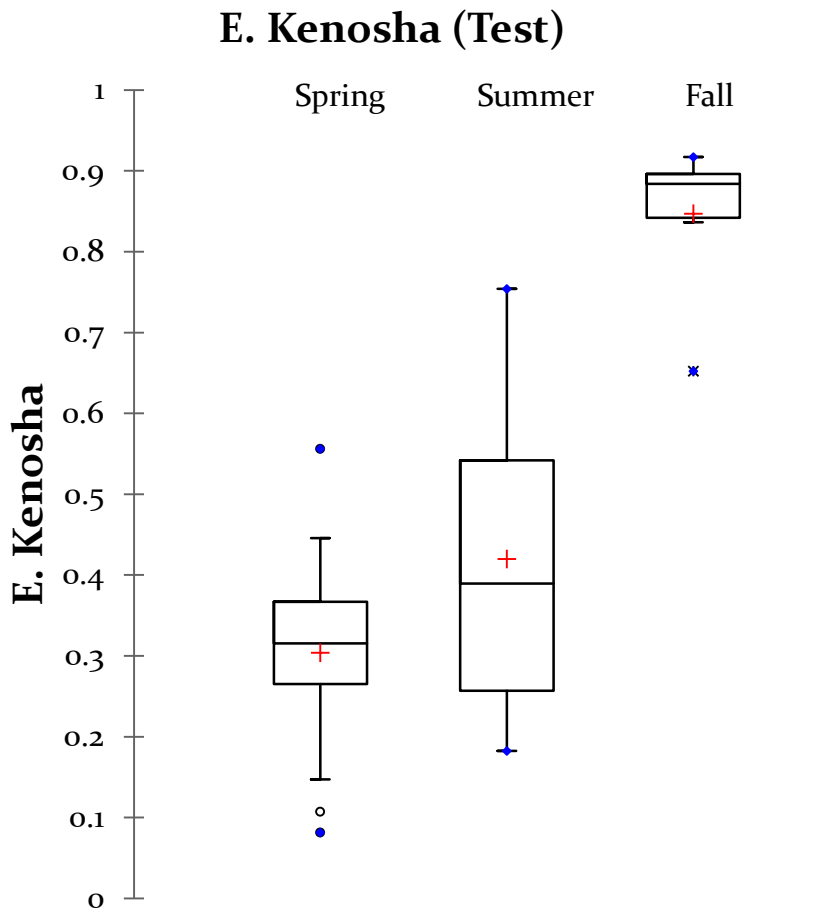




[x] = Number of events

Seasonal Phosphorus Speciation

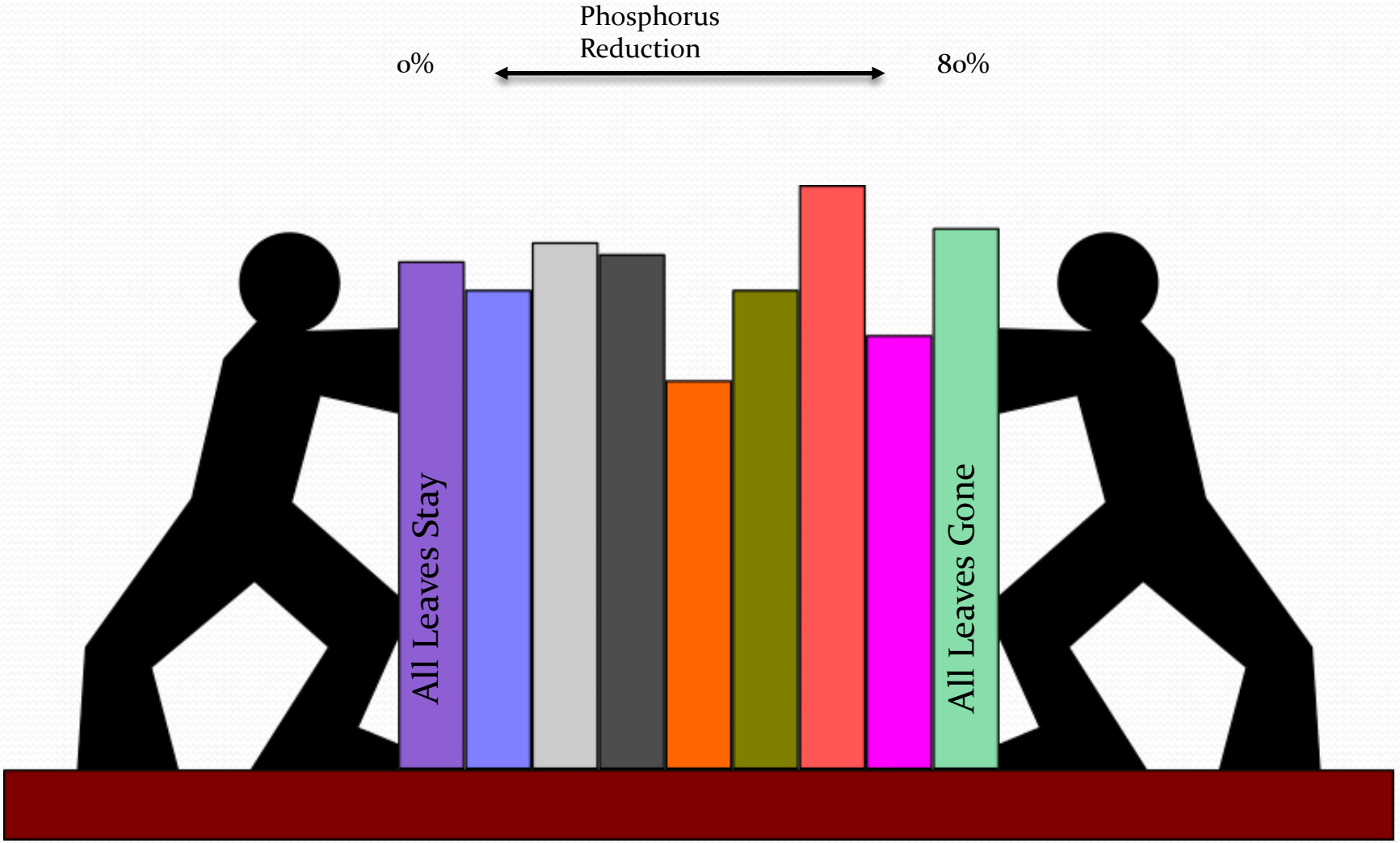




Charts show the range of dissolved P as a percent of total P

http://www.ripple-effects.com/documents/reports/STOTEN_Selbig_2016.pdf

Impact of Collection on Phosphorus



Leaf Collection		Street Cleaning			
Method	**Frequency**	**Method**	**Frequency**	**Year Completed**	**Title**
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

Vacuum Collection Trial

Test:

- Weekly Vacuum Collection + Weekly Sweeping

Results:

