

Unfortunately, Larry had always approached from the side that wasn't posted, and a natural phenomenon was destroyed before anyone could react.





#### By GARY LARSON

" mon

# **RIPARIAN BUFFER PROTECTION USING MUNICIPAL ORDINANCES**

John Theilacker, AICP, Brandywine Conservancy

Dr. Seung Ah Byun, P.E., LEED AP, Brandywine Conservancy

Andrew JG Schwartz, AICP, RLA, LEED AP, Environmental Planning & Design, LLC

APA PA Conference 2015 Pittsburgh, PA October 2015



## Our Message to You Today:

Trees are really important – valuable eco-services.

Trees along streams are really, really important – valuable eco-services are magnified in riparian areas.

Enact forested riparian buffer regulations at the municipal level

New model ordinance (ConservationTools.org) addresses both protection <u>and</u> restoration.

An ounce of prevention...a ton of cure.

An MS4 action at minimal cost to municipalities.

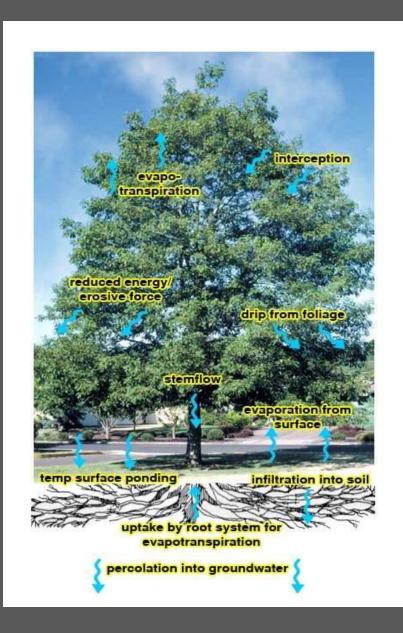




### Trees provide valuable eco-services.



Trees as the only true Best Management Practice

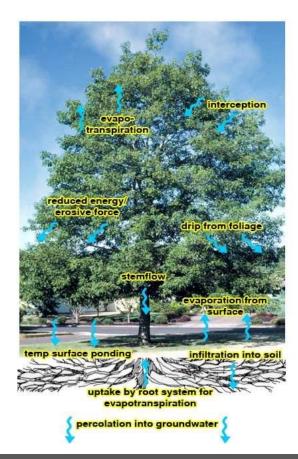




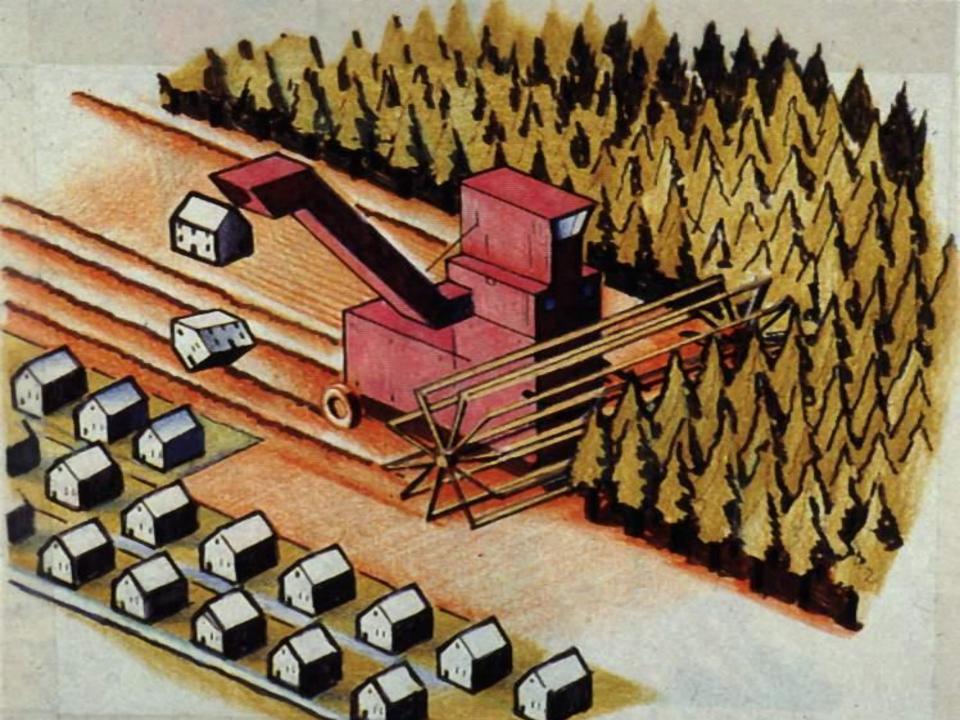
## Loss of Site Vegetation Means Lost Vegetation Functions (Eco-Services)

### **Precipitation:**

Above Ground Interception/Slowing Absorption **Evaporation/Transpiration** At Ground **Temporary Storage Quality Filtering Below Ground** Infiltration/Permeation Storage **Quality Filtering/Uptake** ...And this is just the beginning!

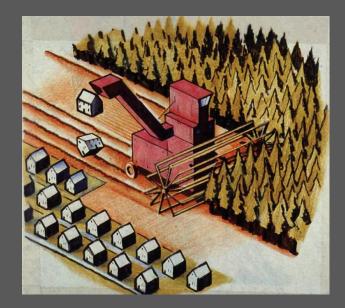






### The price we pay downstream...





# HOW CAN WE REDUCE SOME OF THIS DAMAGE?

....creating a little space between the danger of what we are doing.....and what we are trying to protect



# We need to create some space and fill it with trees.....wherever streamside forest has been lost!







# **BUILDING THE SCIENCE OF BUFFERS FOR DECADES**

Importance of Buffers Importance of Forested Buffers Importance of Forested Buffers in Headwaters



# Can creating the space (buffer) increase a stream's ability to process stuff that gets into it?





# If the buffer contains grass.....the answer is yes but not nearly as well



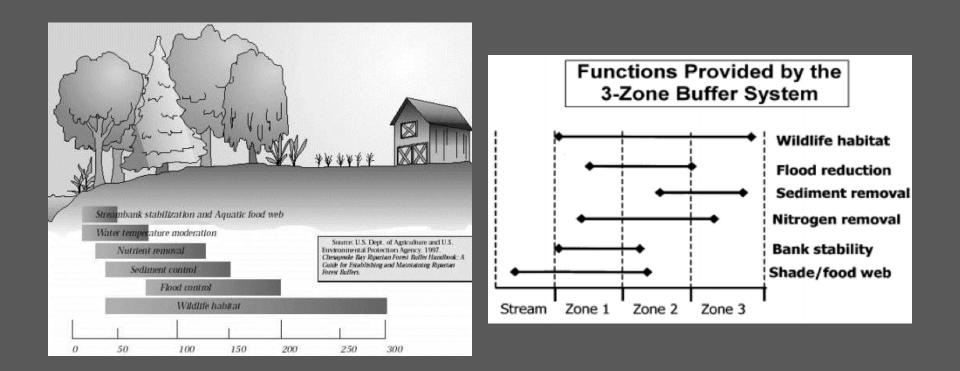
## Not wide enough!

Chemicals used to grow corn will drain into this stream...a source of drinking water for Newark, DE





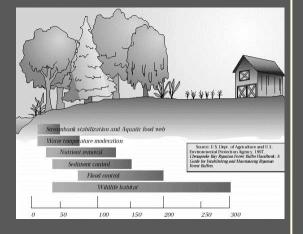
## **Riparian Buffer Functions:**





# Buffer Width

Riparian Buffer Zones: Functions and Recommended Widths (Ellen Hawes and Markelle Smith, Yale School of Forestry, April 2005)



Lots of data showing lots of things, depending on study structure....

