

# Mowing to Meadows; Lessons Learned

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Pennsylvania Environmental Council

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PA Department of Conservation and Natural Resources

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Schuylkill Watershed Congress





***The Pennsylvania Environmental Council (PEC)*** **protects** and **restores** the natural and built environments through innovation, collaboration, education and advocacy. PEC believes in the value of **partnerships** with the private sector, government, communities and individuals to improve the quality of life for all Pennsylvanians.

Trails and Greenways

Water Resources

Energy & Climate

## **Introduction**

- Benefits of Meadow Creation
- Meadow Case Studies

## **Lessons Learned**

- Education and Outreach
- Design
- Installation
- Maintenance
- Unintended positive consequences

DO NOT MOW

# Case Study Partners

- Terry Hough (DCNR grant)
- Drew Gilchrist (NLT, now DCNR)
- Gary Gimbert (NLT)
- Derek Dureka (Upper Dublin Township Parks)
- Doug Knauss (Whitemarsh Township Parks)
- David Kline (Montgomery School teacher)

# Financial Support Provided By:

- PA Department of Conservation and Natural Resources
- Martin Foundation
- Philadelphia Water Department
- William Penn Foundation

**MEADOWS IMPLIMENTATION TEAM**

<b>ORGANIZATION</b>	<b>CONTACT PERSON</b>
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**MEADOW DESIGN**

Natural Lands Trust	Drew Gilchrist
Natural Lands Trust	Andrea Stevens
Viridian Design	Tavis Dockwiler
Larry Weaner Landscape Associates	Larry Weaner
Native Return	Christina Kobland,
Philadelphia Parks and Recreation	Sarah Low
URS Corporation	Tony Federici

**INSTALLATION**

Weeds Inc.	Brian O'Neill
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**MAINTENANCE**

Charles Friel Inc.	Charles Friel
Green Weaver Landscapes	Greg Nicols
Green Weaver Landscapes	Lee Armillei

**LAND MANAGERS AND FACILITIES DECISION MAKERS**

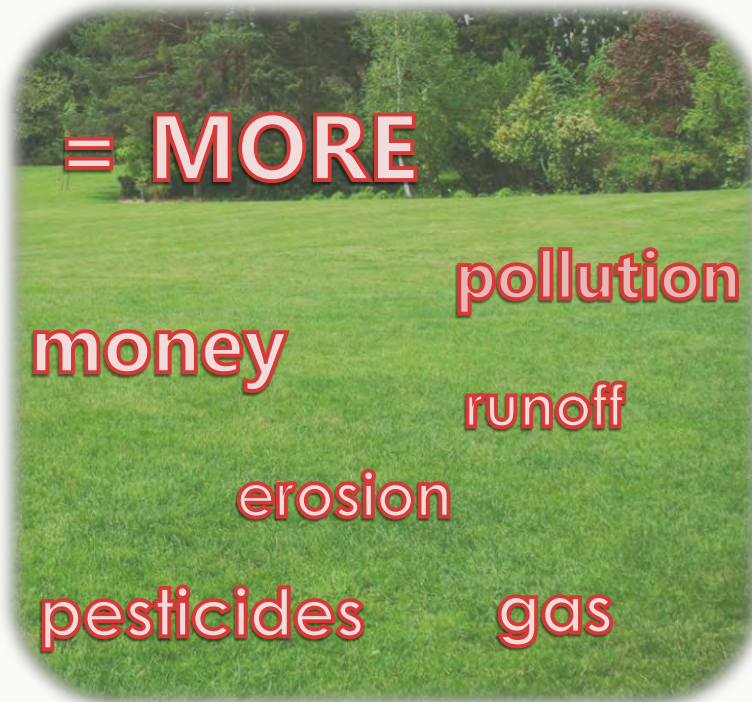
Woodland Cemetery	Sue Pringle
National Park Service at Valley Forge	Kris Heister
PECO	Alex Brown
East Goshen Township	Mark Miller
Upper Dublin Township	Derek dureka
Upper Dublin Township	Andy Fowler
Whitemarsh Township	Doug Knauss
Bartram's Garden	Kimberly Massare
Philadelphia Parks and Recreation	Curtis Helm
Haverford College	Claudia Kent
Rhodale	Susan Fordyce
EAC for Lower Makefield Township	Jim Bray