- Streets noticeably cleaner
- **Cost doubled**
- Need for transfer locations

SOP+ Weekly Vacuum Sweeper

+

10/5/2017

10/6/2017

10/9/2017

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

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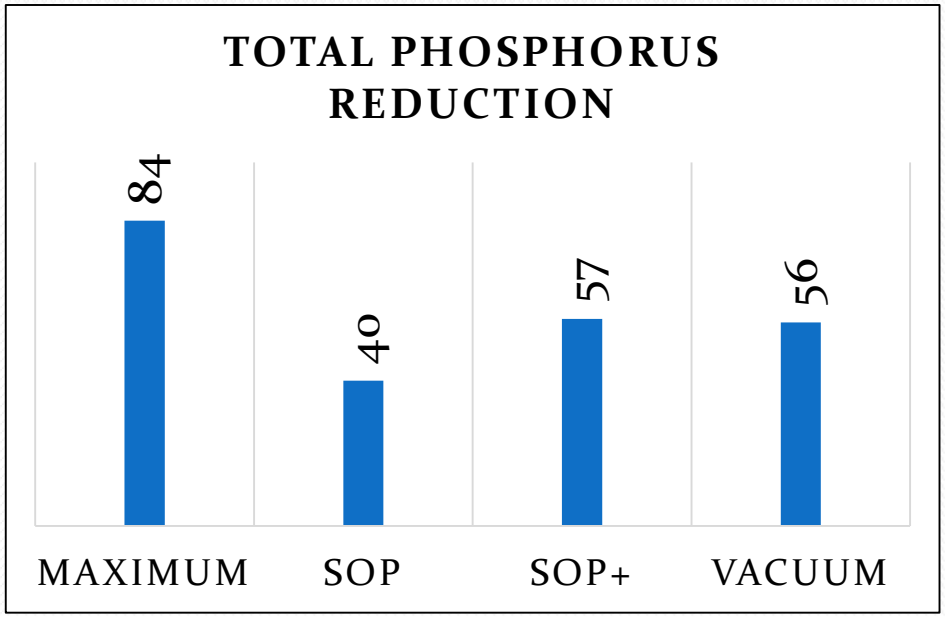
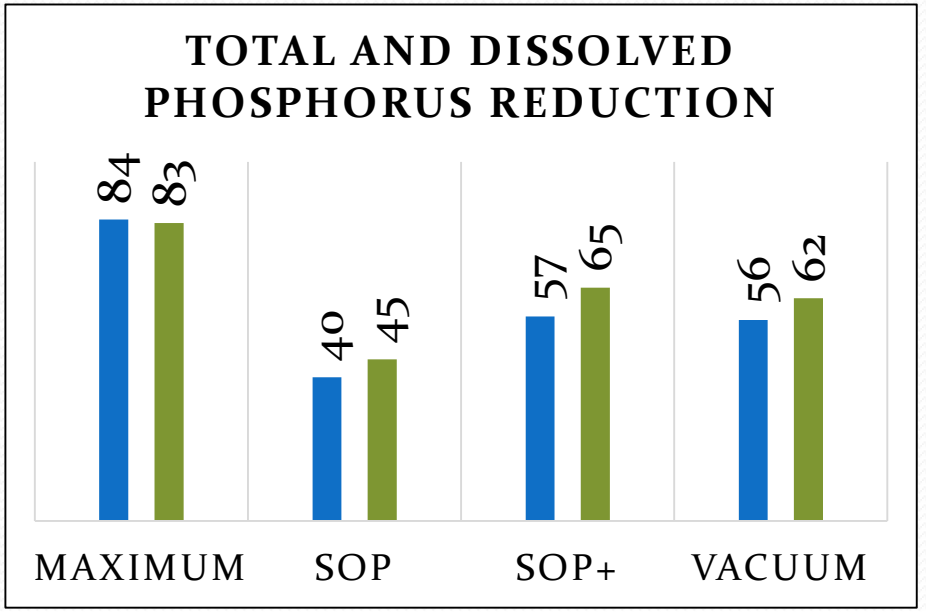
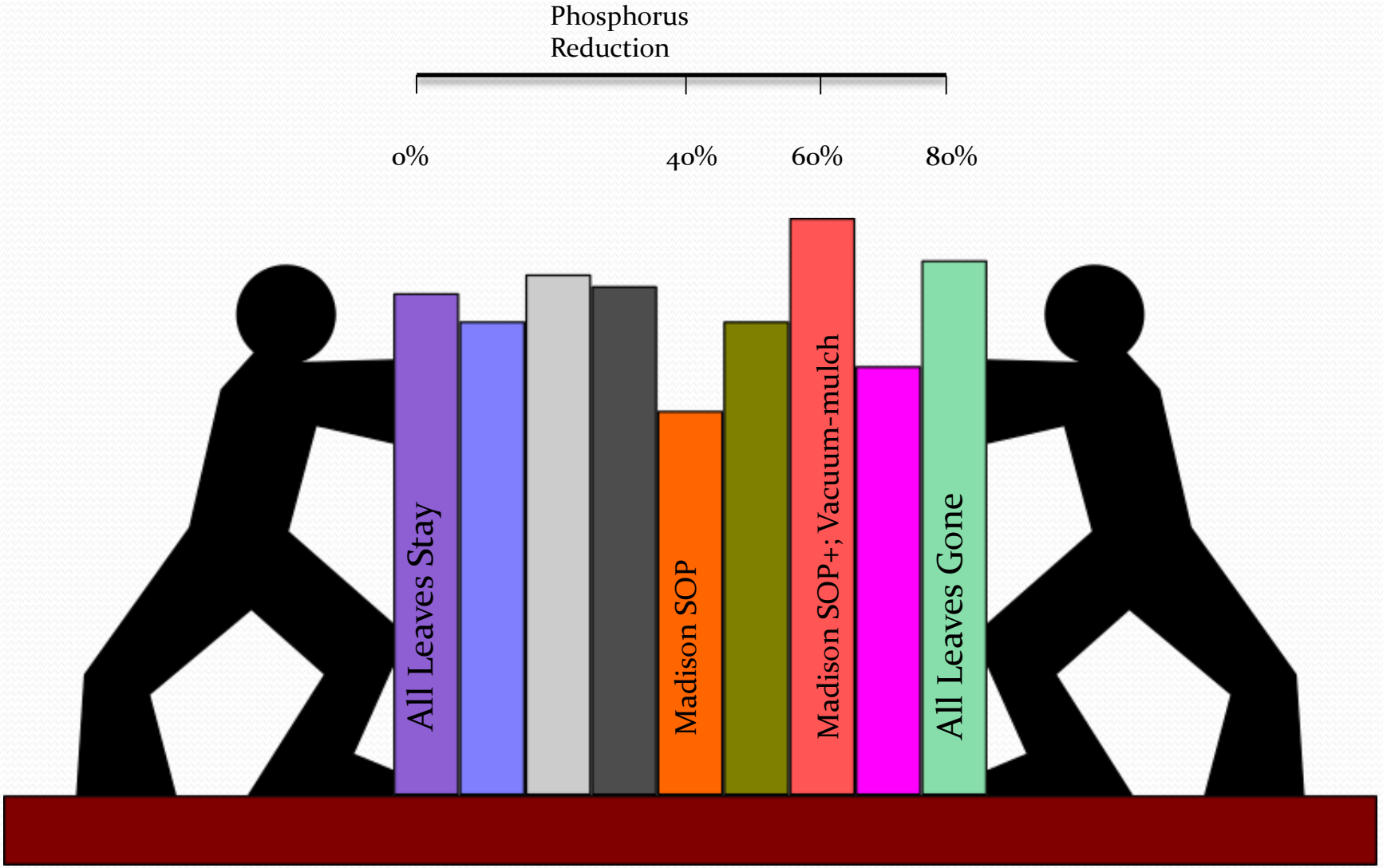




