

# Good Results from Green Stormwater Infrastructure



# PennFuture . . .



- Is a statewide public interest membership group.
- Advocates for policies and legislation that protects our public health, our environment, and the economy.
- Has offices in Philadelphia, Harrisburg, Pittsburgh and Wilkes-Barre and serves as the Pennsylvania affiliate for the National Wildlife Federation.
- Focuses on water, air, land conservation, and energy.
- [www.pennfuture.org](http://www.pennfuture.org)

# Discussion Overview

- The stormwater challenge
- Changes expected in PA MS4 permit
- Opportunities for the public to participate in stormwater planning
- Example approach to stormwater planning

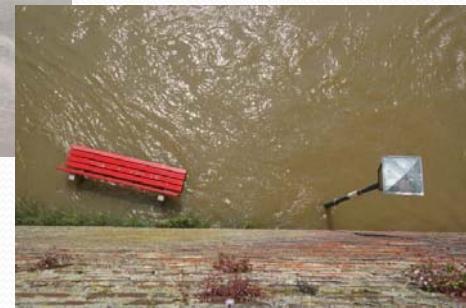


# Acronyms

- CWA = Clean Water Act (federal statute)
- NPDES = National Pollutant Discharge Elimination System
- MS<sub>4</sub> = Municipal Separate Storm Sewer System
- PAG-13 = PA general permit for MS<sub>4</sub>s
- SWMP = Stormwater Management Plan
- MCM = Minimum Control Measure (part of PA MS<sub>4</sub> permit requirements)
- BMP = Best management practices
- IDD&E = Illicit Discharge Detection & Elimination
- PCSM = Post-construction Stormwater Management
- TMDL = Total Maximum Daily Load
- WLA = Wasteload Allocation (part of TMDL)
- PRP = Pollutant Reduction Plan



# Why Manage Stormwater?



# Flooding, but also...



# History

- 1972- Clean Water Act
- 1990- “Phase I” MS4 municipalities (medium and large, as defined by federal regulations) required to get NPDES permits
- 1999- “Phase II” MS4 municipalities (small municipalities in urbanized areas and other municipalities designated by the permitting authority) required to get NPDES permits
- 2003 - First PAG-13 for small MS4s in PA
- 2013 - Second PAG-13
- 2018 – Anticipated third PAG-13 (Application required in Fall 2017)



# Today

- 2 out of 5 waterways nationally are still impaired by pollution
- Polluted runoff is the fastest growing source of pollution to the Chesapeake Bay
- An estimated 10 TRILLION gallons of stormwater flows untreated into local waterways





# The Challenge of Reducing Stormwater Pollution



- How do we undo what we've already done?
- Where does the money come from?
- Public awareness: "It's just rain..."
- Over 2,500 municipalities in PA



# MS4 Permit Application

- “Phase I” and “Phase II” municipalities are required to obtain NPDES permits for their stormwater discharges.
  - Individual permit
  - Coverage under general permit (PAG-13)
- Required to comply with 6 Minimum Control Measures (“MCMs”)
- Some MS4s required to develop additional measures to address water quality impairments (TMDL Plans, Pollutant Reduction Plans, DEP Appendices).



## 6 Minimum Control Measures

1. Public Education and Outreach on Stormwater Impacts
2. Public Involvement/Participation
3. Illicit Discharge Detection and Elimination (“IDD&E”)
4. Construction Site Stormwater Runoff Control
5. Post-construction Stormwater Management (“PCSM”) in New and Re-development Activities
6. Pollution Prevention/ Good Housekeeping for Municipal Operations

# Dischargers to Impaired Waters

- TMDL Plan
- Chesapeake Bay Pollutant Reduction Plan
- Pollutant Reduction Plan for dischargers to impaired waters that do not yet have a TMDL





# Total Maximum Daily Load

- Maximum amount of pollution that can be released into a water body while allowing the water body to attain water quality standards.
- TMDLs may contain wasteload allocations (“WLAs”) that limit the amount of pollution individual MS4s may discharge.
- Municipalities that have been assigned a WLA for nutrients or sediment in a TMDL document are required to submit a “TMDL Plan.”