**OTHER**

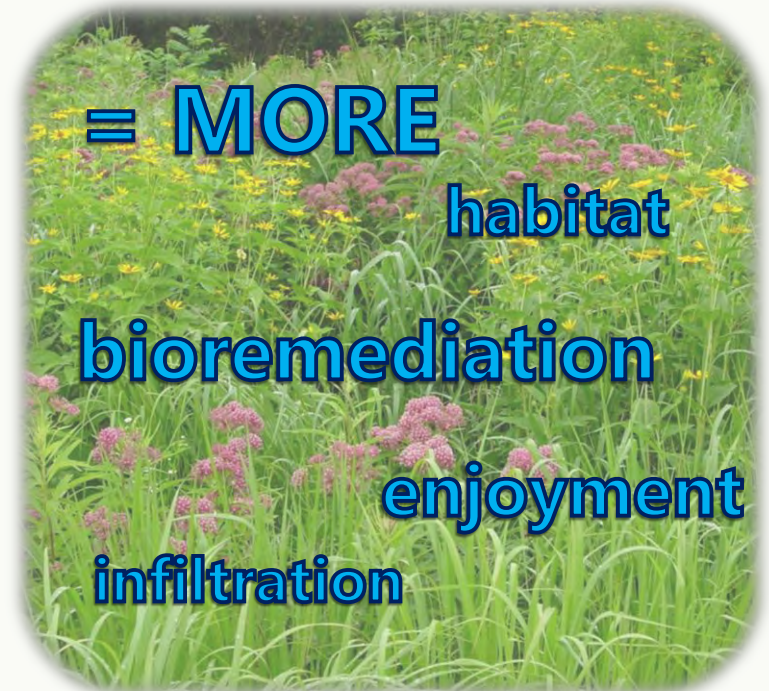
PEC's SW office	Scott VanderMark
PEC's SE Office	Megan Gonzales
Villanova University	Rob Traver

Convert lawns to landscapes of less mowing and more diversity to improve water quality.

## LAWNS



## MEADOWS



# Three Types

## Let it grow

Reduce Mowing



Observe



Remove weeds



## Grow and Plant

Reduce Mowing



Plant seed, plugs, or containerized plants



Remove weeds



## Kill and Plant

Kill existing vegetation, herbicide, smother, or till



Plant seed, plugs, or containerized plants



Remove weeds





# Mondauk Commons

## Kill and Plant





# Aiden Lair Basin

## Grow and Plant



# Montgomery School

## Kill and Plant



# Koontz Park

## Kill and Plant



# Lessons Learned

- Education and Outreach
- Design
- Installation
- Maintenance
- Unintended positive consequences

DO NOT MOW

# Education and Outreach

- Project location
- Aesthetics in SE PA
- Cues to care
- Proactive outreach
- Municipal buy in
- Meadow Implementation Team

DO NOT MOW

# Project Location



- View-shed site control
- Get it right first, then scale up
- Grow and expand meadow expertise



# Aesthetics in SE PA

- Neat/tidy means care
- Concerns about wildness:
  - Looks messy
  - The coyote ate my cat



# Turf Grass and Machine Culture



# Cues to Care

Joan Iverson Nassauer, U. of Michigan

- Mowed edge and fences
- Flowering plants and trees
- Wildlife feeders and houses
- Bold patterns
- Trimmed Shrubs



# Degrees of Wildness

Changes in appearance

*Manicured* → *Wild*

What appeals to landowner



# Beautiful Trails



Invite people into the meadows



# More Proactive Outreach

- Letters to neighbors...+...
- Social media
- Newspaper article
- Look Book
- Educational events



*STAY CONNECTED*



# Municipal Buy In



# Meadow Implementation Team

## ...Lessons Learned...

- Communicate the benefits!
- Train the communicators (people fielding complaints)
- People's aesthetics differ
- Wildflowers desired, but increases \$



# Shift perceptions

A landscape photograph showing a meadow with tall grasses on the left and a mowed lawn on the right, with trees in the background. The meadow is filled with tall, dry grasses, while the lawn is a well-maintained, green surface. The background is a dense line of trees.