Collection Impacts on Total Phosphorus



Citizen Action

- Leaf piles on grass
- Bagging
- Rake leaves from the street before storm
  - Sign up for Alerts:
    - www.Ripple-Effects.com
- Compost on site
- “Chop and Drop”
  - Mowing frequently may be enough for some.

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)

Curb Line Clear

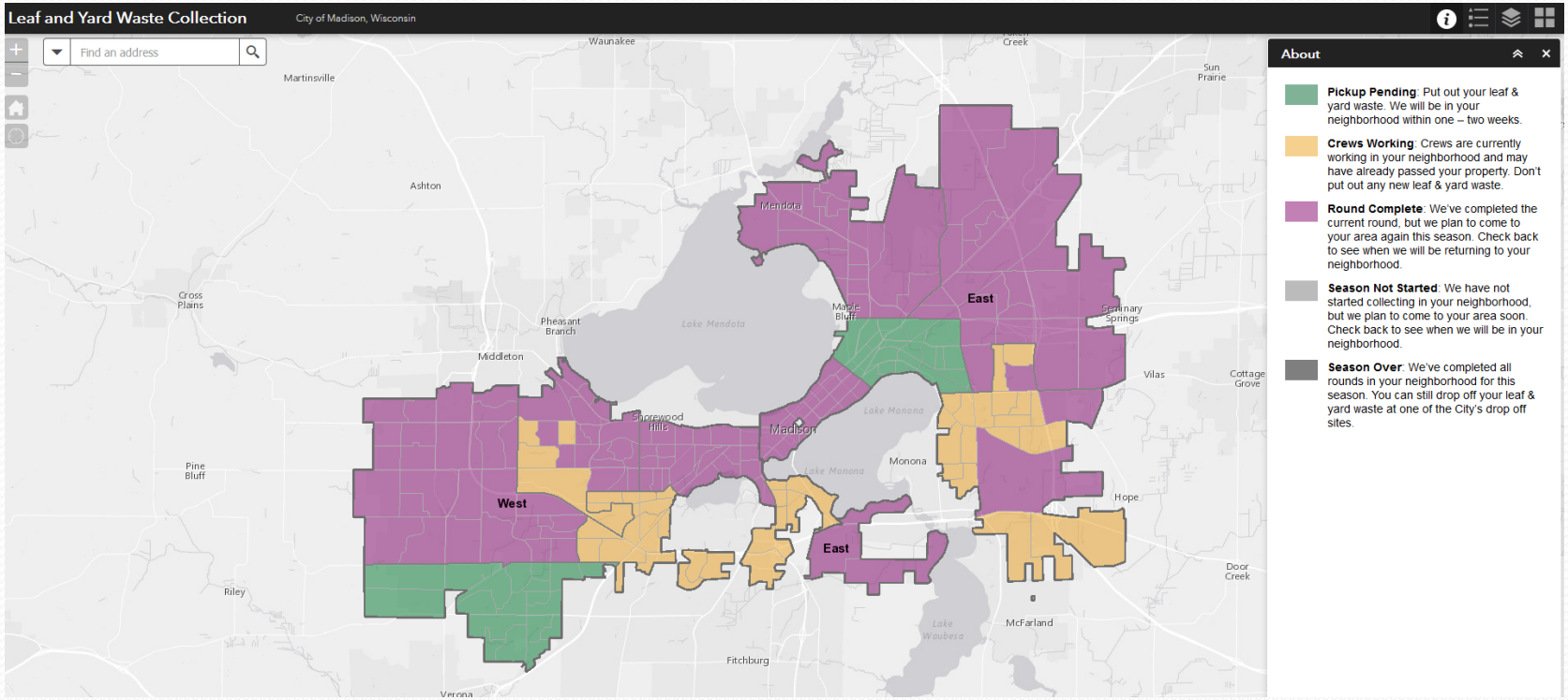
Leaf Piles on Grass

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?
Outreach planned for 2018

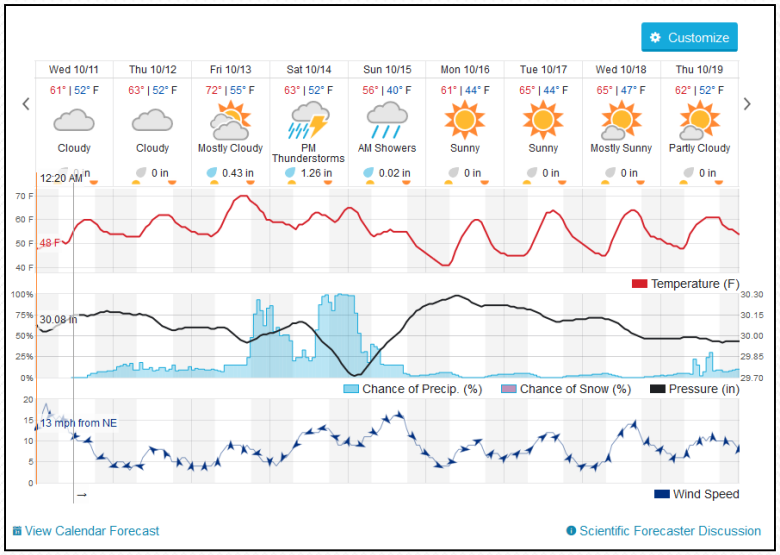
Reduced Raking into Street with Improved Collection Maps

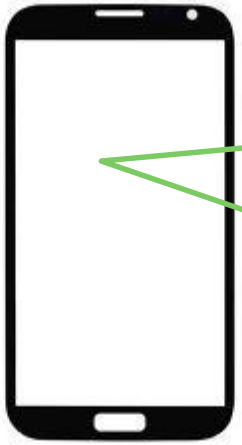


http://www.cityofmadison.com/streets/yardWaste/leaf/

#1 critique is the non-defined collection time