Erosion control30 to 98 feetWater quality-•Nutrients49 to 164 feet•Pesticides49 to 328 feet•Biocontaminants (fecal, etc.)30 feet or more

Aquatic habitat •Wildlife •Litter/debris •Temperature

33 to 164 feet50 to 100 feet30 to 230 feet

**Terrestrial habitat** 

15 to 330 feet

## THE NEWEST SCIENCE

The Stream as a Processing System



## **Recent Research**



### NO trees results in:

- unstable stream channels
- deep incised channels
- erosion
- negative hydrology and morphology impacts

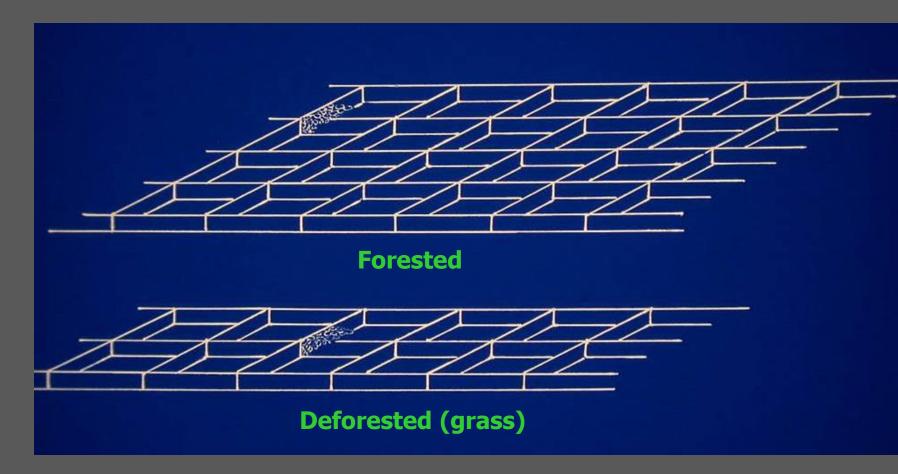


Forested reaches of streams are wider, shallower.





# Wider streams have more "ecosystem" because the ecosystem is <u>on the bottom of the stream</u>







# Forested streams are healthier because of more natural conditions

- Temperature
- Food



E • Light

## Importance of <u>Forested</u> Buffers

Indirectly, forms stream eco-systems which are more effective processors, are more robust downstream, have more power to remove pollutants downstream, can support stronger biotic systems, etc.

Energy is key – forested buffers convey maximum energy flow from land to water, leading to maximum stream health (potential).



#### Stream critters who like to eat algae... but prefer to eat diatoms which grow best in the shade





protist.i.hosei.ac.jp/.../Cladophora/index.html

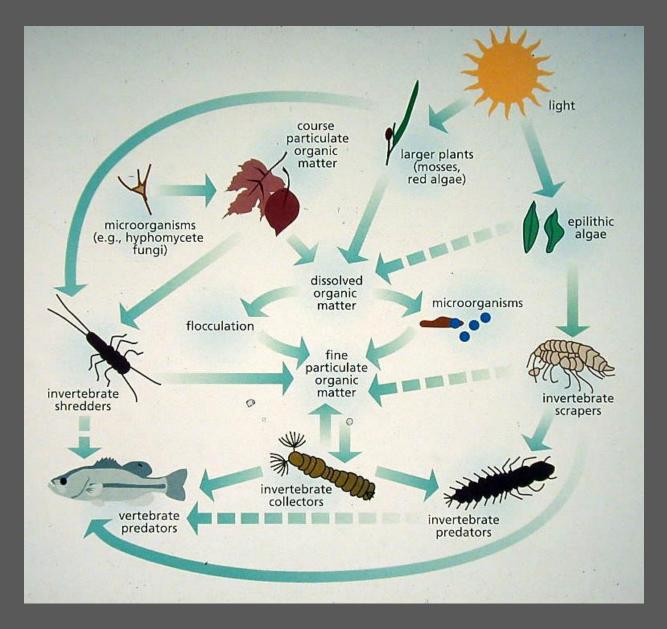


### Newest Science

Forested streams have:

- more ecosystem
- healthier ecosystems





## Newest Science: Forested Buffers in Headwaters Provide Critical Functions

Increased instream processing (direct and indirect) including...

- Increased biogeochemical processing
- Increased photooxidation
- Increased aerobic processing of dissolved organic and inorganic compounds

Major focus on biological interactions



# Newest Science: Forested Buffers in Headwaters

#### Energy is also key

 Forested buffers convey maximum energy flow from land to water, leading to maximum stream health (potential)

#### **Biological interactions are critical**

- Especially intense energy transfer from land to water in headwaters via "fuel" from algae, aquatic mosses, rooted aquatics, trees, understory shrubs, other herbaceous
- Especially rich, abundant insect community in headwaters (Kaplan et al 2008)

### Importance of <u>Forested</u> Buffers <u>in</u> <u>Headwaters</u>

To maximize instream processing and to maximum positive energy flow opportunities, start from the headwaters down.

Most stream mileage exists as first order streams/headwaters.

"...restoration and preservation of small stream ecosystems should be a central focus of management strategies...."



Pennsylvania streams need Pennsylvania forests.



### **Putting the Science to Work!**

A New Model Riparian Buffer Ordinance for Pennsylvania's Municipalities!



BRANDYWINE Conservancy

# THE "STATE" OF PENNSYLVANIA'S STREAM BUFFER PROTECTIONS



# PA Buffer Regulations (pre-2015)

Chapter 102, Erosion and Sedimentation Control:

"no disturbance" buffer

For projects requiring PCSM permit

Required for Special Protections Waters (HQ and EV)

About 30% of all PA streams

All perennial/intermittent streams, lakes, ponds, reservoirs

Minimum <u>150 foot</u> average buffer width

Maintain native vegetation with 60% canopy

If Non-Attaining/Impaired, then <u>must restore</u> full buffer

**Multiple Exceptions** 





The bad news: PA Act 162 reduced these requirements via the Clean Water Act



# **PA Buffer Regulations (current)**

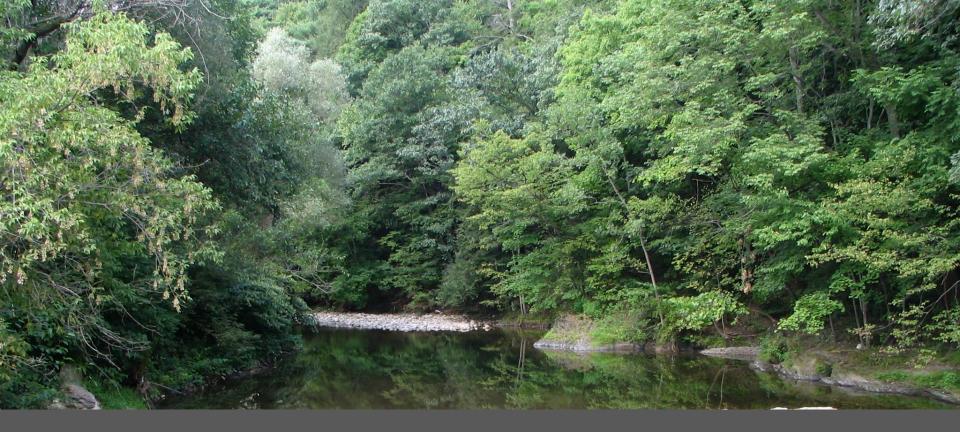
# For HQ/EV streams, riparian buffers and forested riparian buffers

- <u>are now an option</u> rather than a requirement
- have been reduced in width from 150' to 100'

#### However - developers must

- demonstrate "functional equivalency" for alternative BMPs
- demonstrate offset buffers are as close as feasible to original site





The good news: Act 162 did not "pre-empt" local regulatory authority!