- Increase number of meadows
- Advertise successful ones
- Goal: People recognize and appreciate meadows

# Design Considerations

- Ordinances
- Invasive species (%) in/around meadow
- Grow the grasses first
- Cover Crop/mix of species
- Impact of shade trees
- Soil tests: pH, fertility, compost tea

# Ordinances

- Consider set backs



- Check Township weed ordinance too



# Invasive Species

- Percent cover on site
- Nearby migration potential



# Grow the grasses first

- Establish grasses (1-3 years)
- Manage invasives
- Then add color



# Cover Crop/mix of species



# Impact of shade trees



# Soil tests – Know Your Soil

- pH (5-6 range desired)
- Fertility
- Compost tea





# Montgomery School

## Too much organic matter



Farmer  
was  
spreading  
manure



Boundary line determined and manure spreading stopped

# Installation

- Shock of herbicide kill
- Signage (meadow in progress)
- Involving volunteers
- Forensics - when things go wrong.
- Adding flowers



# Herbicide Shock

- **“The initial project was started by removing most of the vegetation on the lot. Many of the kids were horrified by the stark change and “accused” Mr. Kline of destroying nature.”**
  - David Kline, Teacher at Montgomery School

# Temporary signage



# Koontz Park Volunteers ☺

- Green house on site!
- Volunteer gardeners!
- Planting workforce!
- Maintenance crew!



# Koontz Park Forensics ☹️



- Plant die off
- pH was  $>8$ . added aluminum sulfate, lowered to 7
- Compacted soils a factor
- And droughty summer
- The culprits: longer lasting herbicides
  - AquaNeat, Bullseye Blue, Clean Slate, MSO 7.9.10
- No long-term toxicity, meadow recovered!

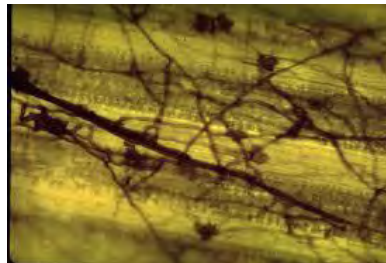
# Montgomery School Compost Tea



Photo by Lee Armillei, GreenWeaver Landscapes  
GreenWeaver spraying fungal dominant compost tea over the meadow

# Compost Tea

- Concentrations and ratios of bacteria, fungi, protozoa, and nematodes.
- Amend soil to create conditions more favorable for warm season grasses.
- 3 soil samples October 2012; recommended apply “compost tea” to boost levels of fungi, protozoa, and nematodes.
- Fungal-dominant compost tea (30 gallons tested and approved compost extract, diluted with water) applied April 25 2013
- Follow-up sampling indicate concentrations of protozoa and nematodes increased, and a more desirable (but not optimal) bacteria/fungi ratio was reported.
- Soil report noted that the microbial community is still selecting for the growth of earlier successional species rather than the most productive and desired warm season meadow grasses.
- Need more compost tea data/results.
- Costs (\$878/3 acres)





# Adding Color: The Flowers

- After grasses established
- Where to plant
  - High visibility areas
  - Existing gaps
  - Herbicide openings
- Plugs and/or seeds
  - \$1/plug + volunteers
  - Protection (e.g. from deer)



# Maintenance

- Staff buy in and training
- Invasive plants
- Timing of maintenance mowing
- Dealing with mother nature
- Education and outreach continues

DO NOT MOW

## Staff Buy In



- Less mowing and weed whipping
- Initial training for plant ID and invasive removal
- Continued training as techniques evolve

# Invasive Plants



## Monitor and control

- Pull
- Spot treat
- Mow
- Basal Bark
- Cut stump



# Prioritized Invasive Removal

- Thistle
- Phragmite
- Mile-a-Minute
- Loosestrife
- Stilt grass



# Create Specific O/M Plans

## Upper Dublin Township- Mondauk Commons & Aidenn Lair Park

### Meadow Management Annual Task Schedule

(see Meadow Management section in the Stewardship Handbook, pages 138- 145)

Quarter	Task
<p>1<sup>st</sup> Quarter (January – March)</p>	<p><b>Meadow Mowing</b></p> <ol style="list-style-type: none"> <li>1. Late winter /early spring when soil is dry or frozen</li> <li>2. Mow to a height of 8 – 12 inches</li> </ol> <p><b>Control invasive plants</b></p> <ol style="list-style-type: none"> <li>1. Apply basal bark herbicide treatment to woody plants (if needed)</li> <li>2. Treat any known patches of mile-a-minute and Japanese stiltgrass with pre-emergent herbicide in March (check PSU fact sheets for best timing)</li> </ol>
<p>2<sup>nd</sup> Quarter (April – June)</p>	<p><b>Meadow Monitoring</b></p> <ol style="list-style-type: none"> <li>1. Check meadows monthly for any potential problems</li> </ol> <p><b>Overseeding &amp; plug planting</b></p> <ol style="list-style-type: none"> <li>1. Overseed any bare areas by broadcasting seed into prepared soil bed (April – May)</li> <li>2. Prepare and plant desired herbaceous plugs (April – mid-May); plugs can be planted later if they can be watered</li> <li>3. See pages 185 – 190 in the Stewardship Handbook for list of native species suitable for various site conditions</li> </ol> <p><b>Control invasive plants</b></p> <ol style="list-style-type: none"> <li>1. Control Canada thistle with herbicide(preferred) or mowing before it goes to seed(late May – early June)</li> <li>2. Control mile-a-minute by hand pulling and bagging small patches before June or spot treat with post-emergent herbicide as soon as detected</li> <li>3. Japanese stiltgrass can be treated with a pre-emergent herbicide through May; check label for best timing, and treated with a post-emergent herbicide June through August</li> </ol>

