

# EVALUATION OF MS4 NPDES COMPLIANCE MEASURES IN SOUTHEAST WISCONSIN

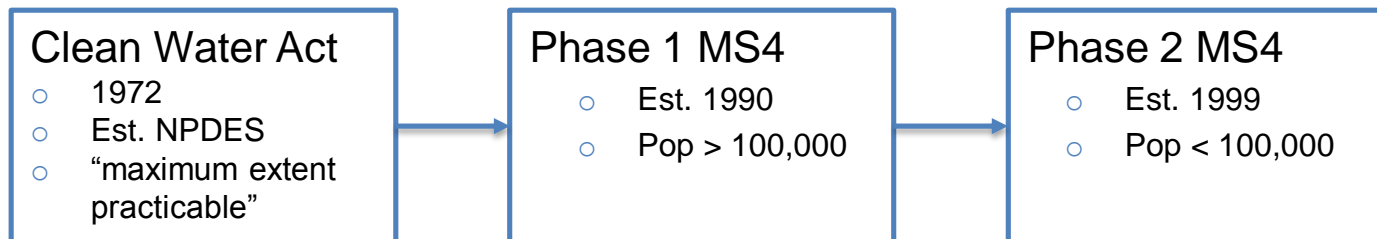
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AWRA Wisconsin Section 2017 Annual Meeting  
March 9-10, 2017

# Background



## MS4 – Municipal Separate Storm Sewer System

*NPDES permits for regulated MS4s require permittees to develop a SWMP, which describes the stormwater control practices that will be implemented consistent with permit requirements to minimize the discharge of pollutants from the sewer system.*

\*US EPA

# Wisconsin - WPDES

- Wisconsin DNR issues MS4 permits under WPDES program
- Approximately 245 municipalities in Wisconsin
- A municipality must have a permit if:
  - Its located in a federally-designated urbanized area
  - Pop > 10,000
  - DNR designates municipality for permit coverage



# WPDES Permit Requirements

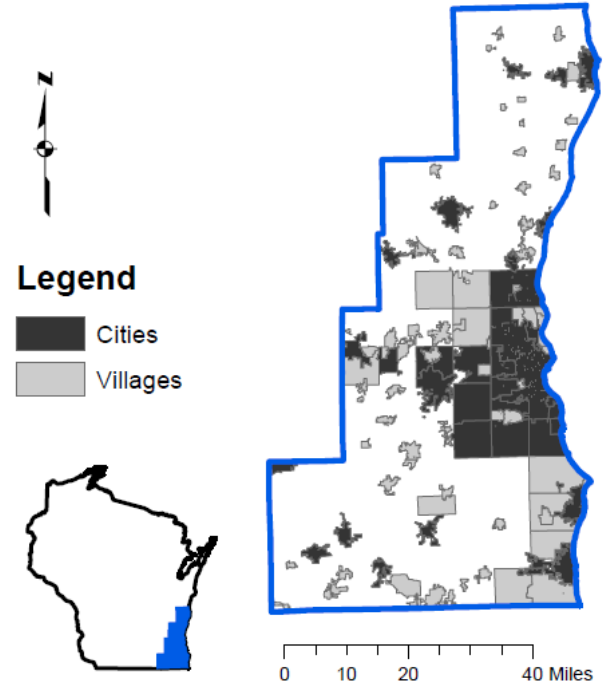
- **Minimum Control Measures**
  - (a) *Public education and outreach*
  - (b) *Public involvement and participation*
  - (c) *Illicit discharge detection and elimination*
  - (d) *Construction site pollution control*
  - (e) *Post-construction site storm water management*
  - (f) *Pollution prevention*
- **Storm Sewer System Map**
- **Annual Report**

# Changes on the horizon

- NPDES Remand rule (Dec. 2016)
  - Impacts small MS4s (<100k pop.)
  - New public engagement process
  - Requires greater permitting authority review unless requirements are “clear, specific, and measurable”
    - Ex: Municipalities should “achieve a 20% reduction in the annual average mass of total suspended solids discharging from the MS4”