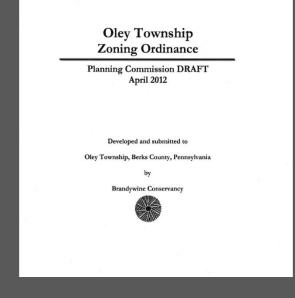
# So....municipalities can get tough on protection!

Within a Zoning Ordinance

- Overlay district
- Protection standards

Within a SALDO

- Design standards
- Within a Stormwater Ordinance
  - Riparian buffer requirements

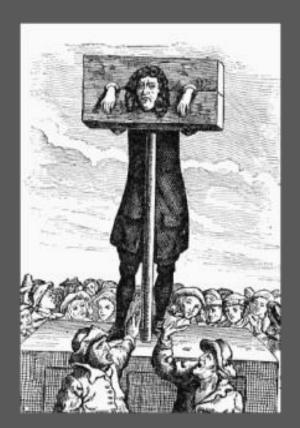


*Capitalize on the "water quality" momentum!* 

# Reasonable restrictions need not fear regulatory takings!

Legislative authorization through:

- Pennsylvania Constitution
- Municipalities Planning Code

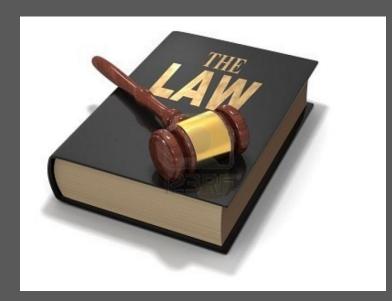


(-4 CMs!)



### Pennsylvania's Constitution states.....

"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations to come."



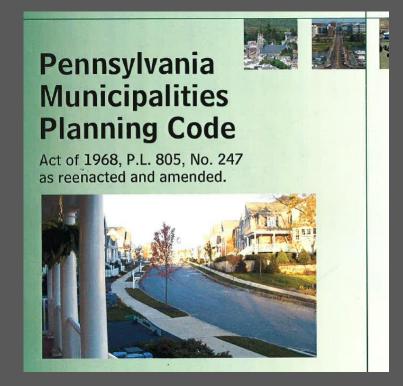


### PA MPC Article VI – Zoning

#### Section 603(b)

"Zoning ordinances may permit, prohibit, regulate, restrict and determine.....

- (1) Uses of land, <u>watercourses and other</u> <u>bodies of water;</u>
- (2) Protection and preservation of <u>natural</u> and historic <u>resources</u> and prime agricultural land and activities.





#### •PA MPC Article VI – Zoning; Section 603(c)(7):

- "Zoning ordinances may contain provisions to promote and preserve.....environmentally sensitive areas."
- PA MPC Article VI Zoning; Section 603(d):
  - "Zoning ordinances may include provisions regulating the siting, density, and design of residential, commercial, industrial and other developments in order to assure the availability of reliable, safe and adequate water supplies..."
  - •PA MPC Article VI Zoning; Section 603(g)(2):
  - "Zoning ordinances shall provide for the protection of natural....features and resources."
- **PA MPC Article VI Zoning; Section 604:** 
  - "Zoning ordinances shall be designed to promote and facilitate the.....preservation of the natural, scenic and historic values in the environment and preservation of forests, wetlands, aquifers and floodplains."



### **PA MPC Article V – SALDO**

#### Section 605:

Municipalities are authorized to enact subdivision and land development ordinances which include: (2) Provisions for insuring that:

 the layout or arrangement of the subdivision or land development shall conform to the comprehensive plan and to any regulations or maps adopted in furtherance thereof;



### Pennsylvania Case Law

Lancaster County Model Conservation Zoning District and Natural Resource Protection Standards, 2010

Fronefield Crawford, Esq.

*"For municipalities to regulate sensitive natural features:* 

The PA legislature must have authorized such;

Regulations cannot be arbitrary or unreasonable;

Regulation cannot deprive the owner of all reasonable use of his property."



### Pennsylvania Case Law

#### Jones v. Zoning Hearing Board of the Town of McCandless

Court upheld performance zoning that preserved steep slopes, forests, floodplains and streams;

#### Chrin Brothers Inc. v. Williams Township Zoning Hearing Board

Court upheld ordinance provisions that prohibited clear-cutting on steep slope areas and floodway areas, and limited clear-cutting, so that substantial forest canopy will remain after logging activities.



#### Help for Pennsylvania's municipalities

#### **Riparian Buffer Protection Via** Local Regulation

#### A Guide For Pennsylvania Municipalities

Riparian buffers-forested or otherwise vegetated lands bordering water bodies-deliver tremendous water quality and other public benefits. Pennsylvania municipalities may ensure the protection and restoration of riparian buffers with their land use regulations.

#### Introduction 1

#### Background 1

Riparian Buffer Defined 1 Services Provided By Buffers 1 The Problem 2 The Science Behind Riparian Buffer Protection 2 **Obstacles To Enacting Regulatory Protections 3** Setting The Stage 3 State-Level Regulation For Riparian Buffers 3 Applicability 3 **Regulatory** Goals 4 Important Differentiations 4 Multi-Zone System 4 Role Of Local Regulation 4 Authority For And Defensibility Of Local Regulatory **Protection Of Riparian Resources 4** Pennsylvania Constitution 5 Municipalities Planning Code 5 Pennsylvania Case Law 6 Local Regulatory Pathways For Protecting Riparian **Buffers 8** Zoning Or SALDO Regulations 8 Act 167 Stormwater Management Ordinances 9 Other Regulatory Tools 10 **Elements Of Good Riparian Buffer Protection** Regulations 11 Purpose And Intent 11 Definitions 12 Applicability 13 **Riparian Buffer Delineation 14** Uses Permitted 14 Buffer Restoration And Planting Requirements 15 Modifications To Riparian Buffer Standards 16 **Case Studies 16** Halfmoon's Riparian Buffer Overlay Zoning District 16 Shrewsbury's Critical Environmental Areas 18 Related Resources at ConservationTools.org 19

Last updated on April 25, 2014





#### Introduction

Forested or, to a lesser extent, otherwise vegetated lands bordering streams, lakes and other water bodies protect water quality and provide other environmental, economic, public health and safety benefits.

Only when a waterway is state-designated as Exceptional Value or High Quality and, even then, only in certain circumstances do state regulations protect these riparian buffers.

Pennsylvania law allows municipalities to adopt land use regulations to protect riparian buffers whether or not state regulations apply. These local regulations can ensure that riparian buffers are maintained as forest and, if not already under substantial forest canopy, are appropriately planted at the time of development. Particularly in the absence of state regulation, these municipal regulations play a crucial role in achieving and maintaining the quality of the Commonwealth's water.

This guide, together with the Model Riparian Buffer Protection Overlay District, is designed to help municipalities draft and adopt practical, science-based, legally enforceable regulations to protect riparian buffers while respecting the rights of landowners.