# What is a TMDL Plan?

The TMDL Plan explains how the municipality plans to reduce stormwater pollution consistent with wasteload allocation requirements



# Pollutant Reduction Plans

- Plan to reduce pollutant discharge by set percentage to address water quality impairments



# Changes to PA's MS4 Permit

2013 Permit (Current)	2018 Permit (As Proposed)
Small MS4 may submit TMDL Plan as part of PAG-13 Notice of Intent	Small MS4 required to submit TMDL Plan (for nutrients/sediment) must obtain individual permit
TMDL Plan may be submitted in two steps	TMDL Plan must be submitted in one step with the individual permit application
Limited public participation	Enhanced public participation: Local-level notice and comment for all TMDL Plans and Chesapeake Bay PRPs
Small MS4s with WLA for any pollutant must submit TMDL Plan	TMDL Plan required only for nutrient/sediment WLA; standard appendices may be used for other pollutants (AMD, pathogens, PCB, etc.)
No additional obligation for dischargers to impaired waters	Dischargers to impaired waters must submit Pollutant Reduction Plan



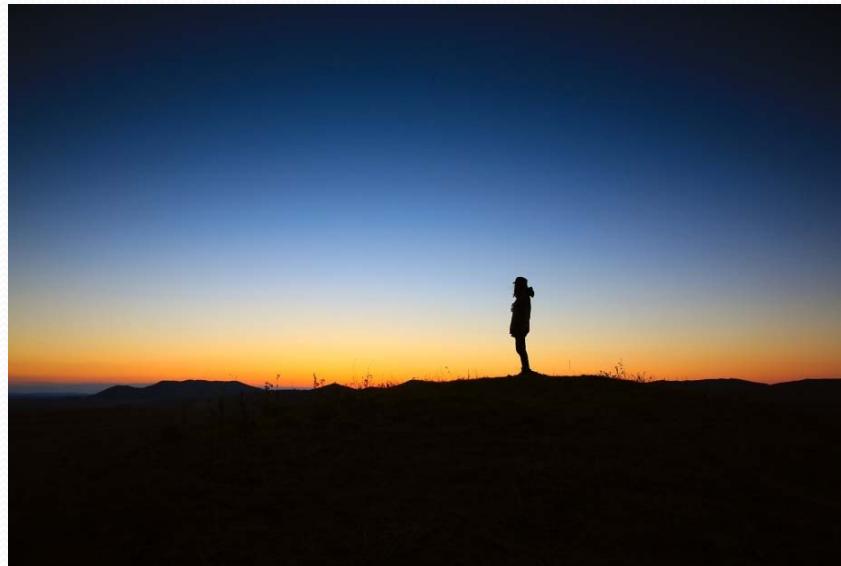
# MS4 Requirements Table

- DEP recently published a table that lists the MS4 requirements for each MS4 municipality.

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
<b>Montgomery County</b>						
NEW HANOVER TWP	PAG130020	No		Schuylkill River	Appendix C-PCB (4a)	
				Swamp Creek	Appendix E-Siltation (5)	Cause Unknown (5)
NORRISTOWN BORO	PAG130159	No		Stony Creek	Appendix E-Siltation (5)	Turbidity (5)
				Sawmill Run	Appendix E-Siltation (5)	Turbidity (5)
				Schuylkill River PCB TMDL	Appendix C-PCB (4a)	
NORTH WALES BORO	PAG130005	Yes	TMDL Plan	Wissahickon TMDL	TMDL Plan-Siltation (4a)	Cause Unknown (4a)
				Wissahickon Creek	Appendix E-Nutrients (4a), Appendix B-Pathogens (5)	
PENNSBURG BORO	PAG130063	No		Green Lane Reservoir	Appendix E-Organic Enrichment/Low D.O. (5)	
PERKIOMEN TWP	PAG130069	No		Perkiomen Creek	Appendix B-Pathogens (5)	
				Schoolhouse Run	Appendix E-Siltation (5)	
PLYMOUTH TWP	PAG130008	No		Diamond Run	Appendix E-Siltation (5)	
				Plymouth Creek	Appendix E-Siltation (5)	
				Sawmill Run	Appendix E-Siltation (5)	Turbidity (5)
				Schuylkill River PCB TMDL	Appendix C-PCB (4a)	
POTTSTOWN BORO	PAG130033	No		Schuylkill River PCB TMDL	Appendix C-PCB (4a)	