# Area of interest

- Southeast Wisconsin municipalities
- 85 WPDES reports submitted in 2015
- PDF format



# Project Goals

- Summarize Best Management Practices (BMPs) from MS4 WPDES reports in Southeast Wisconsin
- Determine if methods to address minimum control measures can be explained by socioeconomic factors

# Data Collection Methods

- 56 WPDES reports cataloged to date
- Qualitative responses coded and themes created
- 47 items per report cataloged
- 119 categorical and 33 numerical variables

State of Wisconsin  
Department of Natural Resources  
[dnr.wis.gov](http://dnr.wis.gov)

Annual Report under MS4  
General Permit No. WI-S050075-2  
Form 3400-195 (R 11/16) Page 1 of 8

Due by March 31, 2017

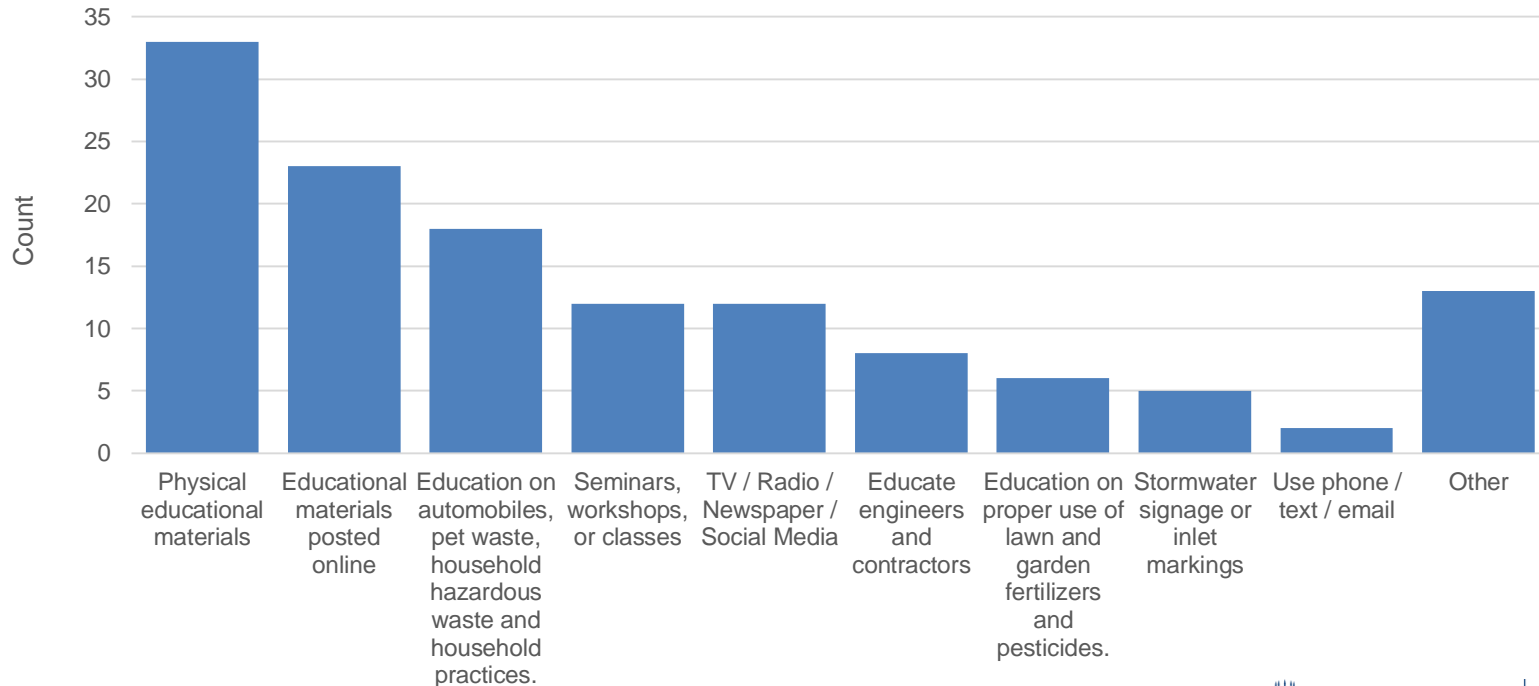
Notice: Pursuant to s. NR 216.07(6), Wis. Adm. Code, an owner or operator of a Municipal Separate Storm Sewer System (MS4) is required to submit an annual report to the Department of Natural Resources (DNR) by March 31 of each year to report on activities for the previous calendar year. This form is being provided by the DNR for the user's convenience. Personal information collected will be used for administrative purposes and may be provided to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. This form is for reporting on activities undertaken in calendar year 2016.

