A.D. MARBLE & COMPANY

Environmental, Cultural & Engineering Services

Angelica Creek Park

Adaptive Management Strategies: Managing Wetland & Stream Restoration in an Urban Park

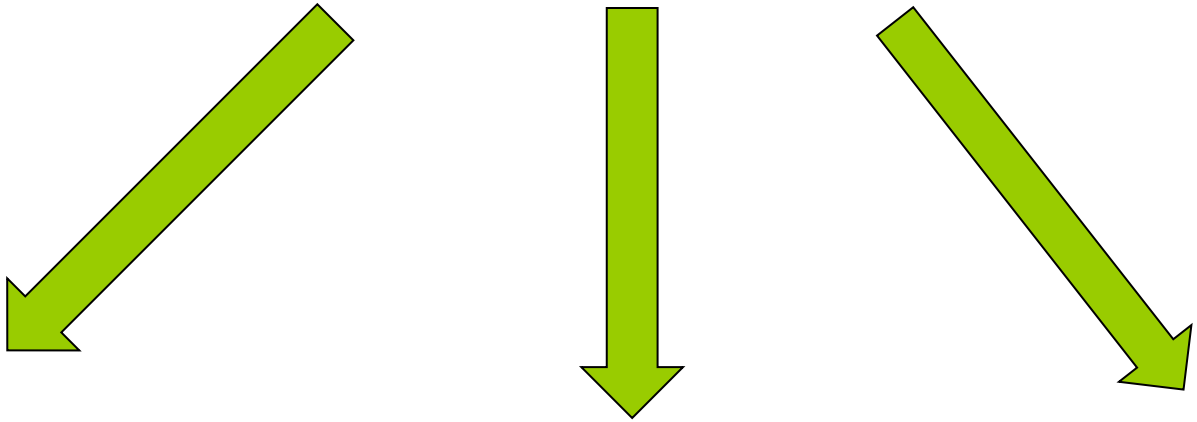
SWS Mid Atlantic Chapter Conference 2014

Xavier Riva, PWS

A.D. Marble & Company

Angelica Creek Park

Challenges



Ecological Needs

Park Users Experience

Maintenance Capabilities

Angelica Creek Park

City of Reading reached a settlement for resolution of allegations of chronic water pollution violations at the wastewater treatment facility.

Settlement required;

- **Rehabilitation of Wastewater Treatment Plant, and**
- **Fine or EPA *Supplemental Environmental Project* (SEP)**

