



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

Why are leaves an issue in an urban environment?

- Directly connected impervious areas are really efficient at moving water and nutrients
- No place for water to soak away
- Dissolved phosphorus passes through ponds
- Controlling the source is the key

Why do we care about phosphorus?

Blue Green Algae on Yahara River June 16th, 2017

Excessive lake weed growth

Photo Credit: Amber Arnold WSJ

Federal and State Regulations

Madison leaf Management

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

*3 pick ups a season plus mechanical sweeper .

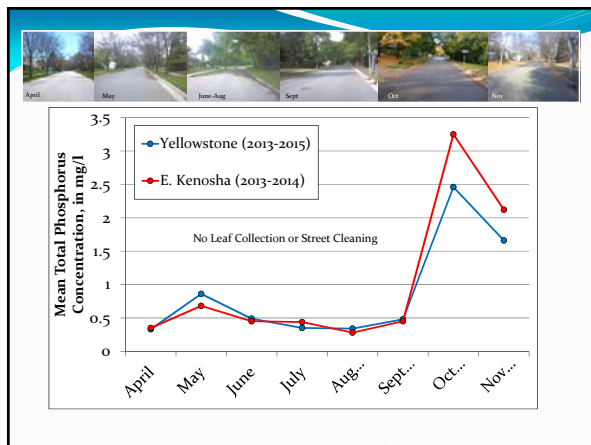
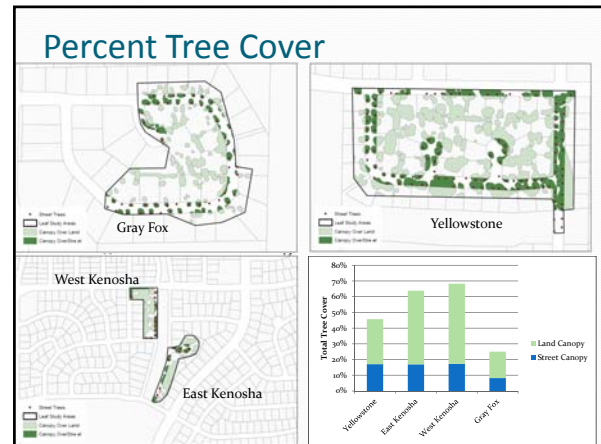
Timeline

	Type of Leaf Management Program to be Tested					
	2013	2014	2015	2016	2017	2018
Control	No Collection	No Collection	No Collection	SOP	No Collection	Report
Test	No Collection	Existing*	Escalated	No Collection	SOP +	Report

* Treated as calibration due to no rain

Control no practices

Test existing/escalated practices



"Escalated" Leaf Management in Test Basins

Weekly collection of leaf piles followed by high-efficiency street cleaning
October - November 2015

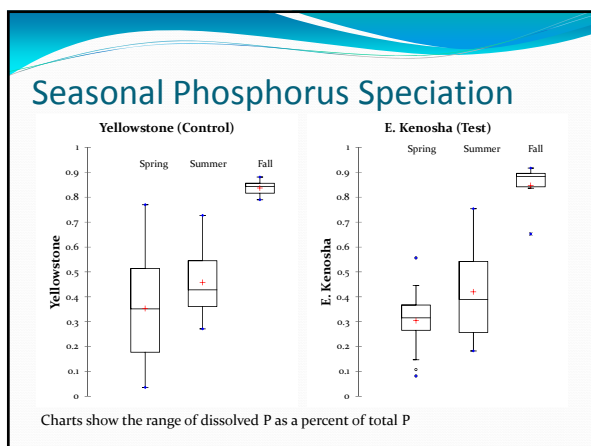
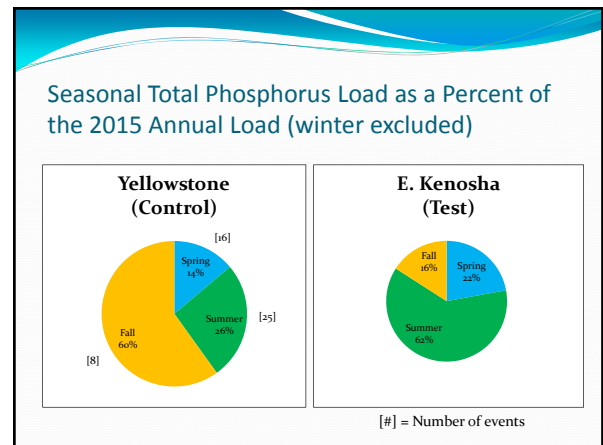
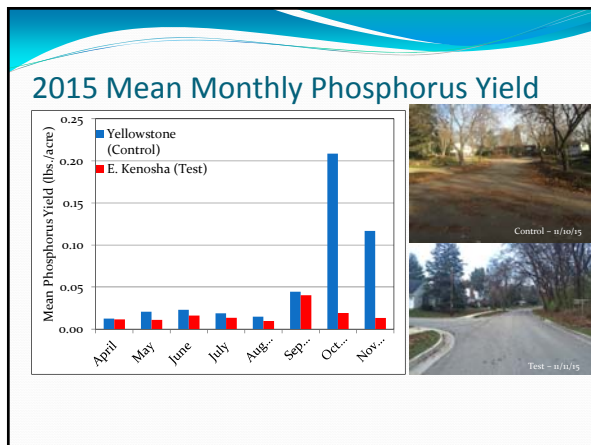
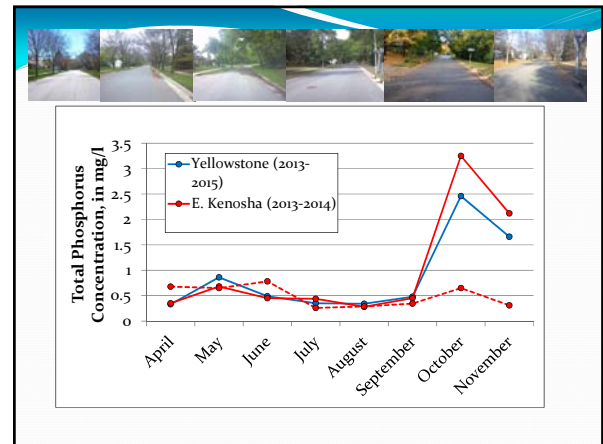
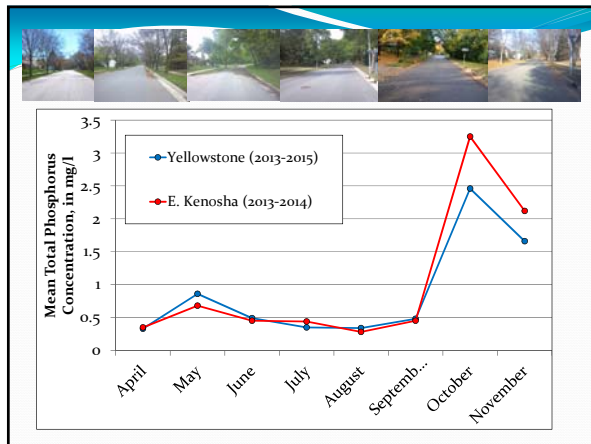
Plus...