Instructions: Complete each section of the form. If additional space is needed, attach additional pages. Provide descriptions that explain the program actions taken to comply with the general permit. Complete and submit the annual report by March 31, 2017, to the appropriate address indicated on the last page of this form.

Part I. Municipal Information			
Name of Municipality		Facility ID No. (FIN)	
Mailing Address	City	State WI	ZIP Code
County(s) in which Municipality is located	Municipality Type: (select one) <input type="radio"/> County <input type="radio"/> City <input type="radio"/> Village <input type="radio"/> Town <input type="radio"/> Other (specify)		
Part II. Municipal Contact Information			
Name of Municipal Contact Person		Title	
Mailing Address (if different from above)	City	State WI	ZIP Code
Email	Phone Number (include area code)	Fax Number (include area code)	
Has the contact person changed in the last year? <input type="radio"/> Yes <input type="radio"/> No			
Part III. Certification			
<i>I hereby certify that I am an authorized representative of the municipality covered under MS4 General Permit No. WI-S050075-2 for which this annual report is being submitted and that the information contained in this document and all attachments were gathered and prepared under my direction or supervision. Based on my inquiry of the person or persons under my direction or supervision involved in the preparation of this document, to the best of my knowledge, the information is true, accurate, and complete. I further certify that the municipality's governing body or delegated representatives have reviewed or been apprized of the contents of this annual report. I understand that Wisconsin law provides severe penalties for submitting false information.</i>			
Authorized Representative Printed Name	Authorized Representative Title		
Signature of Authorized Representative	Date		
Email	Phone Number (include area code)	Fax Number (include area code)	
Part IV. General Information			
a. Describe the municipality's efforts to invite the municipal governing body, interest groups, and general public to review and comment on the annual report.			