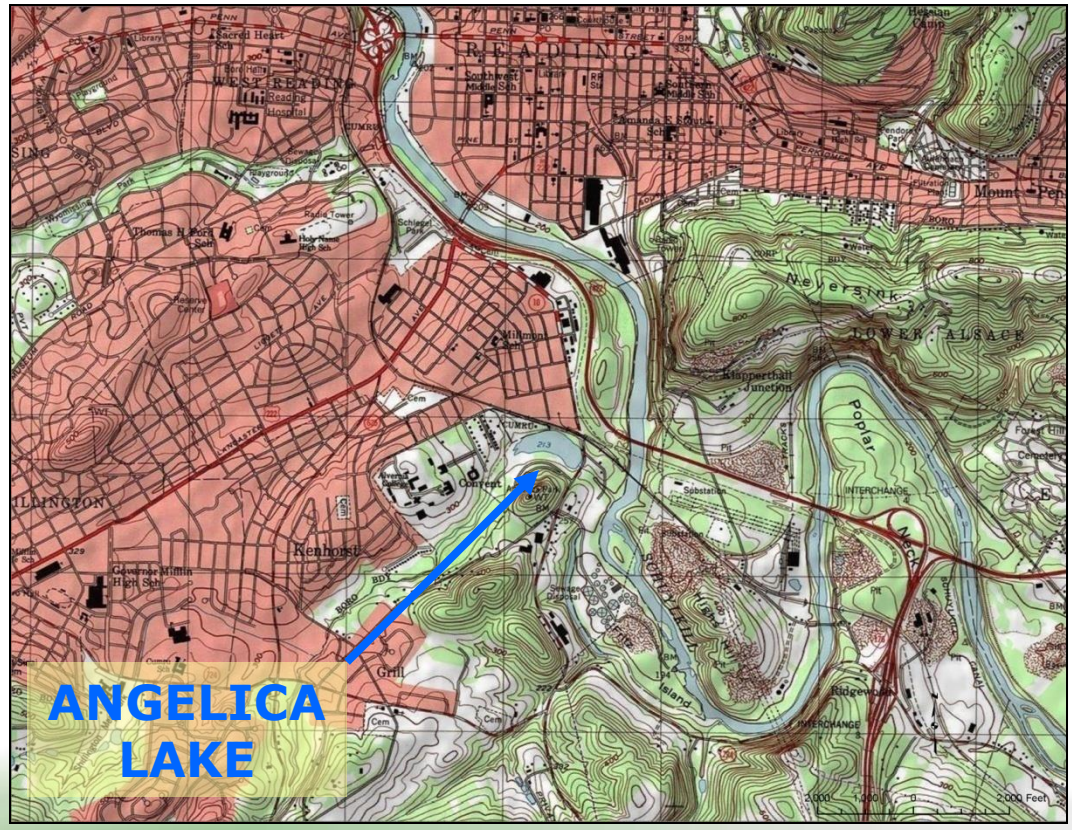
Angelica Creek Park

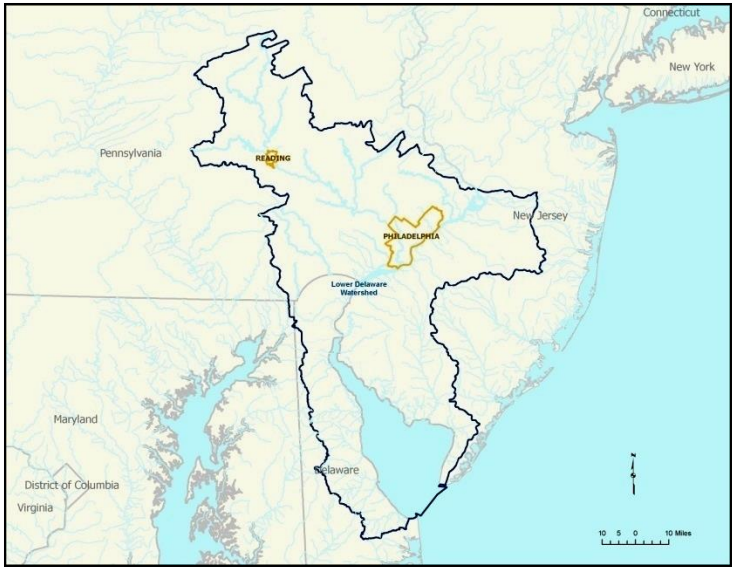
Why Angelica Creek Park?

1. Dam Breach (Angelica Lake Park)
2. High Sediment Loads into Schuylkill River
3. Proximity to Wastewater Treatment Plant
4. Reduced Recreational Opportunities
5. Location for Environmental Education

Angelica Creek Park

Why Angelica Creek Park?





Tropical Storm Allison (June 23, 2001) drops 8 inches of rain in 24 hours in Southeast Pennsylvania.

Angelica Lake No More!

July 2001

Exposed Lake Bed

2004

Angelica Creek Park

SEP Design Goals

1. Remove excess sediment and stabilize site.
2. Restore 2000 ft of stream corridor.
3. Create wetland habitat (two 1.0 ac sites).
4. Create 50.0 ft of riparian buffer on both banks.
5. Create 3.0 ac of floodplain meadow and 0.5 ac fishing pond.

Additional Goals:

- Pedestrian trails and boardwalks
- Habitat enhancement features (wood duck and bluebird boxes, bat boxes, and perching structures).
- In-stream habitat (rock & log vanes, riffles, and root wads).
- Designated outdoor classrooms, benches.

Proposed wetlands will provide flood relief for Angelica Creek and improve water quality within the Schuylkill River Watershed.

Proposed in-stream Rock Cross Vanes will provide grade control and will improve the aquatic habitat of Angelica Creek.

Upland native wildflower and grass meadows will enhance visual interest and provide food and cover for native wildlife.

(Inset) Existing Angelica Creek
Proposed creek widening and riparian buffer plantings will stabilize stream banks and provide shade and food for aquatic species.

An additional pedestrian bridge will allow access to Wetland #2 and to the North stream bank of Angelica Creek for fishing.

Pedestrian trails will provide links to the Schuylkill River Trail and to the potential Environmental Education Center. Interpretive signage and outdoor classrooms will provide educational viewing stations along the trails.