#### Background

**Riparian Buffer Defined** 

Riparian buffers are vegetated lands, ideally forested, that border streams, rivers, reservoirs, ponds, lakes, wetlands and other water bodies

A variety of definitions adopted by governments, academic and research institutions, and others can be found on the world-wide-web but most if not all of them are consistent with the definition provided here.

#### Services Provided By Buffers

Scientific research clearly documents that riparian buffers, particularly forested buffers, deliver tremendous public



#### A Scientific Foundation for Shaping Riparian Buffer **Protection Regulations**

Extensive scientific research documents that vegetated strips of land along water bodies provide extensive water quality and other environmental benefits. The science shows that development should be kept away from the water's edge, wider protected strips provide greater benefits, forested buffers are more effective than grassy ones, and forested buffers in headwaters provide the greatest benefits of all.

#### **Overview** 1

- Summary 1 Conservation Impact 1
- Riparian Buffer Defined 1 Content of Guide 2
- The Science 2
- Point 1. Do Not Allow Development to Encroach into **Riparian Buffers 2**
- Point 2. The Wider the Buffer, the Greater the Benefit 3 Point 3, Riparian Buffers Need to Be Forested 3 Point 4. Protect Forested Riparian Buffers into
- Headwaters 4

Related Resources at ConservationTools.org 5

#### Overview

#### Summary

Scientific research has strongly established the harm to water quality, the increased flooding and the damage to the ecosystem that results from failure to protect riparian buffers. This guide identifies the key scientifically grounded principles that municipalities should follow when developing riparian buffer protection regulations.

Pennsylvania's streams, rivers, wetlands, and other natural water bodies are a major part of our state's "life blood" and at one time, virtually all were in a naturally forested landscape that contributed to their high quality. Riparian buffers, particularly when forested, effectively prevent nonsource pollutants from degrading these resources. Extensive scientific research documents that undisturbed, vegetated buffers provide extensive water quality and other environmental benefits. New research shows an even higher ecological value of riparian buffers in headwaters, or first-order streams that should be protected from disturbance or degradation. As explained in later sections, headwater streams are primary food/fuel production areas

Last updated on May 16, 2014

and have been found to be essential to the health of the entire aquatic system.

#### Conservation Impact

- · Riparian buffers, particularly forested buffers, have been documented to provide the following conservation benefits: prevent stream bank erosion; protect natural stream morphology (i.e., broad meanders with maximum stream bottom habitat); remove excess nitrogen, phosphorus and sediment from surface water runoff; reduce downstream flooding; provide thermal protection to adjoining streams, wetlands, and water bodies; provide food and habitat for wildlife; provide food and habitat for fish and amphibians; form corridors for habitat conservation and greenways; and protect associated wetlands
- · Forested riparian buffers in headwaters (first-order streams) generate high levels of organic inputs directly from land to water, which in turn maximize in-stre processing functions that provide the "fuel" needed for downstream energy and nutrient processing.

#### Riparian Buffer Defined

Riparian buffers are vegetated lands, ideally forested, that border streams, rivers, reservoirs, ponds, lakes, and wetlands. Riparian buffers provide an array of valuable ecological functions (often termed "eco-services") and are critical natural resources worthy of both public and private landowner protection efforts. Riparian buffers effectively intercept non-point source pollutants carried by surface water runoff or groundwater from adjoining land uses, preventing these pollutants from reaching water bodies. Forested buffers, in particular, minimize erosion of streamor river-banks, help to control stream temperature fluctuations and elevated temperatures harmful to aquatic life, provide food and habitat for wildlife, fish and amphibians, allow for wildlife movement within stream or river corri-

SERVATIO





#### BRANDYWINE CONSERVANCY

Pennsylvania Land Trust Association (PALTA) and the **Brandywine Conservancy** 







#### Contents

- Purpose and Intent
- Definitions
- Applicability
- Riparian Buffer
  Delineation
- Uses Permitted
- Buffer Restoration and Planting Requirements
- Modifications to Riparian Buffer Standards

#### Model Riparian Buffer Protection Overlay District

Proposed Regulations For Use In A Municipal Zoning Ordinance





Edition of April 25, 2014

Section 100. Purpose and Intent. The specific purposes and intent of this article are to:

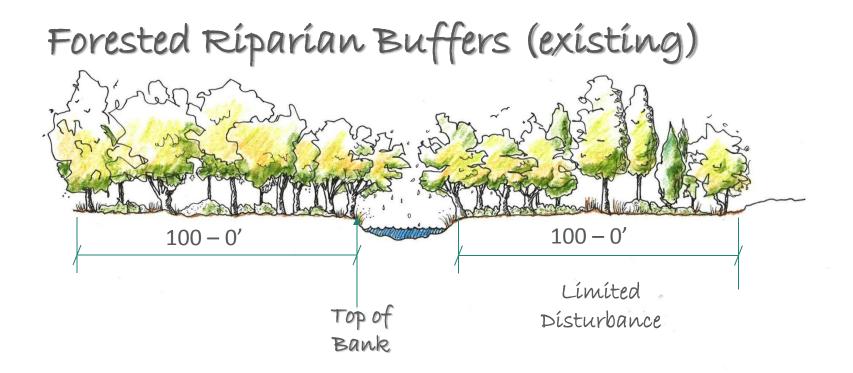
- A. Conserve, protect, and restore natural riparian resources through scientifically supported processes.
- B. Maintain and improve surface water quality by reducing the entry of detrimental substances, including nutrients, sediment, organic matter, pesticides, and other harmful substances that reach watercourses, wetlands, and surface and subsurface water bodies.
- C. Reduce the entry of detrimental substances by restricting development and uses in riparian areas that intercept surface water runoff, wastewater, subsurface flow and deep groundwater flows from upland sources and where the processes of filtration, deposition, absorption, plant uptake, sediment and phosphorus attenuation, denitrification and infiltration may occur; encouraging sheet flow and minimizing, mitigating and preventing concentrated flows of storm water runoff across riparian areas, and securing increased channel and bank stabilization that avoids stream bank erosion and associated water quality, quantity and flow harms.
- D. Attenuate flooding and reduce soil loss.
- E. Reduce adverse aquatic health impacts due to changes in the temperature of receiving waters (both temperature increases and temperature decreases) as a result of storm water runoff, loss of vegetative shading and direct discharges to water bodies.

### **NEW MODEL ORDINANCE:**

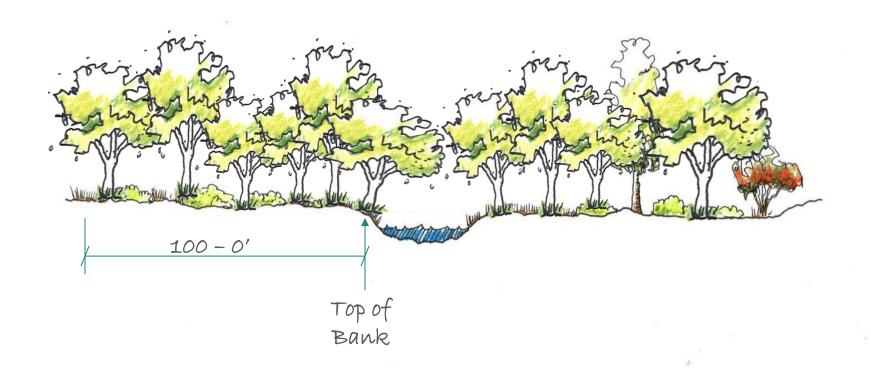
What Does It Do?



