

THE FAR SIDE

By GARY LARSON



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



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CONSERVANCY

RIPARIAN BUFFER PROTECTION USING MUNICIPAL ORDINANCES

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APA PA Conference 2015
Pittsburgh, PA
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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 and restoration.

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

An MS4 action at minimal cost to municipalities.

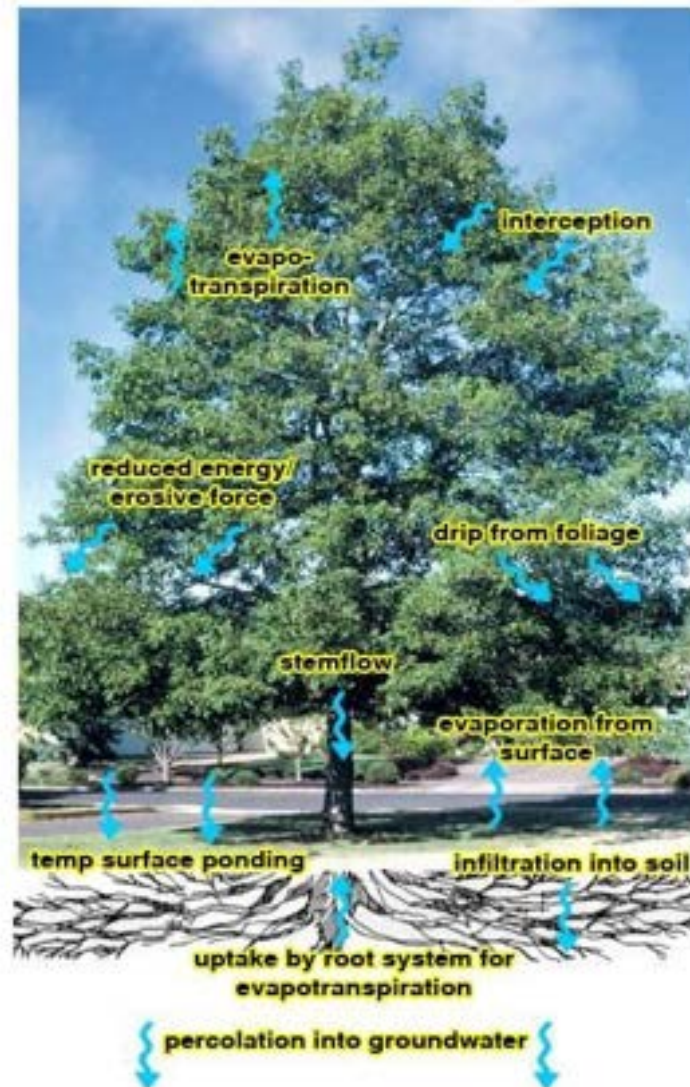


Trees provide valuable eco-services.



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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