50 0 50

Scale in Feet

Angelica Park

Preliminary Stream Relocation and Grading Plan

Construction Begins
January 2007


JOHN DEERE


NPCO

Angelica Creek Park

Invasive Species

Angelica Creek Park

Invasive Species Management

Public Works & WWTP Facility Crews

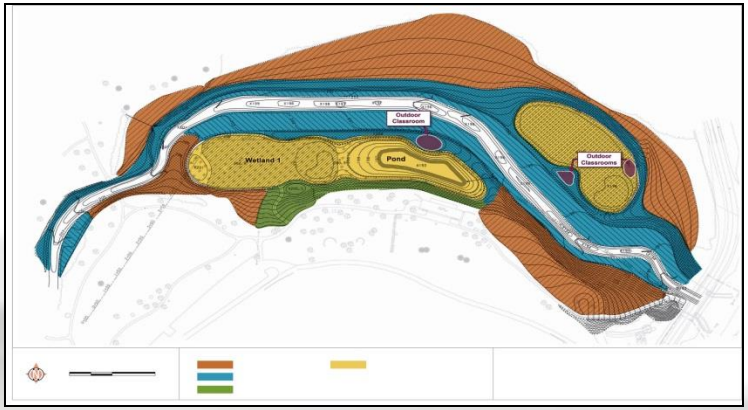
- **Mowing & Tree Removal**

Berks County Conservancy

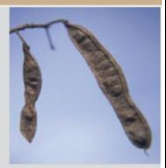
- **Chemical Treatment & Manual Pulling**

Alvernia University/Albright College

- **Student Interns**
- **Environmental Education**



Angelica Creek Park

Invasive Species	SPRING	SUMMER	FALL
black locust (Robinia pseudoacacia)	**Mechanical:** Hand-pull new seedlings, cut down saplings/trees (most effective when combined with chemical application). **Chemical:** Apply Glyphosate* to the freshly cut stump of saplings and trees to stop root shoots. **Biological:** None. 	**Mechanical:** Hand-pull new seedlings, cut down saplings/trees (most effective when combined with chemical application). **Chemical:** Apply Glyphosate* to the freshly cut stump of saplings and trees to stop root shoots. **Biological:** None. 	**Mechanical:** Cut down saplings/trees (most effective when combined with chemical application). **Chemical:** Apply Glyphosate* to the freshly cut stump of saplings and trees to stop root shoots. **Biological:** None. 
Canada thistle (Cirsium arvense)	**Mechanical:** Hand-pulling or selective cutting/mowing 3X during the growing season – ex: June, August, and September. Cutting is most effective a week **after flowering.** **Chemical:** None. **Biological:** None 	**Mechanical:** Hand-pulling or selective cutting/mowing 3X during the growing season – ex: June, August, and September. Cutting is most effective a week **after flowering.** **Chemical:** Glyphosate* (destroys plant tops) or vinegar (destroys foliage). **Biological:** weevil larvae, *Ceuthorhynchus litera* (stems), weevil, *Larinus planus* (seed-head).  *Flowers June through August, or after disturbance (mowing).*	**Mechanical:** Hand-pulling or selective cutting/mowing 3X during the growing season – ex: June, August, and September. **Chemical:** None. **Biological:** weevil larvae, *Ceuthorhynchus litera* (stems), weevil, *Larinus planus* (seed-head). 
common reed (Phragmites australis)	**Mechanical:** Mowing throughout growing season and subsequent years (upland only), cut to the ground in late spring/early summer, then apply chemical herbicide. Prescribed burn, but only between chemical herbicide applications. **Chemical:** glyphosate* and/or imazapyr, applied to new growth after cutting. **Biological:** None. 	**Mechanical:** Mowing throughout growing season and subsequent years (upland only), cut to the ground in late spring/early summer, then apply chemical herbicide. Prescribed burn, but only between chemical herbicide applications. **Chemical:** glyphosate* and/or imazapyr, applied to new growth after cutting. **Biological:** None. 	**Mechanical:** Mowing through-out growing season and subsequent years (upland only). **Chemical:** glyphosate* and/or imazapyr, applied to new growth after cutting. **Biological:** None. 

Laminated cheat sheet for identifying and treating invasive species

Angelica Creek Park

Trail Maintenance

Angelica Creek Park

Trail Management

Relocate trail sections outside of riparian corridor.

Replace course aggregate, install gravel bars to shed runoff off trails.