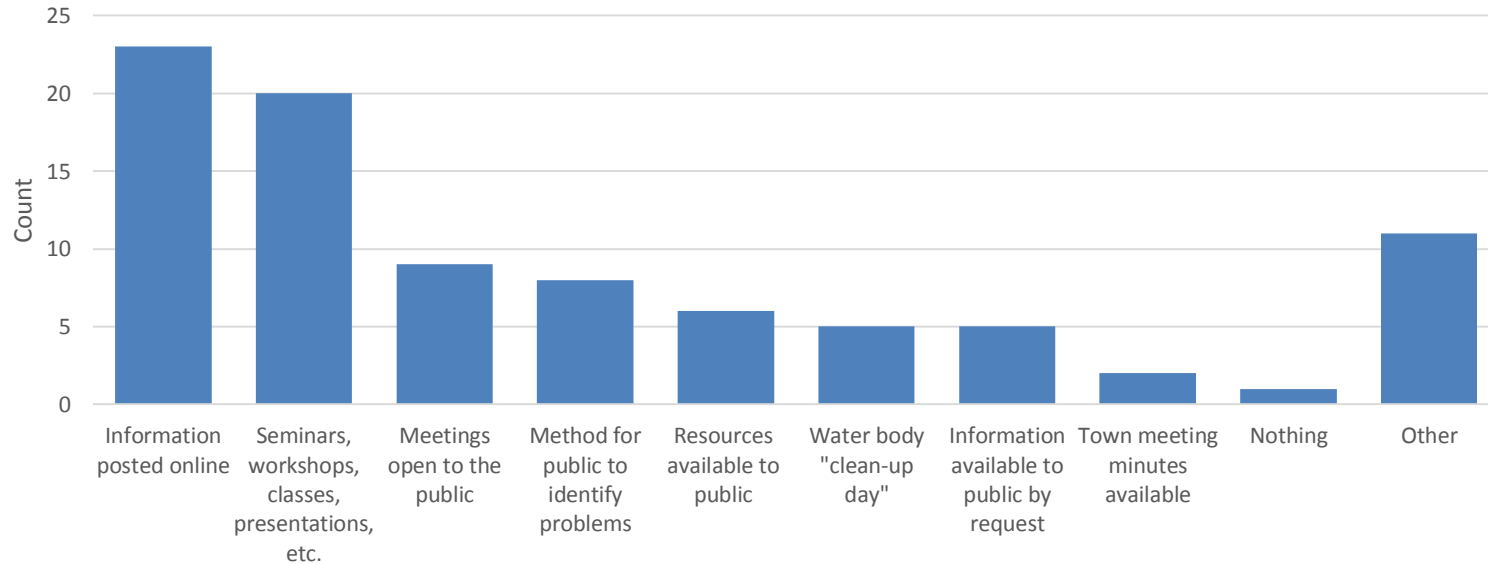


# Public Education and Outreach - BMPs



# Public Involvement and Participation - BMPs

*A program to notify the public of activities required by the municipal storm water discharge permit... and to encourage input and participation from the public regarding these activities.*



# Illicit Discharge Detection and Elimination

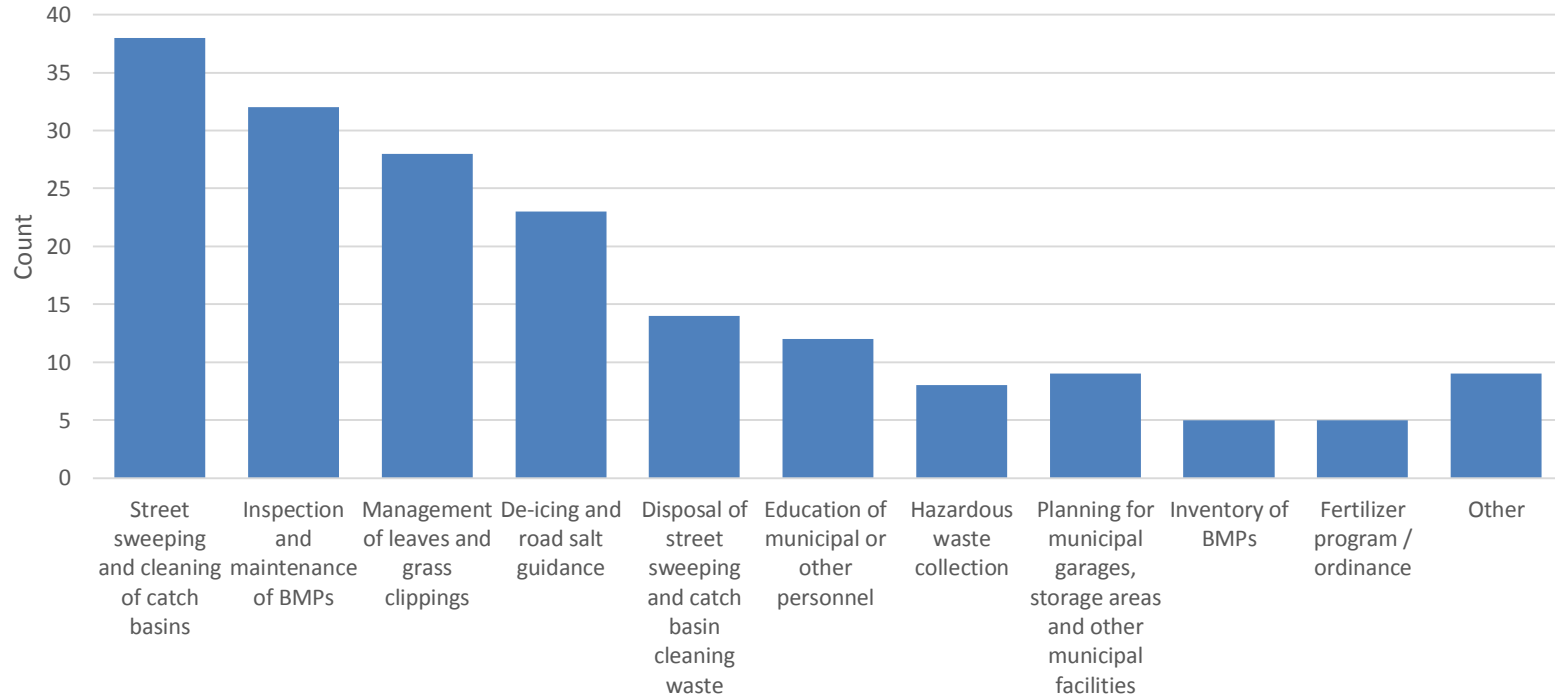
Have they conducted outfall inspections?