#### Preserves existing riparian buffers



BRANDYWINE CONSERVANCY Mínímum of 60% natíve tree canopy ín ríparían buffer





BRANDYWINE CONSERVANCY Restoration to minimum 60% native tree canopy In riparian buffer

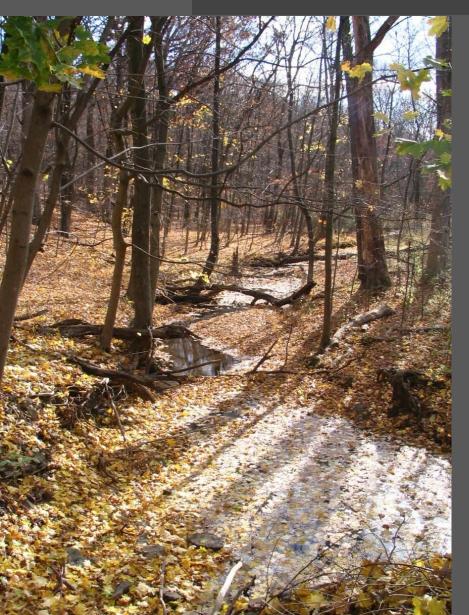
#### Restores impacted riparian buffers

#### CONSERVANCY MODEL APPLIES TO WETLANDS





### **Modifications to Buffer Requirements**



Municipalities can get tough on protection provided.....

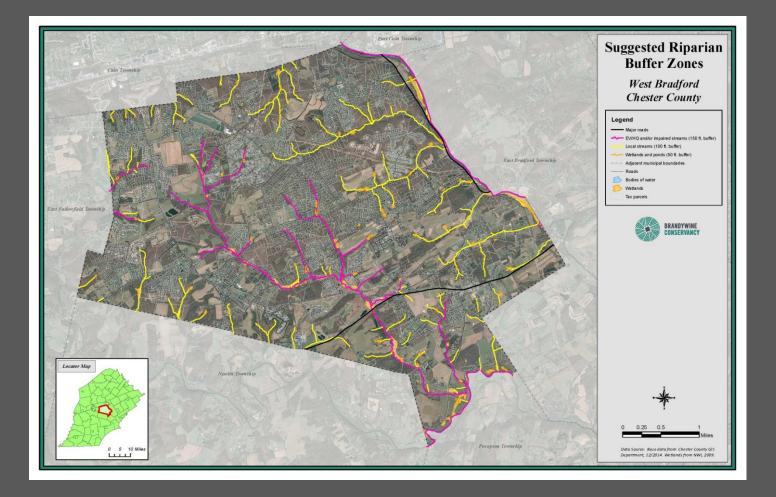
- A "safety valve" exists for unique/unforeseen circumstances
- Simpler modification process
  proposed
- Requested at the time of conditional use, special exception, or variance approval, or subdivision or land development approval
- Limited to minimum adjustment necessary to allow relief while adhering to riparian buffer purposes



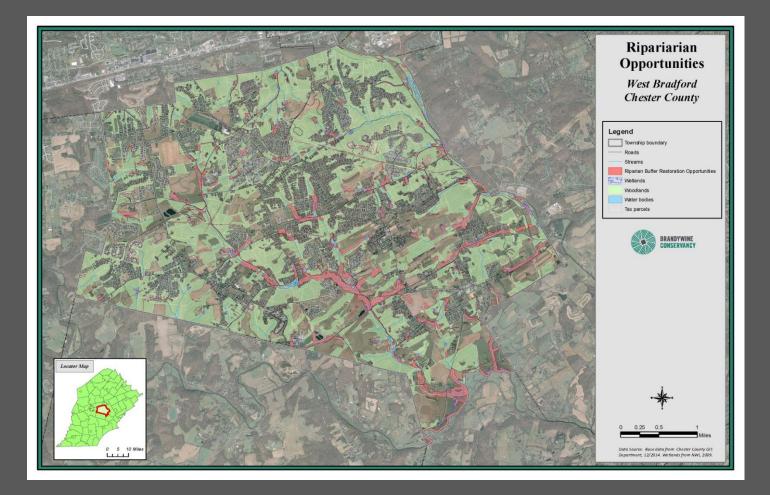
### **RIPARIAN BUFFER ANALYSIS**



### **Riparian Buffer Zones**



### **Riparian Restoration Opportunities**

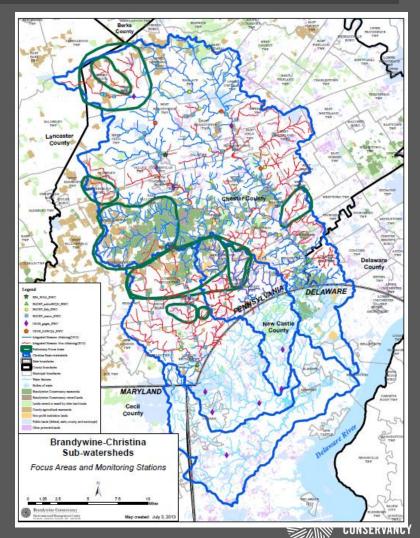


### William Penn Foundation/Delaware River Watershed Project

**Brandywine/Christina basin** 

# Free technical assistance for riparian buffer implementation

- 10 municipal assessments
- 5 municipal ordinance updates
- MS4/TMDL credits

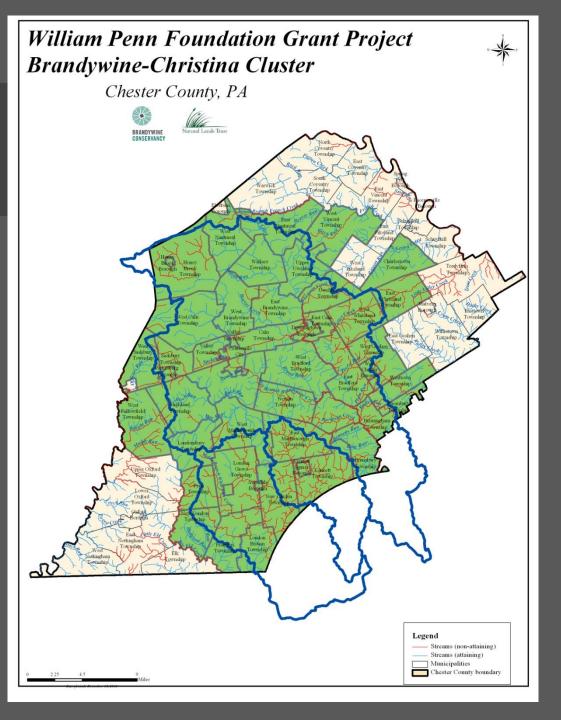


#### WPF Cluster Project Area

**Initial Outreach:** 

 Breakfast meeting - all Chester County municipalities in the Brandywine Christina Cluster