# Changes to Current Permit Cycle

- Public participation in revisions to TMDL Plan components



# Public Participation Opportunities

- Revised Municipal TMDL Strategies/Design Details

	<b>TMDL Strategies</b>	<b>TMDL Design Details</b>
DEP Comment Letter to Municipality	March 1, 2015	June 1, 2015
Latest Date for Municipal Submission to DEP	December 31, 2015 (Some extended to as late as May 31, 2016)	March 31, 2016

PLEASE NOTE: Municipalities are required to hold a 30-day, municipal-level notice and comment period for these plans. Individual municipalities may choose to begin/end their own public participation process at varying times.

# What to Look for: TMDL Strategies

## MUNICIPALITIES W/ TMDL STRATEGIES THAT HAVE NOT BEEN APPROVED

A TMDL Strategy should:

- Accurately report WLAs and required load reductions (Compare to TMDL documents)
- Follow one of the approved methods for “parsing” wasteload allocations (if parsing is done)
  - Must include a map
- Include a reasonable timeline for meeting wasteload allocation requirements (400 years is NOT reasonable.)



# What to Look for: TMDL Strategies (Cont.)

- A TMDL Strategy should: (cont.)
  - Propose the use of specific control measures and BMPs to reduce pollution from stormwater
    - Brief analysis justifying choice of control measures and BMPs
      - Expected load reductions from each of the BMPs
      - Explain source of pollution and why selected measures are appropriate to address it
      - Consider local factors that may impact effectiveness



# What to Look for: TMDL Strategies (Cont.)



- A TMDL Strategy should: (cont.)
  - Show that proposed controls are sufficient to attain TMDL reduction requirements
  - Provide reasonable suggestions for stormwater BMPs considering municipal budget and physical constraints
  - Be signed and sealed by a Professional Engineer
- Has the municipality addressed all of DEP's comments?
- Can you suggest better ways of managing stormwater?
- Are there any opportunities the municipality overlooked?

# What to Look for: TMDL Design Details

## MUNICIPALITIES W/ APPROVED TMDL STRATEGIES–WINTER 2016

- TMDL Design Details should:
  - List all BMPs installed since the date of the TMDL report
  - Include an analysis of sources of TMDL pollutants
  - Include specifics about each of the BMPs to be installed
    - Location information
    - Timeline for installation
    - Estimated load reduction



# What to Look for: TMDL Design Details (cont.)



- TMDL Design Details should (cont.):
  - Describe how the municipality will satisfy WLA obligation (may be completed over multiple permit cycles)
  - Contain a record-keeping plan for load reductions
  - Explain how proper operation and maintenance of the BMPs will be ensured
  - Be signed and sealed by a Professional Engineer
- Has the municipality addressed all of DEP's comments?



# Watershed-wide Solutions for Watershed-wide Problems

- Potential collaboration among municipalities
- Possible stormwater “authority”



# Other Resources...

- For MS4 Detailed Information and Webinars:
  - <http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/default.aspx#.VtdieqMo7IU>
- Regional Watershed Studies and Maps:
  - [www.PhillyWatersheds.org](http://www.PhillyWatersheds.org)
- For Stormwater Educational Videos/Brochures
  - [www.stormwaterpa.org](http://www.stormwaterpa.org)
- Coalition for the Delaware River Watershed
  - <http://www.delriverwatershed.org/>



# Questions ?



Mike Helbing  
[helbing@pennfuture.org](mailto:helbing@pennfuture.org)