●	Yes inspections	41
●	Not specified	8
●	No inspections	4

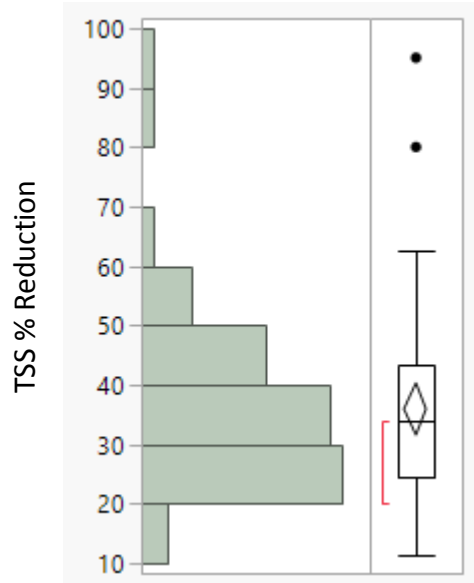


- Number of outfalls inspected
  - Avg: 84.2; Std Dev: 175
  - Min 0; Max: 730
- Illicit Discharges Identified
  - Avg: 0.9; Std Dev: 2.46
  - Min 0; Max: 9

# Pollution Prevention - BMPs



# Pollution Prevention – TSS (%) Reduction



- MS4s required to conduct pollutant-loading analysis for total suspended solids
- TSS % Reduction
  - Mean 36 %
  - Std Dev 16 %

# Other Annual Report Data

Has the municipality prepared its own municipal-wide storm water management plan?

[Details](#)

●	Yes	32
●	No	17
●	Not specified	0



Is snow hauled away?

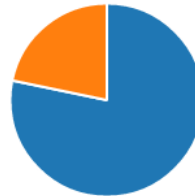
●	Yes	26
●	No	23
●	Not specified	1



Does the municipality have a maintenance program for installed storm water best management practices?

[Details](#)

●	Yes	36
●	No	10



Are adequate revenues being generated to implement your storm water management program to meet the permit requirements?

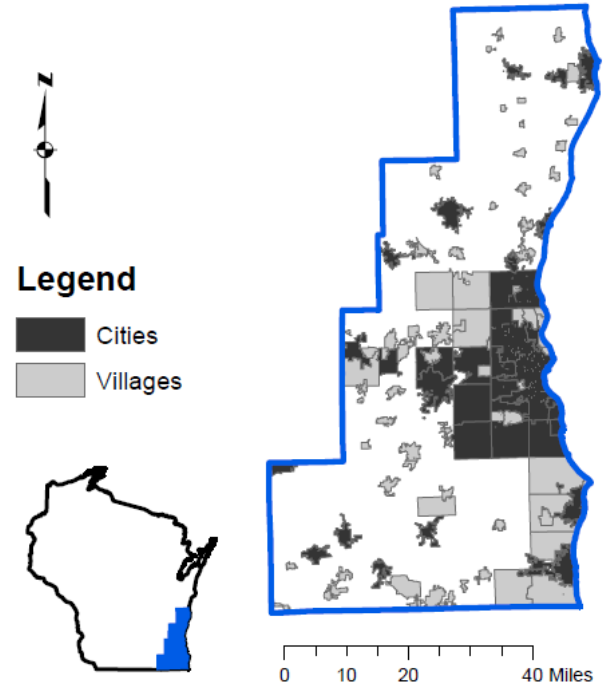
[Details](#)