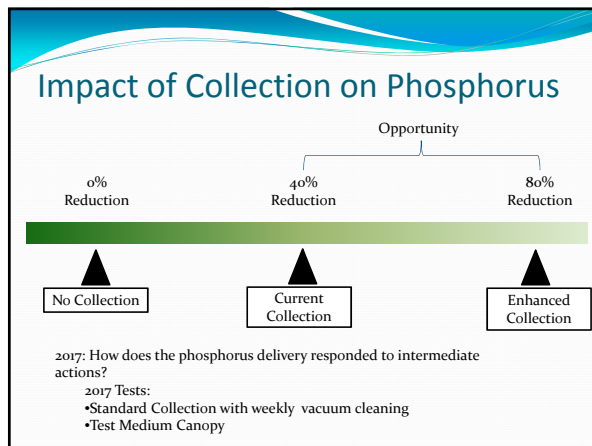
"Escalated" Leaf Management

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

Before

After





Municipal Options

- Increase frequency of collection or sweeping
- Bagging leaves
- Vacuum collection
- Focus on leaves in the street
- Thorough post collection clean up

- 800 miles of curb in medium to high canopy area
- Sweepers fill quickly
 - Distributed transfer stations?
- Cost benefit analysis of practices as phosphorus credits get linked to practices.

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)
- % reduction dependent on 2017 data

Weekly Vacuum Sweeper Impact

10/5/2017 10/6/2017

10/9/2017

Vacuum Collection Trial

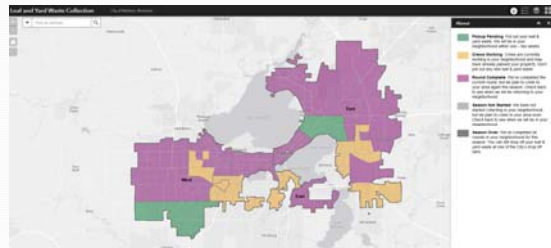
Test:

- Weekly Vacuum Collection + Weekly Sweeping

Results:

- Streets noticeably cleaner
- Cost doubled
- Transport costs would increase
- Water quality pending 2017 calibration results

New Collection Maps



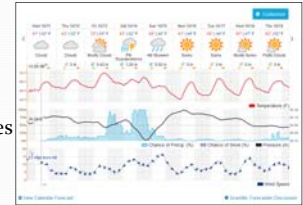
<http://www.cityofmadison.com/streets/yardWaste/leaf/>

Timing is Very Important

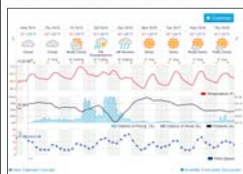
Strong Correlation between amount of leaves on Street and P export

The P leaving is 80-90% dissolved so once it leaves the leaf it is hard to capture

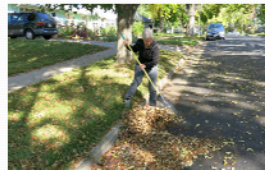
How can we best control the source before rain events?



Text Alerts when Rain is Coming



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



Leaf-free Streets
For Clean Waters

www.Ripple-Effects.com

DNR Draft Guidance

- 17% Reduction in TP
- Only for Medium Density Residential
- Require mature tree every 80 ft
- Must use Madison collection method
- Should be in place for 2018 season
 - Existing calculations put savings at 300 -600 lb of phosphorus reduction a year.
 - ~\$45,000 – \$300,000 year savings in phosphorus cost.

Going Forward

- Expand Study to other parts of the State
- Test other land use, tree cover, treatment options
- Citizen outreach and education



Citizen Action

Citizen Action

- Leaf piles on grass
- 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.



Leaf Piles on Grass



Curb Line Clear



Mulch or Compost



Less work
Less transportation
Good for lawn or garden