# Wilson Run Watershed Model Pollution Reduction Analysis



# Wilson Run Watershed Model

Project Context

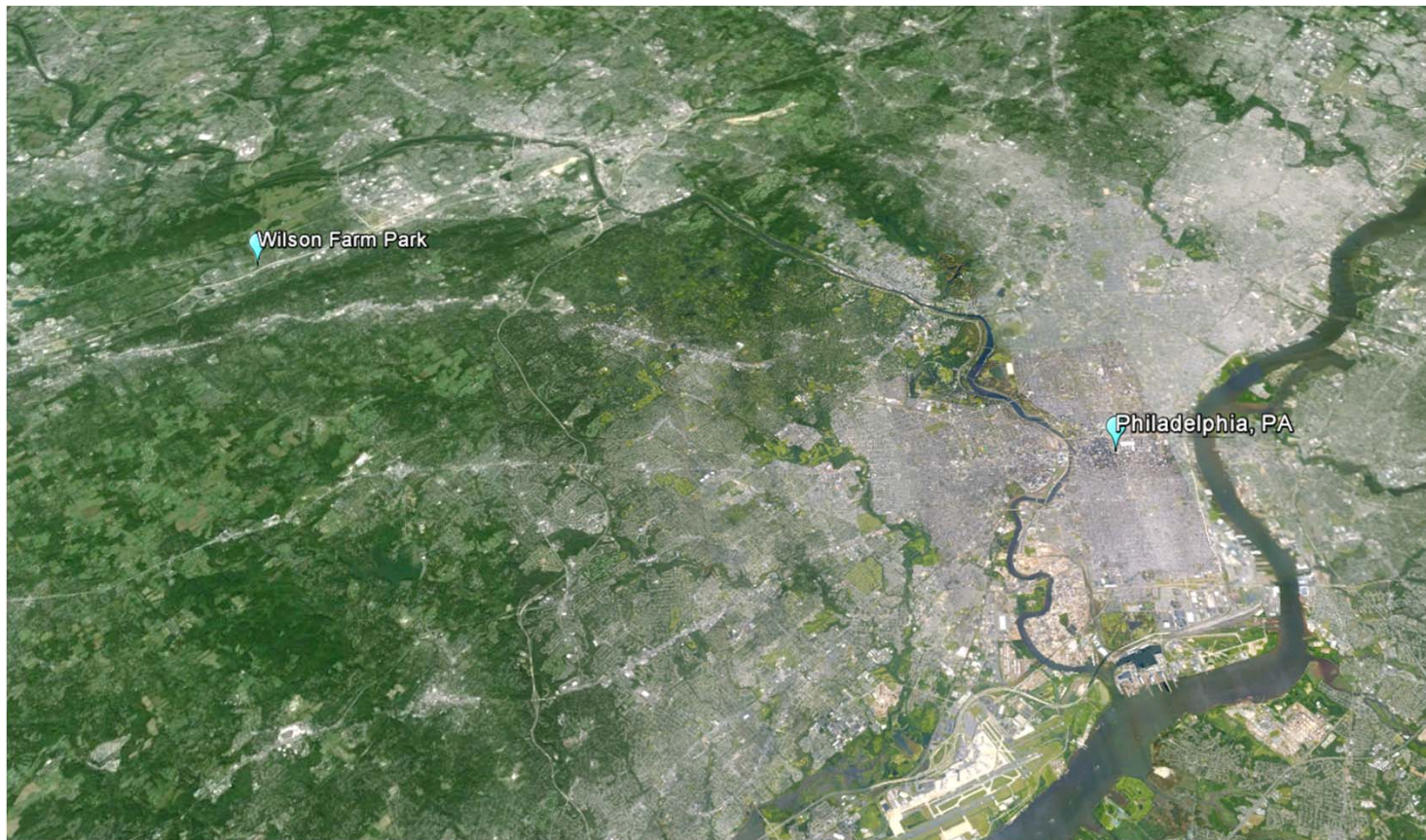
Regulatory Environment

PRP Analysis & Plan Development

WinSLAMM Overview & Wilson Run Model

Results & Recommendations

# Wilson Run Watershed



# Wilson Run Watershed



## Wilson Run Watershed

- 580 acres within Tredyffrin Township
- Tributary to Valley Creek and the Schuylkill River
- Valley Creek is an Exceptional Value (EV) and Migratory Fishery Stream
- TMDL for PCB (Polychlorinated biphenyl)
- Requires a TMDL for Pathogens & Siltation
- Project Goals
  - Quantify & identify projects/practices to address erosion within the Wilson Run stream channel
  - Improve groundwater recharge & support stream base flow