●	Yes	42
●	No	5



# Socioeconomic Data

- Census information includes
  - Population
  - Housing
  - Education
  - Economy
  - Income and Poverty
- 46 numerical variables



# Preliminary Analysis

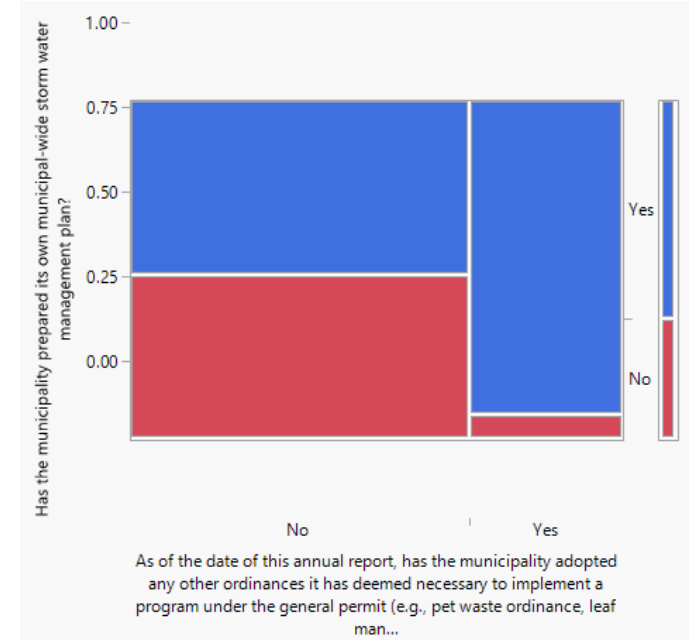
- Response screening among hypothesized explanatory variables (e.g., budget/capita, household income, population, etc.)
- Model development
  - Logistic regression (categorical dependent and independent)
  - Oneway analysis of variance (numerical dependent and categorical independent)
  - Standard least squares (numerical dependent and independent)



# Adoption of ordinances

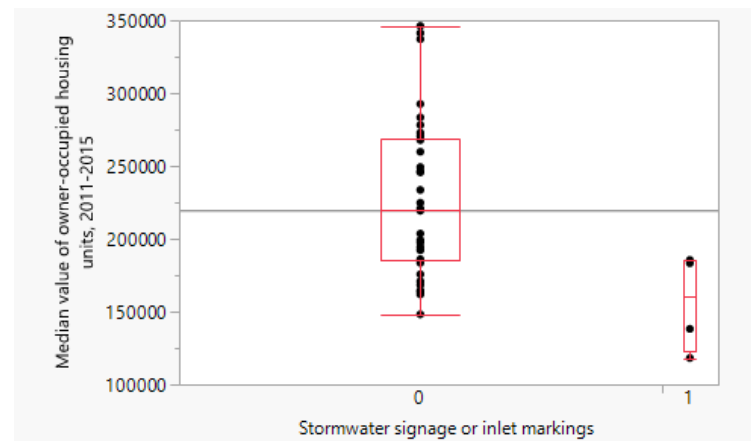
Municipalities that did not prepare their own SWMP are 12x more likely to not adopt any other ordinances deemed necessary to implement a program under the general permit.

Nominal Logistic Regression:  
Prob>ChiSq = 0.0037  
Odds ratio: 12.1



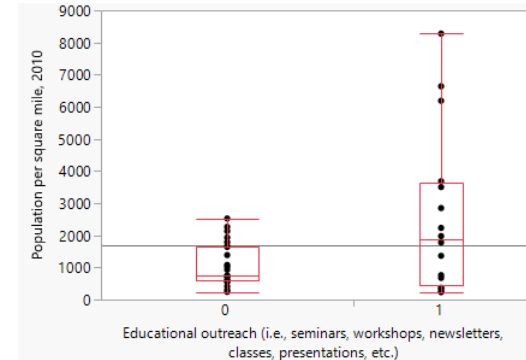
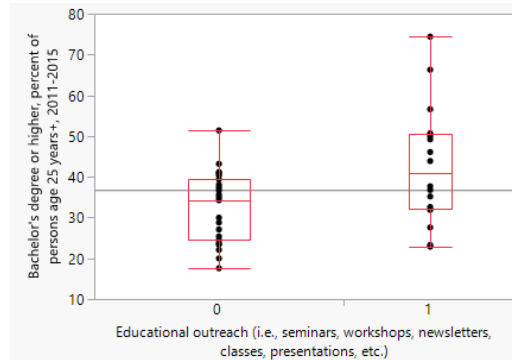
# Public Education and Outreach