**Operation/Maintenance Plan Agreement for Meadow at Koontz Park Stormwater Basin, Whitemarsh Township Parks & Recreation**

This Operation/Maintenance (O/M) Plan includes management tasks for a meadow installed in the stormwater basin at Koontz Park under a Pennsylvania Department of Conservation and Natural Resources (DCNR) Mowing to Meadow Grant (BRC-RCI-16-177) secured by the Pennsylvania Environmental Council.

The O/M Plan includes a plan narrative and an annual task schedule. The O/M Plan also includes back up references including the Natural Lands Trust *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (October 2008), a U.S. Department of Agriculture *Invasive Plants Field and Reference Guide* (May 2008), and Fact Sheets identified in the Plan that provide information on the control of invasive plant species.

The meadow project includes a warm season grass and wildflower meadow installed in the Koontz Park stormwater basin. The creation of this meadow is consistent with the practices recommended in DCNR's *Creating Sustainable Community Parks, A Guide to Improving Quality of Life by Protecting Natural Resources*, January 2007. The meadow installation included the eradication of existing turf grass and re-planting activities consistent with an agreed upon meadow creation design.

Project goals include capturing and filtering stormwater runoff, creating wildlife habitat, reducing erosion, lowering mowing costs, and creating more diverse natural features that are aesthetically pleasing to park users. The meadow was first installed in 2011 and is gradually establishing itself as it enters the third (2013) growing season.

The O/M Plan provides a blue print of monitoring and maintenance tasks that will support the full establishment and continuity of the meadow.

By signing this agreement Whitemarsh Township agrees to:

1. Perform monitoring and maintenance tasks consistent with the recommendations set forth in this O/M Plan.
2. Install meadow educational signage prepared by PEC and reviewed by the Township, at an appropriate location to inform visitors about the meadow project.
3. Maintain records for at least three (3) years that document meadow installation and management costs, and provide records to PEC that document DCNR grant match.



Richard L. Mellor Jr., Township Manager, Whitemarsh Township

2/19/13

Date

Get  
Commitments

# Meadow Implementation Team

## ...Lessons Learned...

- O/M staff need to talk/learn from peers.
- Need equipment budget (e.g. flail mower)
- Streamline planting plans, easier to ID good and bad plants.
- Start a Delaware Valley Community College or PA Nursery Landscaping Association training program.
- Grow landscaping jobs as green infrastructure expands



# Mowing Frequency and Timing

Species composition varies with mowing schedule

Mow no more than two times per year\*

\*Exceptions for spot treatment mowing



# General Rules

- Blackout dates  
April to June
- Mow  
Saint Patty's Day  
and/or  
Fourth of July



# Why not mow April 1 to June 30?



# Saint Patty's Day Mowing

## Positives

- Winter food and cover
- Greatest species diversity
- Higher vegetation acts as snow fence

## Negatives

- Difficult weather or ground conditions
- Less effect on controlling woody and invasive species



# Independence Day Mowing

## Positives

Encourages Warm Season  
Grasses (native)

Greater impact on invasive  
plants

Generally dry conditions for  
mowing

## Negatives

Less winter cover

Effects early wildflowers



# Dealing with mother nature



Summer of 2011....hot and dry June and July



## Post card; messaging on reverse side





# How to Create a Meadow In SE PA Brochure

## Resources

For professional advice, contact your county conservation district or state extension office:



<http://pacd.org/your-district/find-your-district/>

PENNSYLVANIA



<http://extension.psu.edu/counties>

Earth Conservation Seeds, Inc.  
8884 Mercer Pike, Meadville, PA 16335  
800-873-3321 [www.earthseed.com](http://www.earthseed.com)