# Regulatory Environment



## Regulatory Environment: MS4 Requirements

- Tredyffrin Township's MS4 is covered under the PA DEP General NPDES Permit
  - The 2017 permit renewal will require documented reductions in sediment and nutrients in addition to TMDL compounds
    - The Draft Permit requires a Pollutant Reduction Plan (PRP) that provides a 10% reduction in sediment within 5 years.
- Pollution Reduction Plan (PRP) Development
  - MapShed is used by PA DEP
    - TR-55 generally underestimates volume from small storms
  - WinSLAMM is also acceptable
    - More accurate for small storms
  - Chesapeake Bay Watershed Model parameters must be used in PRP development



# WinSLAMM Overview & Wilson Run Model

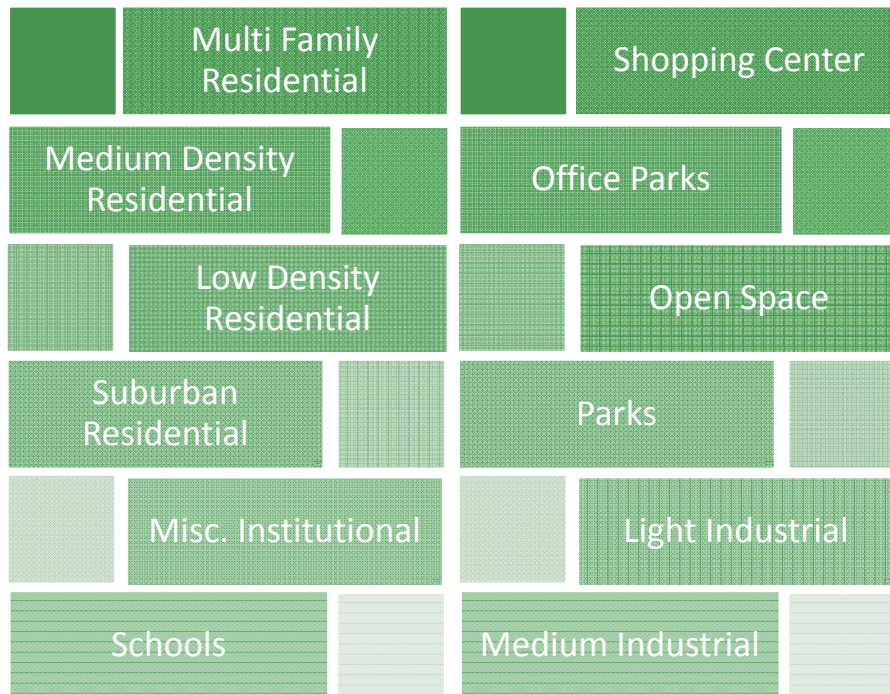


## WinSLAMM Overview

- Developed by Robert Pitt, Ph.D. using low impact stormwater management research projects across the country
  - Validated BMP efficiencies, sediment generation & delivery
- Uses Small Storm Hydrology approach
- Continuous simulation model that models discrete storms
- Easily calibrated with measured data

Evaluates every rainfall event for a given time period (e.g. 50 years).

# WinSLAMM Model Land Uses



- Watershed geography and parcel land use from GIS data
- WinSLAMM models for north and south sub-watersheds (SR 202)
- Applied WinSLAMM Standard Land Uses
- 47 year model simulation
- Data outputs
  - Runoff Volume
  - Sediment Load (lb)
  - Sediment Load (mg/l)