Stop use of wood chips for meadow trail

Angelica Creek Park

Trail relocation = riparian habitat enhancement

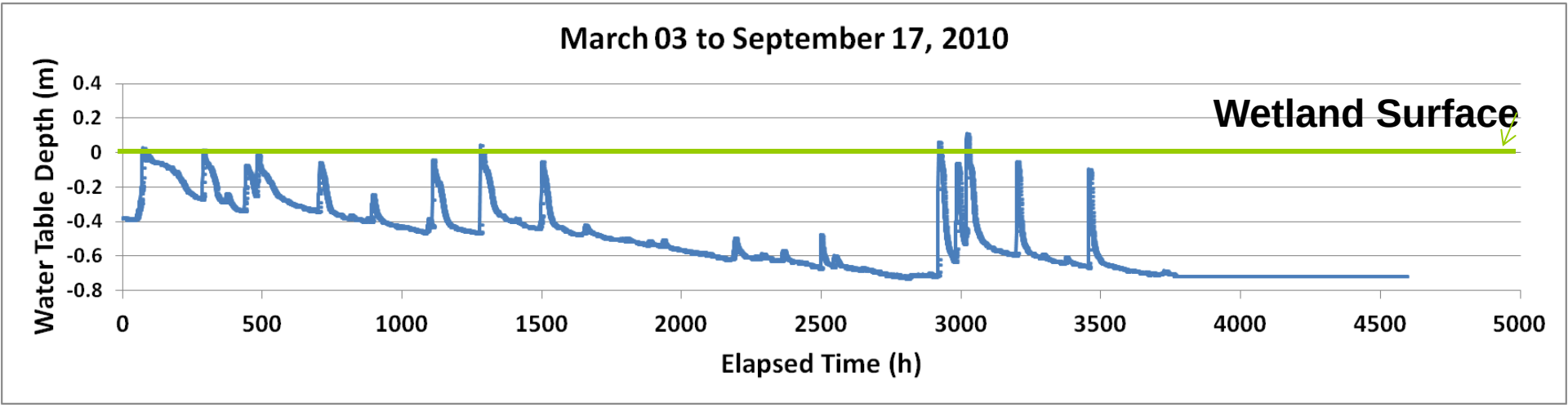
Angelica Creek Park

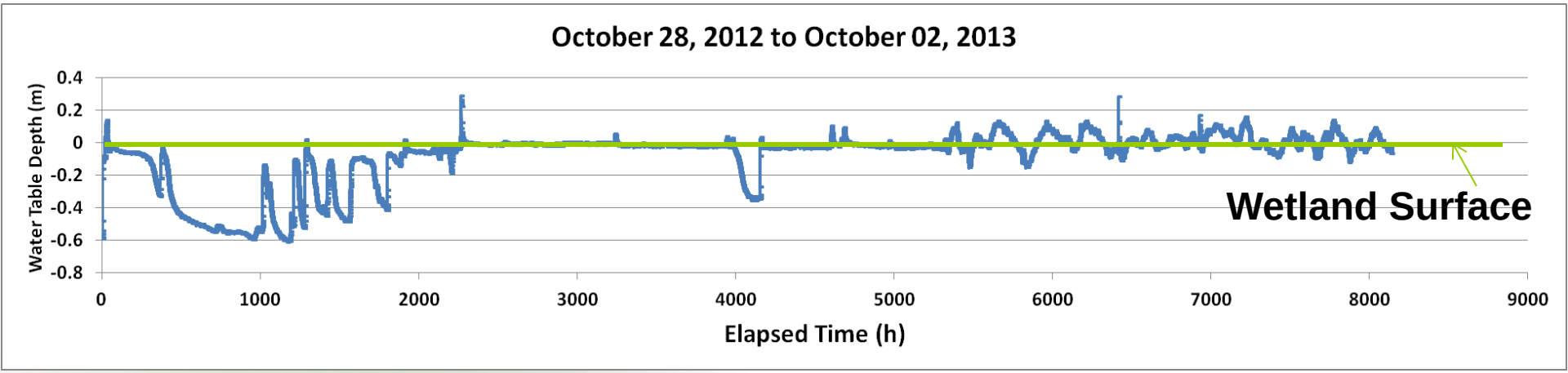
Wetland 1 - Hydrology

Angelica Creek Park

Wetland 1 - Diversion Inlet

Lowered 4ins to increase flood frequency & duration in December 2011





Provided by Dr. David Osgood, Albright College

Angelica Creek Park

Wetland 1 – July 2013

Angelica Creek Park

Take home messages

1. Know the capabilities of maintenance staff

2. Consider how the public will use space (access and high traffic areas)

3. Be prepared to fine tune design (selling vision to the public)

Xavier Riva, A.D. Marble & Co.
xavier@admarble.com, 484-533-2568
www.admarble.com