Text Alerts when Rain is Coming





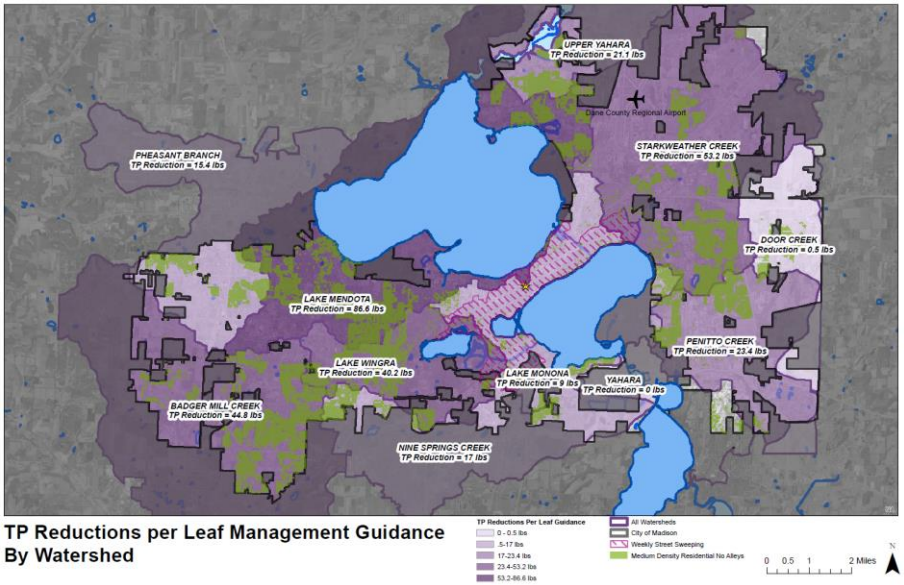
Rain is predicted. Time to rake leaves from the gutter.

~200 residents signed up so far

www.Ripple-Effects.com

WDNR Leaf Management Guidance

- 17% TP reduction
- MDRNA with Mature Trees ever 80 feet
- 3-4 Pickups
- No Leaves Raked to Street
- Follow with a Sweeper in 24 hours



TP Reductions per Leaf Management Guidance By Watershed

~311 lb/ year

Going Forward

- Cost benefit analysis of additional sweepers
- Promote onsite leaf management
- Rake leaves from curb
- Text alerts
- GPS on collection trucks with real time map updates
- Leaf-on flyover converted to canopy layer

Contact Information:

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