- Stormwater signage or inlet markings in municipalities with lower median value of owner-occupied homes
  - (prob > |t| = 0.014)



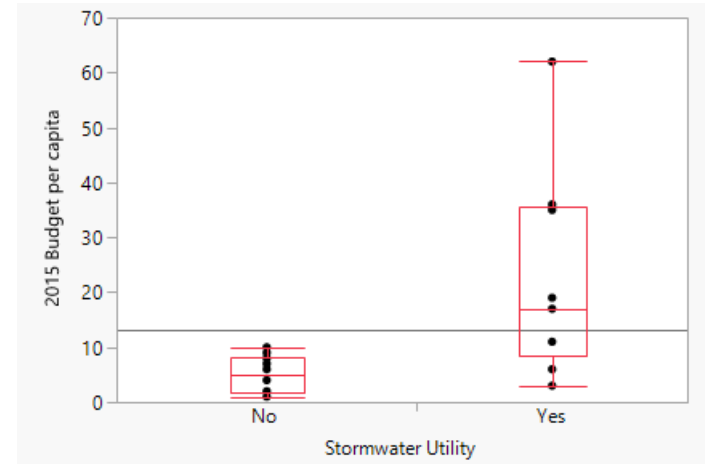
# Public Involvement and Participation

- Seminars, workshops, classes, presentations, etc.
  - Bachelor deg. or higher (prob > |t| = 0.021)
  - Pop. / sq mi (prob > |t| = 0.033)



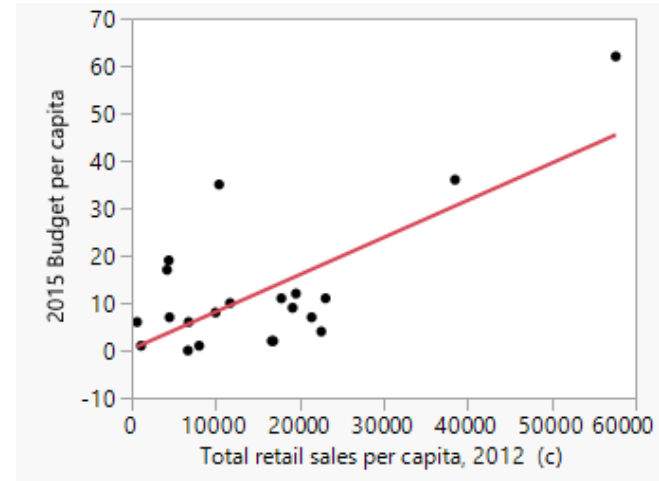
# Stormwater Budget per Capita

- Municipalities with a stormwater fee have a higher per capita budget (prob > |t| = 0.026)
- Sources of funding: General fund (26), stormwater utility (17), other (8)



# Stormwater Budget per Capita

- Budget per capita correlated with total retail sales per capita
- May suggest stormwater spending is linked to sales tax



# Preliminary Conclusions

- There may be a significant degree of variability in how MS4s address the minimum control measures as outlined in NR 216, Wis. Adm. Code
- Socioeconomic variables may be able to explain some stormwater management program strategies
- Greater oversight may require some MS4s to devote more resources to permit requirements

# Future Work

- Finish compiling database for SE Wisconsin
- Evaluate complete dataset (85 reports)
- Identify opportunities for BMP improvements
- Administer survey and interview municipal stormwater managers

Contact:

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UNIVERSITY

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**BE THE DIFFERENCE.**