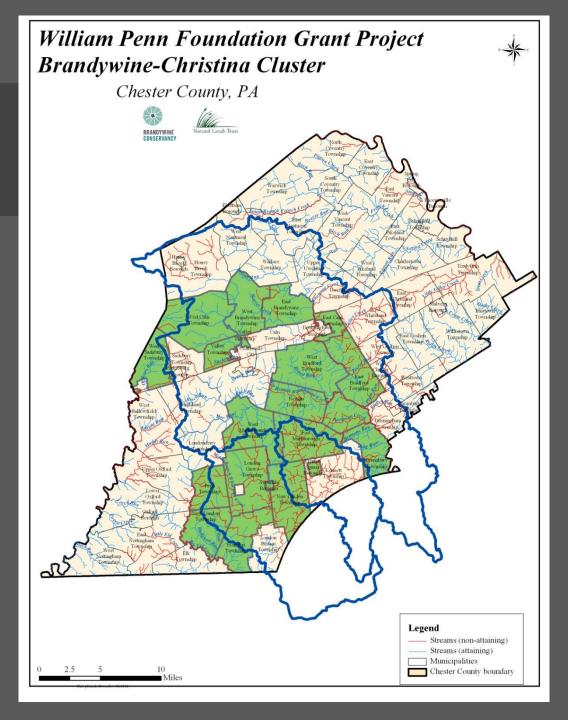




#### Additional Municipal Outreach

- Letters/mailings
- Info Flyers
- Phone calls
- Presentations
  - Board of Supervisors
  - Planning Commissions

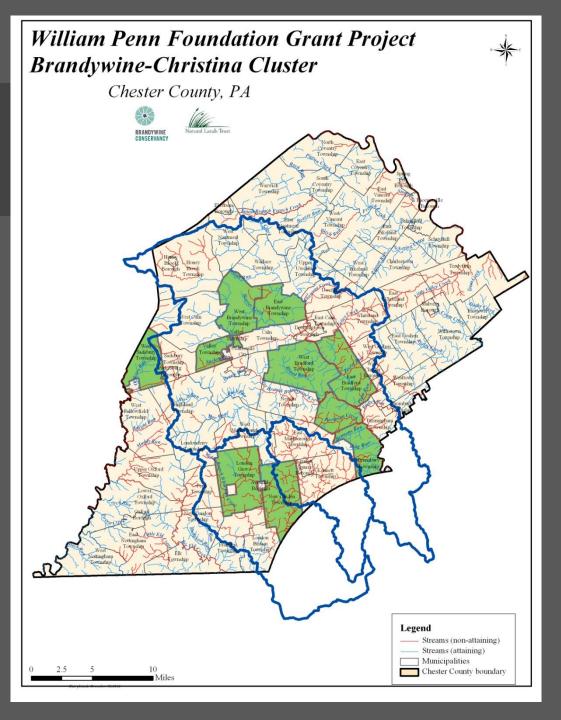




# 10 Municipalities for Assessments

- Evaluation of local codes
  - Zoning
  - SALDO
  - Stormwater Ordinance
- Summary of assessment in memo to Townships



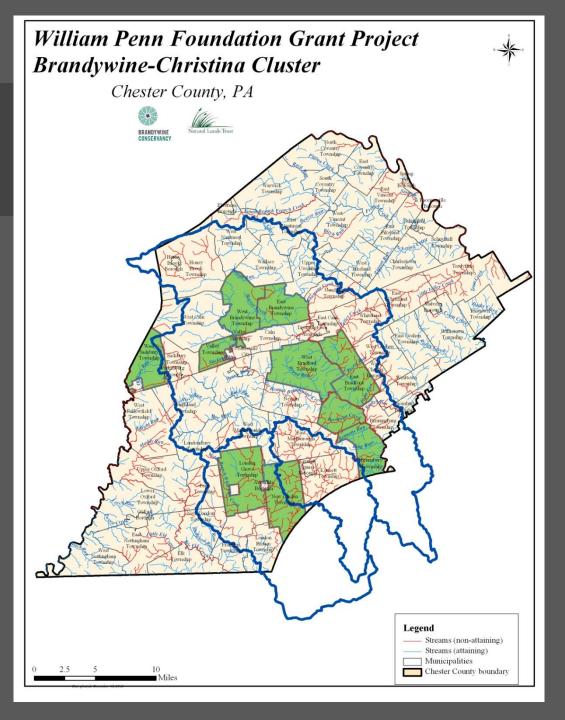


# 10 Municipalities for Assessments

Summary of Assessment Findings:

- General buffer widths
- Wetland margins
- Restoration
  requirements
- Covenants/ management plans

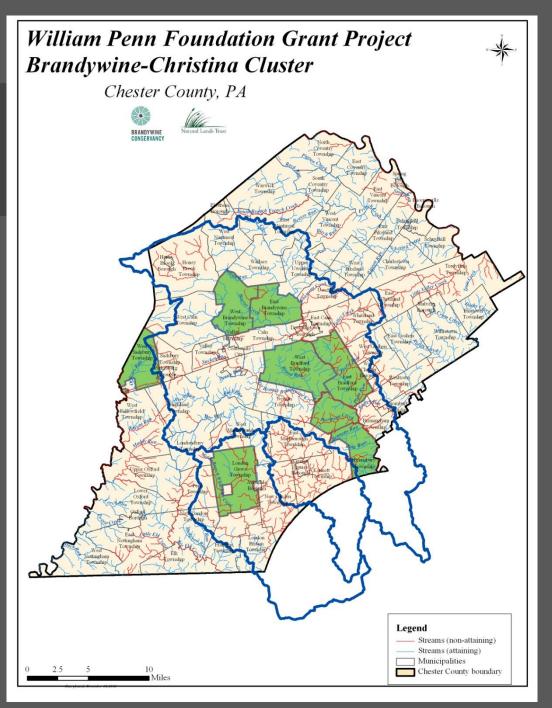




#### Potential Riparian Buffer Ordinance Adoption

7 potential adoptions

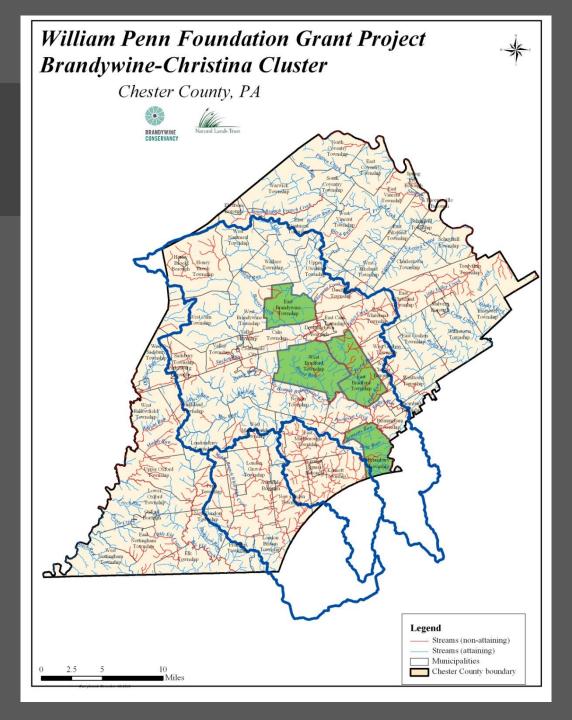




#### Riparian Buffer Ordinance Adoption

4 Confirmed





### **Regulatory Drivers: MS4s/TMDLs**

45 out of 50 Chester County municipalities in the Brandywine-Christina have MS4s.

43 out of the 45 are required to submit individual MS4 permits.

Continuing to work with EPA and PADEP to allow municipalities to receive credits towards MS4 and TMDL requirements for adopting riparian buffer ordinances.