Natural Lands Trust, Hilday Farm Preserve  
1031 Palmers Mill Road, Media, PA 19063  
610-353-5587 [www.natl.org](http://www.natl.org)

Useful reference/reading material:  
*Bringing Nature Home*, Douglas W. Tallamy  
*Urban & Suburban Meadows: Bringing Meadowscape to Big and Small Spaces*, Catherine Zimmerman

Published by:



pennsylvania environmental council

215-545-4570 [www.pccpa.org](http://www.pccpa.org)



Watershed Coalition of the Lehigh Valley  
[www.watershedcoalition.org](http://www.watershedcoalition.org)

Funding provided by PA DNR Bureau of Recreation and Conservation, Environmental Stewardship Fund.

April 2013

Cover photo: Ron Cogswell. Desk at the Meadow, Longwood Gardens, Kennett Square (PA).



Nicholas A. Tonelli

## Meadow Maintenance

The first several years after planting are critical to ensuring native grasses become well-established and that weeds do not take over. The initial seasons require carefully timed mowing to prevent the weeds from developing seed heads while allowing the grasses to flourish. Weeds grow more quickly than native grasses and wildflowers, so regular high (4-6") mowing will keep the weeds from flowering while allowing the grasses to grow and mature. Cut errant large weeds off at ground height - instead of pulling - to avoid disturbing young grass plants. The frequency of mowing will depend a great deal upon the amount of rainfall in the first growing season, but mowing may need to be done up to once a month. Do not mow late in the season, since it is important to allow the young grasses to grow before winter. Mow one final time in the early spring (during March or April) of the second year.

After the first year, avoid mowing during grassland bird nesting season, from early May to mid-July. Mowing at this time can trap adult and fledgling grassland birds, killing them. Instead, where at all possible, use a weed trimmer to target undesirable vegetation, or mow the field

from the inside out, allowing the birds the chance to escape. Application of broadleaf herbicide is also appropriate if weeds are shading out the grasses.

Mowing later than July is also undesirable because it does not give the grasses enough time to develop before winter. This makes the meadow unsuitable habitat during the winter. Only mow in the late summer if there is a late season weed that needs to be managed.



Female Bobolink

In the second year, assess which weeds and invasive plants are causing the greatest problems, and consult with experts or do some research on the best ways to address those problems. Do not mow after early spring unless there are significant weed problems (see inside chart for a list of noxious weeds). It may be necessary to use a pre-emergent herbicide after mowing in the early spring. It is essential to prevent weeds from going to seed. A high mowing (up to 10") is recommended when the weeds are in full bloom, usually in June. At this point, the grasses are unlikely to have grown that high.

Eastern Meadowlark  
Donna: Sherry



Male East

## Herbicides

Although many people are nervous about using herbicides, finding that they are not "natural," herbicides can be very effective tools in the establishment and maintenance of a healthy meadow. After all, the weeds that provide the greatest challenge to meadow establishment are generally not native to North America, and combating them using only mechanical means may not be enough.

The same chemical herbicide is often sold under a wide variety of different brand names produced by different manufacturers. Look for the name of the chemical on the label. Talk to a local resource professional about the correct herbicides to minimize damage to the meadow grasses and wildflowers.

Eastern Purple Coneflower



Doug Sherman

## How to Create a Meadow in Southeastern Pennsylvania the Basics



# GreenTreks Videos



**Mowing to Meadows**



**Neighborhood Parks:  
Partnership in Action**

<http://www.greentreks.tv/programs/video-library>

# Establishment phase can be tough

- Aiden Lair Park challenge
- Desired aesthetics not yet achieved
- That and other complaints have resulted:
  - Ticks and Lyme Disease
  - Blind spot for deer crossing road
  - Allergies
  - Weeds

# Accepting imperfections (but don't let the weeds take over)



Keeping an eye on the Stilt  
Grass in small area

# Meadow Implementation Team

## ...Lessons Learned...

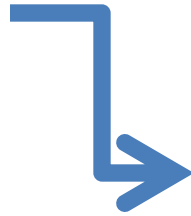
- Manage the “ugly stage” (1-3 years)
- Adaptive management, hard to predict variables
- Knowledgeable decision maker (when/how much to cut, what invasive to remove and how).
- 10-steps meadow guide?...inexperienced landowners may know 75%, but the 25% they don't know can kill the meadow.
- Expand # of “garden ecologists” who can help.