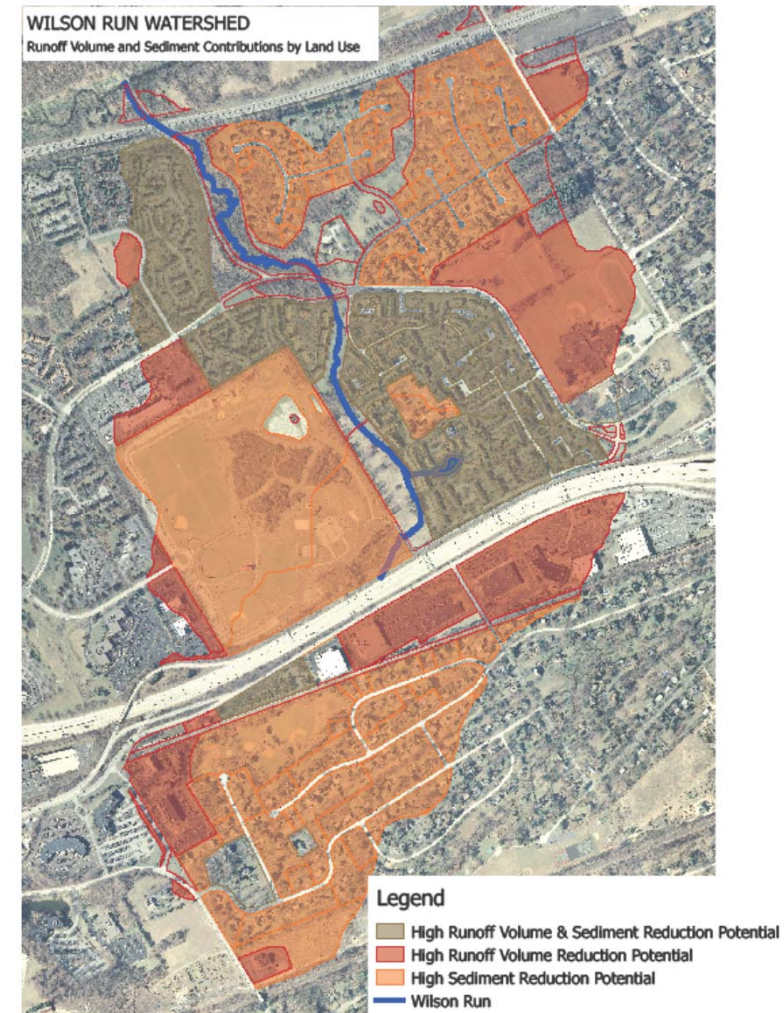


# Results & Recommendations

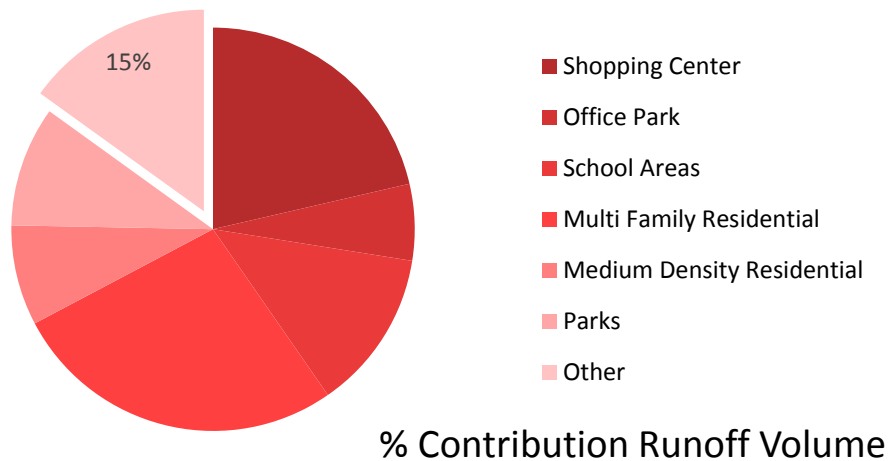


## Results

- Identified High Priority Land Uses for Runoff Management, Sediment Reduction, or Both
  - Next step to identify individual parcels
- Metrics to identify the most impactful retrofit targets
- Secondary analysis to highlight priority sub-areas within each land use



Land Use	% Gross Area	% Contribution Runoff Volume	% Contribution Runoff/ % Gross Area
Shopping Center	7.95%	21.3%	2.7
Office Park	2.88%	6.1%	2.1
Schools Areas	7.69%	12.8%	1.7
Multi Family Residential	19.17%	26.8%	1.4
Medium Density Res.	12.03%	8.0%	0.7
Parks	21.03%	9.6%	0.5