#### Beyond Forested Buffers: Riparian Corridors in Suburban and Urban Contexts

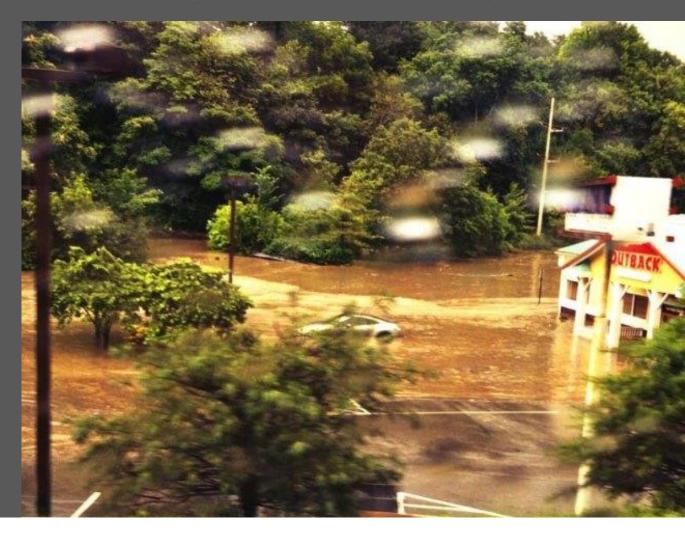
Environmental Planning & Design, LLC



### What Do You Do When Your Riparian Corridor Has Already Been Developed

 Incorporate a set of best practices that are 'tailor fit' to the stream's context

 Approach the stream as an important amenity worthy of not only conservation but of celebration and engagement

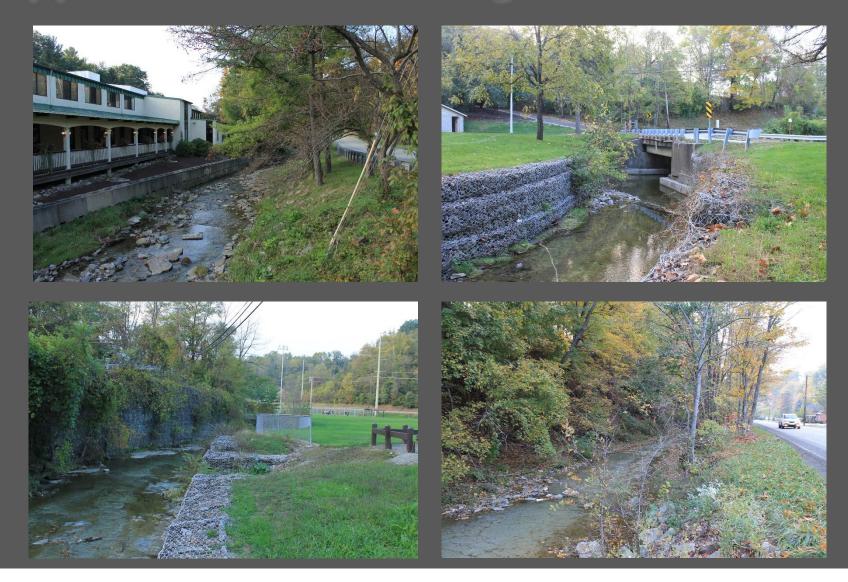


#### Many of the Commonwealth's Waterways Are Similar: One Watershed Consisting of Diverse Landscapes and Development Patterns

### Upper St. Clair's McLaughlin Run

Overview 222 acres 68 parcels 19,000+ residents in USC R-1, R-L1, RM, R4, C-1 Municipal Parks, Light Industrial, Residential, Education, Retail and Office

### Upper St. Clair's McLaughlin Run





#### **Key Challenges**

- In many instances, the Corridor is constrained on both sides of the stream bank within 50 to 75'
- Numerous (nearly 20) property owners adjoining both sides of the stream
- Multiple constraints exist including floodplains, hillsides, nearby road access and narrow lot widths
- An existing and somewhat eclectic mix of land uses along McLaughlin Run Road
- Promote better implementation of how buildings relate to one another and/or relate to the road
- Establish continuous linkage(s) throughout the McLaughlin Run Road Corridor for connections between/among private development and civic spaces

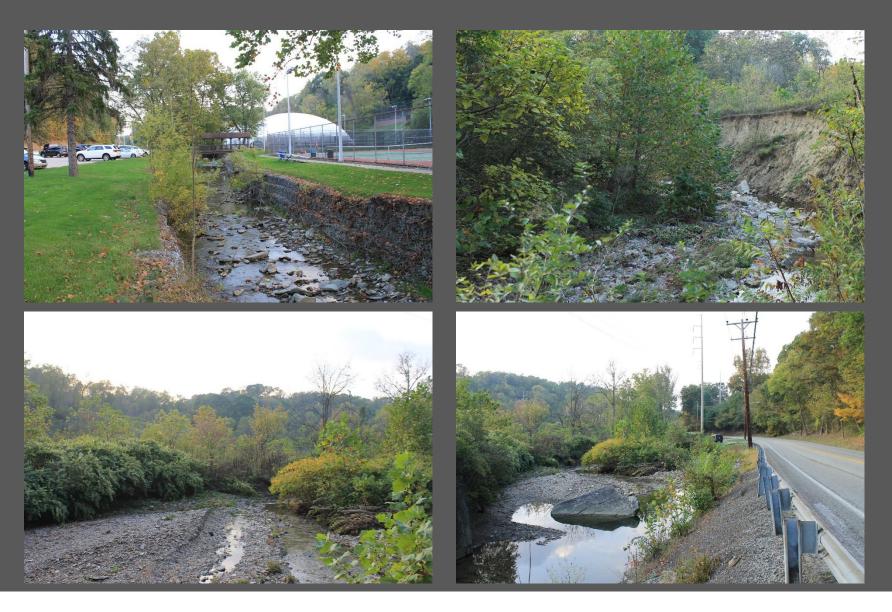


#### **Overarching Objectives**

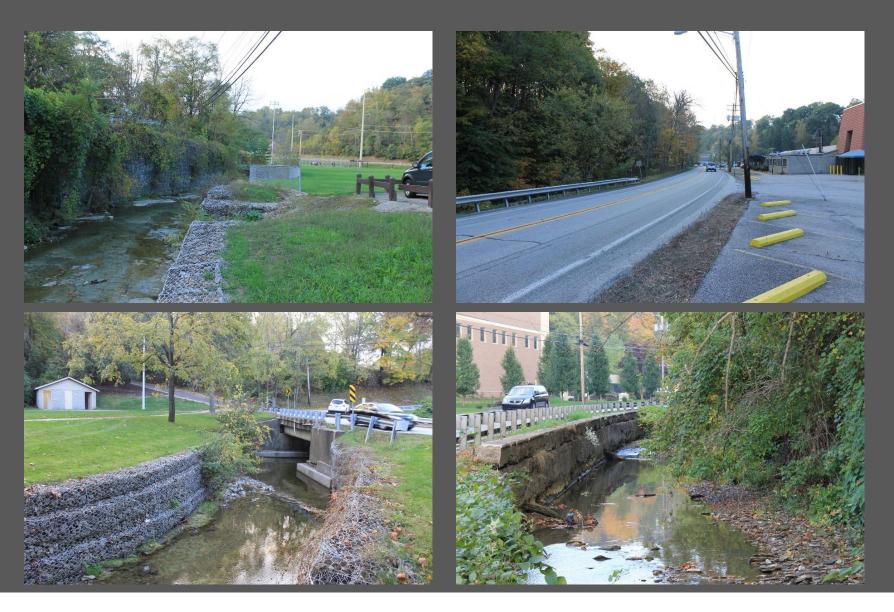
Permit safe development within a commercially valuable yet ecologically sensitive and somewhat unsettled environment