# Unintended Positive Consequences

- Less geese!
- More projects!
- Saving money!
- Student learning/involvement
- Basin retrofits

DO NOT MOW

# Less Geese!



# Townships Considering More Projects!

- Upper Dublin:
  - Robbins Park
  - Twining Valley Golf Course Study
- Whitemarsh
  - East Valley Green Park
    - (let it grow)
  - McCarthy Park basin
    - (naturalized)





# Save Money!

NON-NATIVE LAWN VERSUS NATIVE MEADOW/PRAIRIE MAINTENANCE 10 YEAR COST COMPARISON FOR 1/3 ACRE SITE									
	Contractor	Contractor	Contractor	Contractor	Contractor	Contractor	Contractor	Contractor	Contractor
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
<b>Maintenance Lawn</b>									
Install	\$1,905								
4 step fertilization program	\$480	\$434	\$509	\$140	\$959	\$573	\$608		
Aerating and overseeding	0c	\$190			\$318				
Mowing	\$3,840	\$1,481	\$1,528	\$1,621	\$2,090	\$1,709	\$1,824		
Municipal Water	\$1,342	\$1,382	\$1,424	\$1,510	\$1,956	\$1,602	\$1,700		
Annual expense	\$5,367	\$3,660	\$3,461	\$3,671	\$4,319	\$3,895	\$4,132		
Cumulative expense	\$5,367	\$8,827	\$12,288	\$15,960	\$20,861	\$27,856	\$36,988		
<b>Maintenance Meadow/Prairie using Burn &amp; Mowing Management</b>									
Install using organic practices	\$3,940								
Invasive management/maintenance	\$600	\$618	\$637	\$658	\$685	\$713	\$740		
Mowing	\$180	\$124			\$140				
Burn (mowing costs in years 4 and 8 not shown)	\$447		\$1,460	\$1,483		\$3,576	\$1,672		
Municipal Water	\$1,342	\$1,382	\$1,424	\$1,510	\$1,956	\$1,602	\$1,700		
Annual expense	\$3,367	\$3,742	\$3,521	\$3,743	\$4,005	\$3,849	\$4,072		
Cumulative expense	\$5,367	\$9,109	\$12,630	\$16,373	\$20,378	\$24,227	\$28,299		
Savings	0c	\$2,918	\$4,842	\$8,772	\$13,486	\$19,532	\$27,644		
Percentage savings	0%	33%	40%	47%	56%	64%	70%		
<b>Nearly \$26,000 saved over 10 years</b>									
<b>Maintenance Meadow/Prairie Using Mowing Management</b>									
Install using organic practices	\$3,940								
Invasive management/maintenance	\$600	\$618	\$637	\$658	\$685	\$713	\$740		
Mowing	\$180	\$124	\$128	\$135	\$140	\$144	\$148		
Municipal Water	\$447								
Annual expense	\$5,167	\$3,742	\$3,764	\$3,913	\$4,005	\$4,117	\$4,217		
Cumulative expense	\$5,167	\$9,509	\$13,273	\$17,186	\$21,191	\$25,308	\$29,525		
Savings	0c	\$2,518	\$5,934	\$11,294	\$16,386	\$21,191	\$27,644		
Percentage savings	0%	33%	40%	47%	56%	64%	70%		
<b>\$20,000 saved over 10 years</b>									

Contractor lawn to meadow savings over 10 years for 1/3 acres = \$31,000

Homeowner lawn to meadow savings over 10 years for 1/3 acres = \$20,000

Catherine Zimmerman,  
Urban and Suburban Meadows,  
How Much Does It Cost Table

# Lower Makefield Township Bucks County

- **Basin Naturalization Program...Mowing to Meadows**
- **60 + Basins and Open Space Areas in the Program**
- **Saves \$50,000 +/-Year**

Jim Bray Presentation at PSATS 2012

DO NOT MOW

# More Cost Data

- **Cusano Environmental Edu. Center (4 acres):**
  - Turf mowing labor = 80 hrs./yr. x \$40/hr. = \$3,200
  - Meadow mowing labor = 16 hrs./yr. x \$40/hr. = \$640
  - Savings = \$2,560/year
- **Siemens Corporation Meadow (10 acres):**
  - Created by Wissahickon Valley Watershed Assoc.
  - Reported savings of \$16,000 in mowing cost.

# Student learning/involvement



Montgomery School Students...living classroom

# Basins Retrofits

- Have site control
  - Plentiful
- Minor modifications improve function...like a meadow
- Basin inspection & maintenance is already required

# Basins



***Before and After***

# Thank you!

## Questions and Comments?