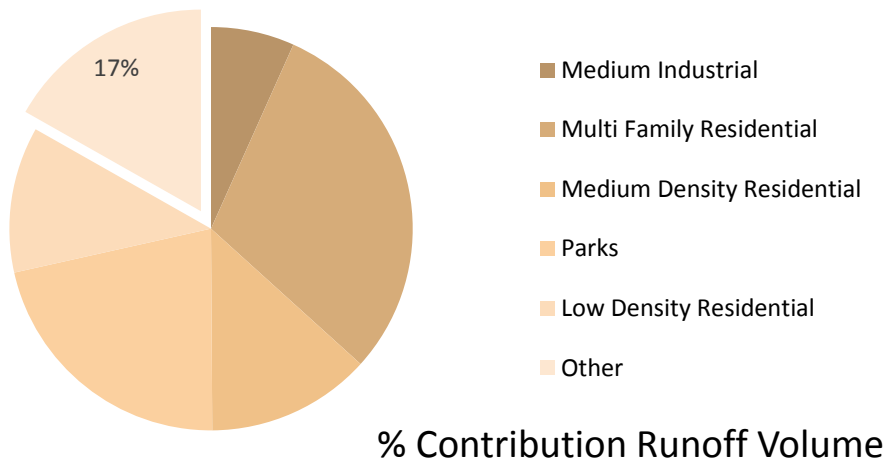


## Data Overview: Runoff Contribution

- Use Ratio of % Runoff Contribution to % Gross Area as a metric
- Greatest contribution from land uses with large impervious areas and compacted lawns



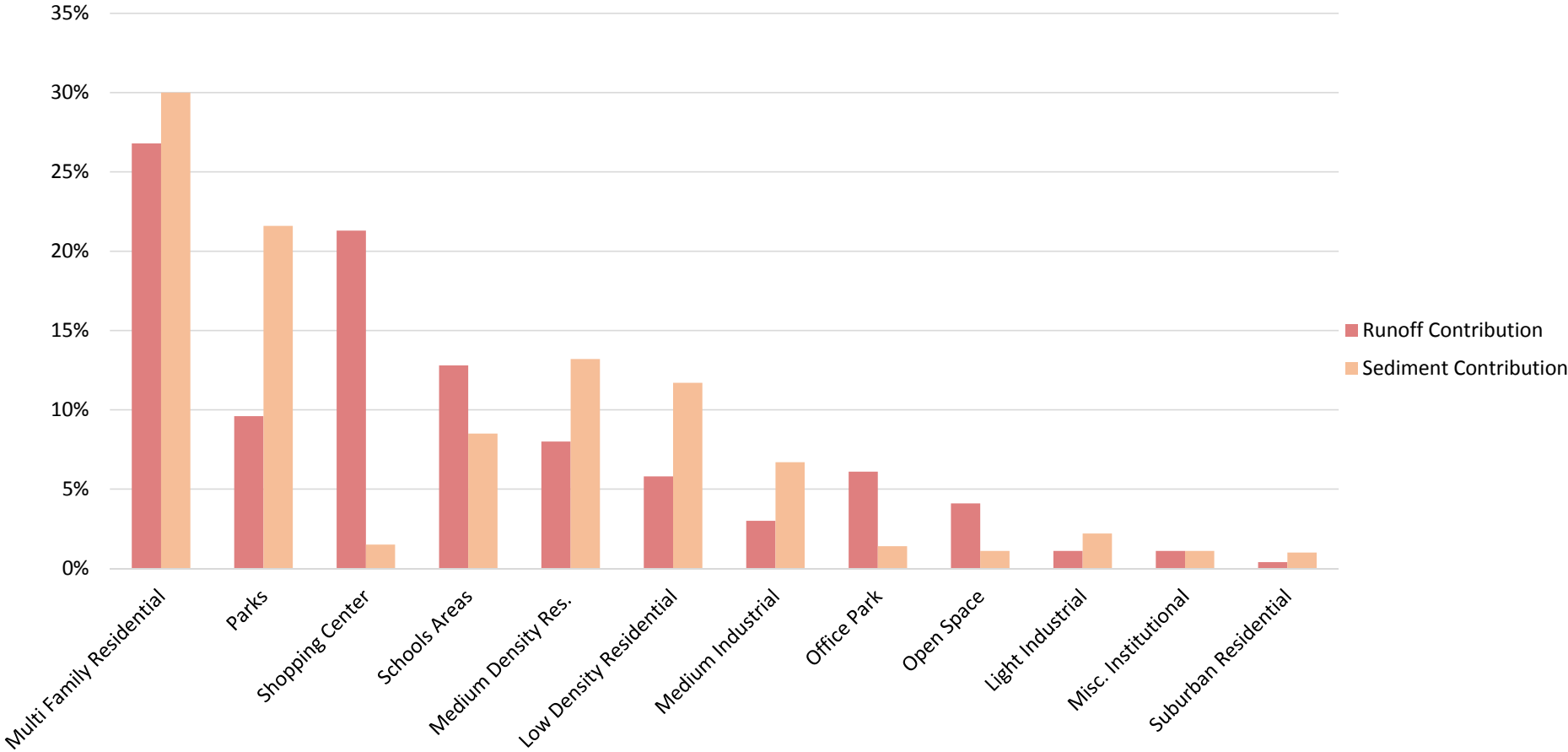
Land Use	% Gross Area	% Contribution Sediment Volume	% Contribution Sediment/ % Gross Area
Medium Industrial	1.60%	6.7%	4.2
Multi Family Residential	19.17%	30.0%	1.6
Medium Density Res.	12.03%	13.2%	1.1
Parks	21.03%	21.6%	1.0
Low Density Residential	12.72%	11.7%	0.9