- Conserve the riparian edge of McLaughlin Run and address the morphology 'health' issues of the stream
- Encourage mixed use development to better balance the Township's land use mix
- Promote better standards or guidelines for the relationship between buildings, the stream and the road
- Establish a string of strategically positioned access points along McLaughlin Run Road in order to mitigate flood hazards and to minimize traffic long-term congestion
- Require connections between/among private development and civic spaces such as a stream side trail

#### Context



#### Context

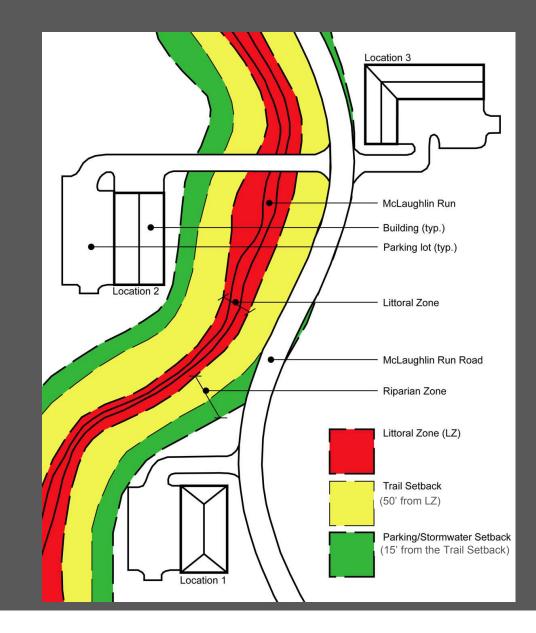


#### Approach

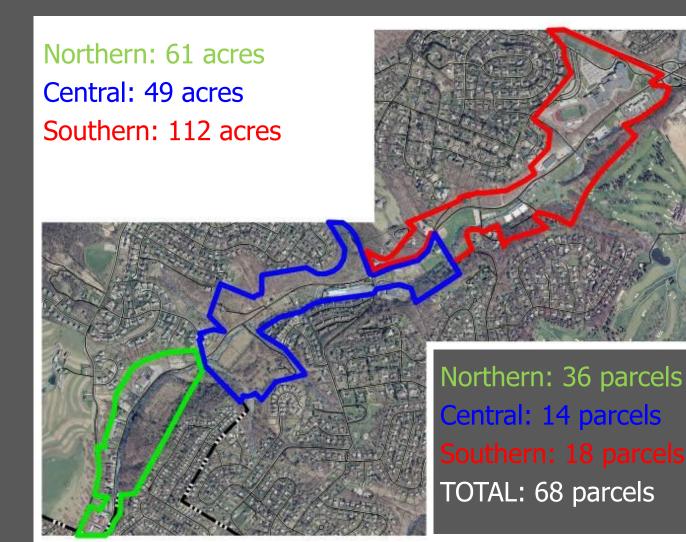
Used stream morphology as the organizing structure of the ordinances provision Employed an incentivesbased system to induce and encourage property owner/developer to 'raise' the bar

A balance between the ecological objectives and the property owner's right to realize a "reasonable" use of their properties

The Littoral Zone extends from the high water mark, which is rarely inundated, to shoreline areas that are permanently submerged.



#### **Overlay Boundary**



EPD Environmental Planning & Design, ac

#### **Key Zoning Standards**

- A. For new development or redevelopment of a lot, a maximum of twenty-five percent (25%) of the required number of parking spaces shall be permitted between the McLaughlin Run Road right-of-way and the front building facade.
- B. For development which uses impervious paving within parking areas, one (1) 4 <sup>1</sup>/<sub>2</sub>" cal. native deciduous tree shall be planted on the lot for every five (5) parking spaces provided. For development which uses pervious paving, one (1) 3" cal. native deciduous tree shall be planted on the lot for every ten (10) parking spaces provided.



#### **Key Zoning Standards**

- C. Storm water management bioretention, also know as "rain gardens," shall be a part of development within the Corridor Overlay. Properly designed facilities shall capture, retain, and infiltrate the 1/8" to 1" rain events. Runoff from a 1" rain in 24 hours shall drain within 1 to 2 days maximum. In designing for 10- to 25-year storms, an integrated system of bioretention shall be integrated into the land development. The purpose of the system shall be to mitigate peak flows and reduce downstream nuisance flooding. Construction of systems shall be in accordance Township construction standards.
- D. As enabled by the Municipalities Planning Code, Section 503(11), a landowner and/or developer shall construct pedestrian open space/trail improvements within the Overlay's defined Trail Setback. Connections to existing or proposed trail segments on adjacent lots shall be made. If the landowner and/or developer elects not to construct said improvements, the provisions of the following *Fee-in-Lieu Requirements* shall apply.

#### **Key Zoning Standards**

E. Shared Parking. For landowners and/or developers that utilize shared parking, the Township may grant the following:

Increased permitted building coverage of an additional 10%

Multiple buildings permitted to be constructed on one (1) lot

Building spacing minimum (of multiple buildings ) of 15' 130.24.6.7.4. Maximum building height increase of 35%

**Defined setbacks reduced by 30%** 

 F. Shared Access. For landowners and/or developers that utilize shared lot access, the Township may grant the following: Multiple buildings permitted to be constructed on one (1) lot



#### **Incentives and Inducements**

Upper Floor Construction Building Materials Special Architectural Features Higher Quality Landscaping Special Storm Water Management Shared Parking Shared Access



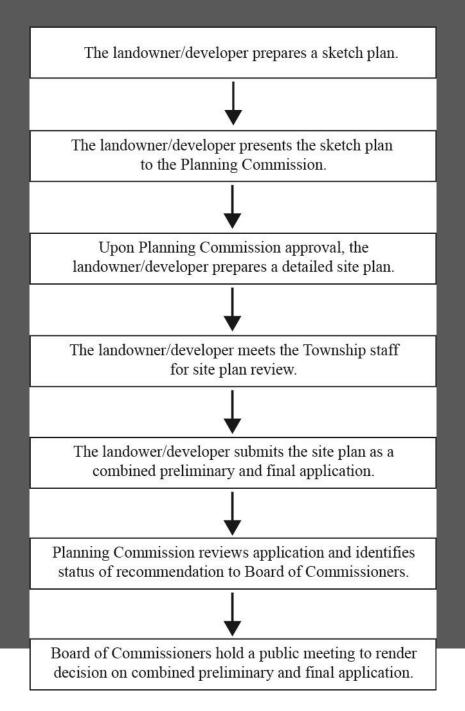






#### **Approval Process**

The overlay imposes conditional use status A sketch plan is required 1<sup>st</sup> for the Planning Commission A combined preliminary and final plan submission is available to the applicant; a draft site plan is required 2<sup>nd</sup> for Staff review A final site plan is submitted to Planning Commission **Public hearing requirement as** per the conditional use





John Theilacker, AICP (JTheilacker@brandywine.org) Dr. Seung Ah Byun, P.E., LEED AP (ByunS@brandywine.org) AJ Schwartz, AICP, RLA, LEED AP (AndrewSchwartz@epd-pgh.com)





### **RIPARIAN BUFFER PROTECTION USING MUNICIPAL ORDINANCES**

John Theilacker, AICP, Brandywine Conservancy

Dr. Seung Ah Byun, P.E., LEED AP, Brandywine Conservancy

Andrew JG Schwartz, AICP, RLA, LEED AP, Environmental Planning & Design, LLC

APA PA Conference 2015 Pittsburgh, PA October 2015



