


Ecosystem Services of SCMs Over Time

A Look at Stormwater Treatment in Wake County Over the Past 18 Years

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SCMs Over Time



SCMs in Human Environment



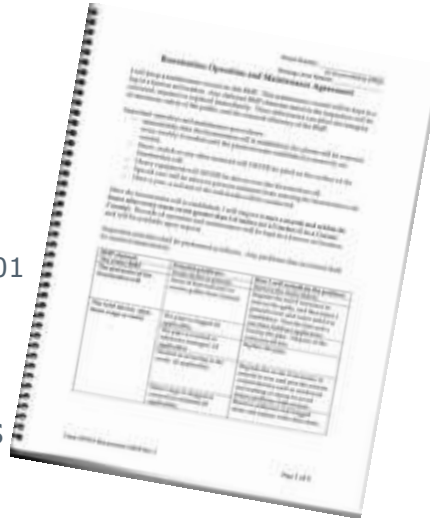
SCMs Built 1998 -2010



Basic Function vs. Additional Services



- Basic Function
 - Annual inspection
 - City of Raleigh
 - Town of Cary
 - Wake County
 - NCDENR Form SW401
- Enhanced Amenity
 - Ecosystem services



Ecosystem Services



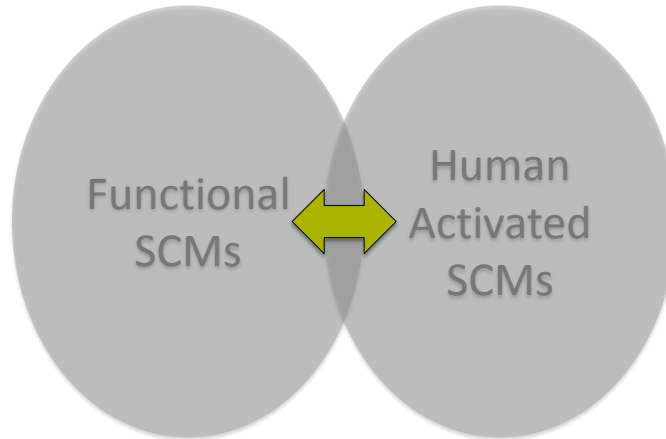
- “The goods or services that human populations derive, directly or indirectly, from ecosystem function”

-Costanza *et al.* 1997

Types of Services			
Provisioning	Regulating	Cultural	Supporting
Food	Air Quality	Cultural Diversity	Soil Formation
Fiber	Climate	Education	Primary Production
Medicinal	Water	Aesthetic	Nutrient Cycling
Fresh Water	Waste Assimilation	Recreation/ Tourism	Biodiversity

Recreated with permission from Dr. Cizek's NCSU BAE 575 lecture on Ecosystem Services

Relationship between Function and Form



Context of Design Era



1997

"The most efficient and cost effective means of managing both the quantity and quality of stormwater runoff is through the use of regional Stormwater Management Plans (SWMPs)."

Potter
manual

"The approach promoted in this manual is to preserve sensitive natural features and to develop stormwater systems that are based on BMPs that mimic, as closely as possible, the runoff characteristics of the site in its natural undeveloped state."
pg 1-4, NCDENR Stormwater Design Manual 7-1-2005

"In North Carolina, ...vegetated buffers and low density development is the preferred method of reducing pollution from developing urban areas. In cases where the preferred methods are not feasible or sufficient, ...engineered stormwater controls are viable solutions to reducing pollution." *pg 1-1, NCDENR Stormwater Design Manual 7-1-2005*

2005

- Hurricane Katrina strikes the Gulf Coast
- Updated draft NCDENR BMP manual released for public comment

Metric



Component	1	2	3
Maintenance			
Incorporated in Human Environment			
Sedimentation			
Biodiversity			
Hidden			
Trash Accumulation			
Changing BMP guidelines			
Mimic Natural Systems			

Marsh Creek Skate Park, 2009



- Landscape materials and labor were donated by community
- BMPs partially funded by CoR Stormwater Utility Department and used as test site for plants and maintenance techniques.