## Data Overview: Sediment Contribution

- Use Ratio of % Sediment Contribution to % Gross Area as a metric
- Greatest contribution from land uses with unmaintained impervious areas and large landscapes

# Data Overview



# Data Detail: Runoff Contribution

## Public & Institutional Land Uses

Runoff Volume Contribution - Typical Impervious Areas		
Sub-Area	Schools Areas	Parks
Paved Parking/ Storage	3%	3%
Roofs	4%	0%
<b>Grand Total</b>	<b>6%</b>	<b>3%</b>

Runoff Volume Contribution - Typical Pervious Areas		
Sub-Area	Parks	Schools
Large Landscaped Area	5%	1%
<b>Grand Total</b>	<b>5%</b>	<b>1%</b>

## Commercial & Industrial Land Uses

Runoff Volume Contribution - Typical Impervious Areas				
Sub-Area	Office Park	Shopping Center	Medium Industrial	Multi Family Residential
Paved Parking/ Storage	4%	15%	2%	7%
Roofs	1%	6%	1%	13%
<b>Grand Total</b>	<b>5%</b>	<b>20%</b>	<b>3%</b>	<b>20%</b>

Runoff Volume Contribution - Typical Pervious Areas	
Sub-Area	Multi Family Residential
Small Landscaped Area	2%
<b>Grand Total</b>	<b>2%</b>

# Data Detail: Sediment Contribution

## Public & Institutional Land Uses

Sediment Contribution - Typical Impervious Areas		
Sub-Area	Schools Areas	Parks
Paved Parking/ Storage	3%	4%
Roofs	5%	0%
<b>Grand Total</b>	<b>8%</b>	<b>4%</b>

Sediment Contribution - Typical Pervious Areas	
Sub-Area	Parks
Large Landscaped Area	14%
<b>Grand Total</b>	<b>14%</b>

## Commercial & Industrial Land Uses

Sediment Contribution - Typical Impervious Areas		
Row Labels	Medium Industrial	Multi Family Residential
Driveways	0%	2%
Paved Parking/ Storage	6%	11%
Roofs	0%	6%
<b>Grand Total</b>	<b>7%</b>	<b>20%</b>

Sediment Contribution - Typical Pervious Areas	
Sub-Area	Multi Family Residential
Small Landscaped Area	7%
<b>Grand Total</b>	<b>7%</b>

# Questions?