Marsh Creek Skate Park, 2009



Marsh Creek Skate Park, 2009



Greek Village – Small , 2010



Greek Village – Large, 2010



Greek Village, 2010



Summary



Component	1	2	3
Maintenance	X		
Incorporated in Human Environment	X		
Sedimentation	X		
Biodiversity			
Hidden			
Trash Accumulation			
Changing BMP guidelines			
Mimic Natural Systems			

Holly Hill, 2008



Apple Call Center – small, 2010



Apple Call Center – small, 2010



Apple Call Center – small, 2010



Apple Call Center – Large, 2010



Apple Call Center – Large, 2010



Summary



Component	1	2	3
Maintenance	X		
Incorporated in Human Environment	X		
Sedimentation	X		
Biodiversity		X	
Hidden		X	
Trash Accumulation		X	
Changing BMP guidelines			
Mimic Natural Systems			

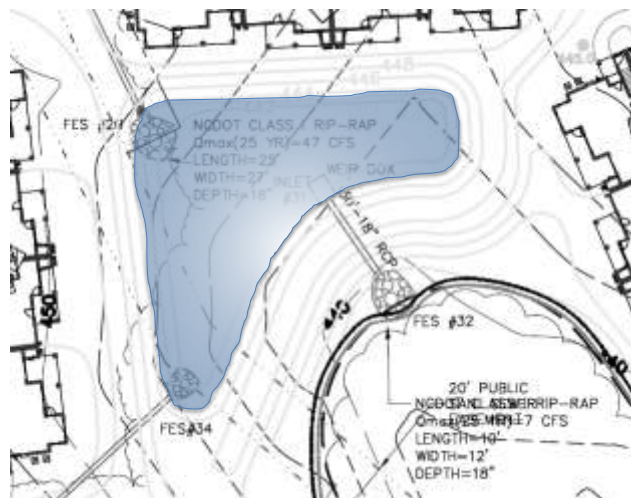
Waltonwood, 2010



Waltonwood, 2010



Strickland Apartments, 1999



Strickland Apartments, 1999



Strickland Apartments, 1999



Strickland Apartments, 1999



Summary



Component	1	2	3
Maintenance	X		
Incorporated in Human Environment	X		
Sedimentation	X		
Biodiversity		X	
Hidden		X	
Trash Accumulation		X	
Changing BMP guidelines			X
Mimic Natural Systems			X

NCDENR Scorecard Findings



Low is good

<i>Bioretention</i>										
Project	trash/ debris	Peri- meter	inlet device	Pre- treatment	Vegeta- tion	soils and mulch	Under drain	drop inlet	outlet	TOTAL
Marsh Creek Skate Park		X			X	X				3
Greek Village Large	X		X			X				3
Greek Village Small			X	X						2
Holly Hill					X	X				2
Waltonwood		X	X							2
Apple Call Center Large				X		X				2
Apple Call Center Small	X					X				2
<i>Wet pond</i>										
Project	trash/ debris	Peri- meter	inlet device	forebay	main pond	soil accumm.	embank ment	drop inlet	outlet	TOTAL
Greek Village	X	X		XX	X					5
Waltonwood										0
Strickland Apt Large	X		N/A	X			X	X	X	6
Strickland Apt Small	X			X	X			X		4

Ecosystem Services Findings



High is good

	Ecosystem Service			
	Education signage	Aesthetic subjective	Recreation/ Tourism # of people	TOTAL
<i>Bioretention</i>				
Marsh Creek Skate Park	0	7	9	16
Greek Village Large	0	3	0	3
Greek Village Small	1	8	1	10
Holly Hill	0	4	0	4
Waltonwood	0	6	0	6
Apple Call Center Large	0	4	0	4
Apple Call Center Small	0	9	2	11
<i>Wet pond</i>				
Greek Village	0	3	2	6
Waltonwood	0	6	1	7
Strickland Apt Large	0	0	0	0
Strickland Apt Small	0	3	1	4

Overall Lessons Learned



- Maintenance is key
- BMP design has changed over time
- Impact of human element is mixed
- Biodiversity helps with aesthetics and function



References



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- Moore, T.L. (2011). *Assessment of Ecosystem Services Provided by Stormwater Control Measures*. Dissertation, NCSU. Raleigh, NC
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