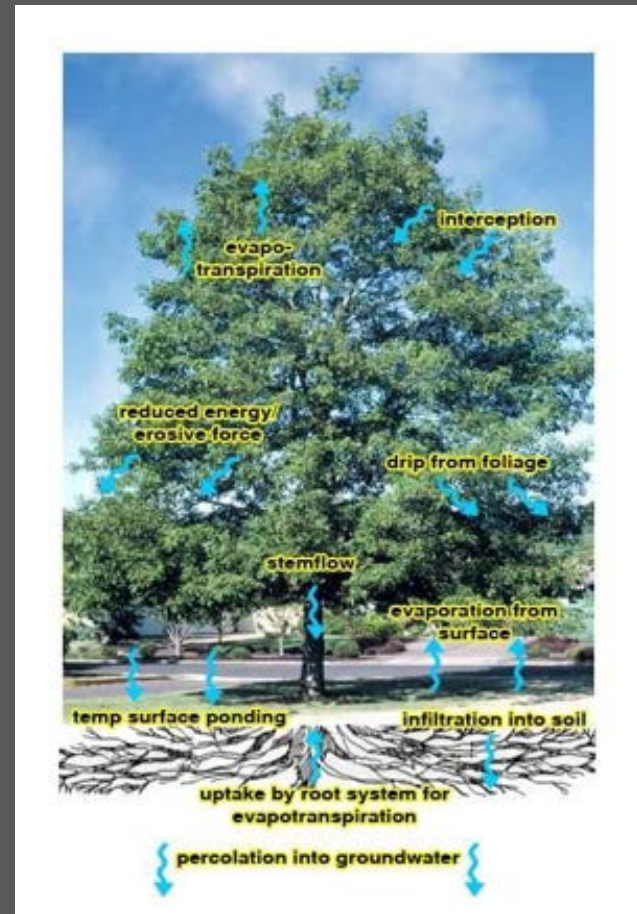
Below Ground

Infiltration/Permeation

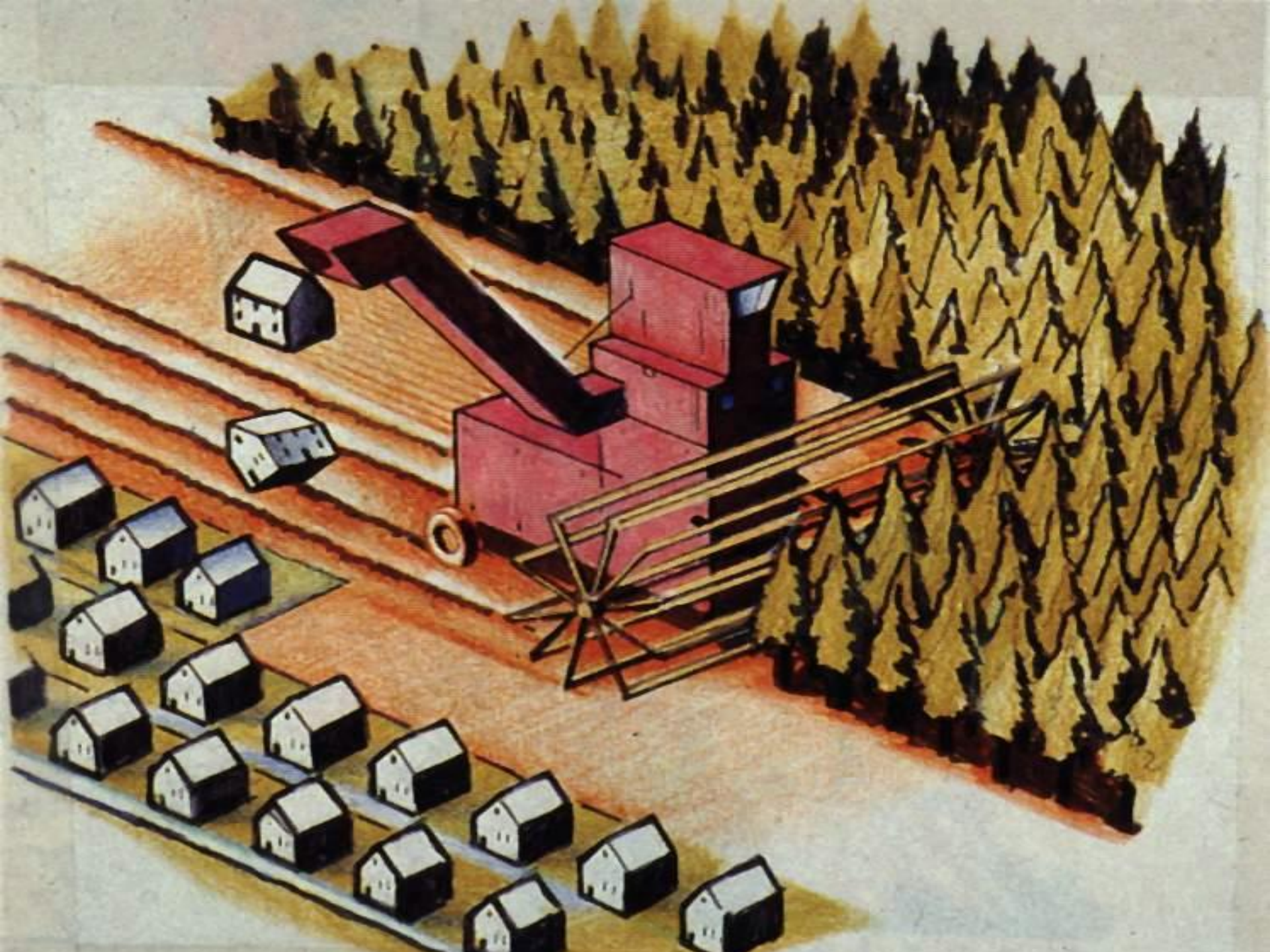
Storage

Quality Filtering/Uptake

...And this is just the beginning!

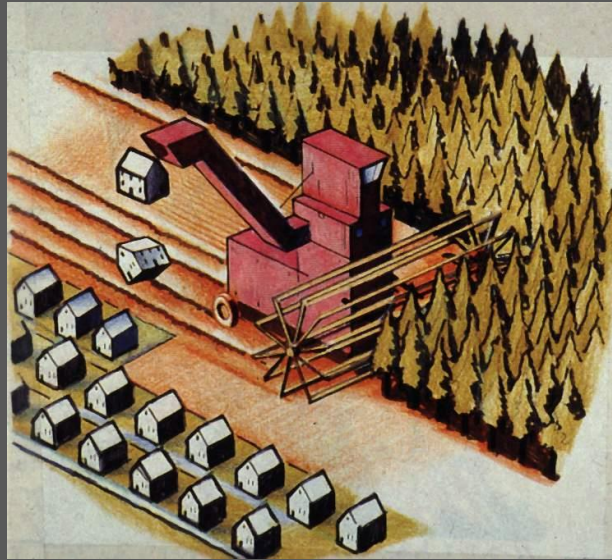


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The price we pay downstream...





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



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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



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



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



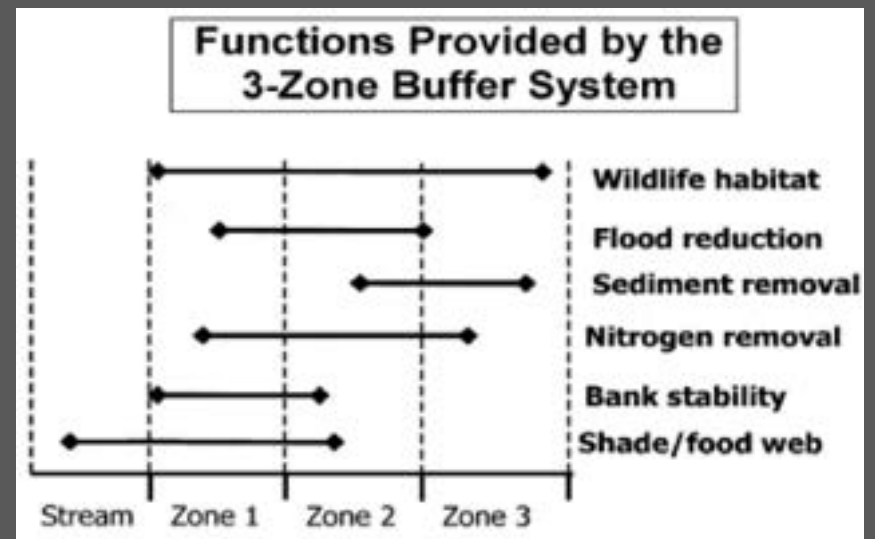
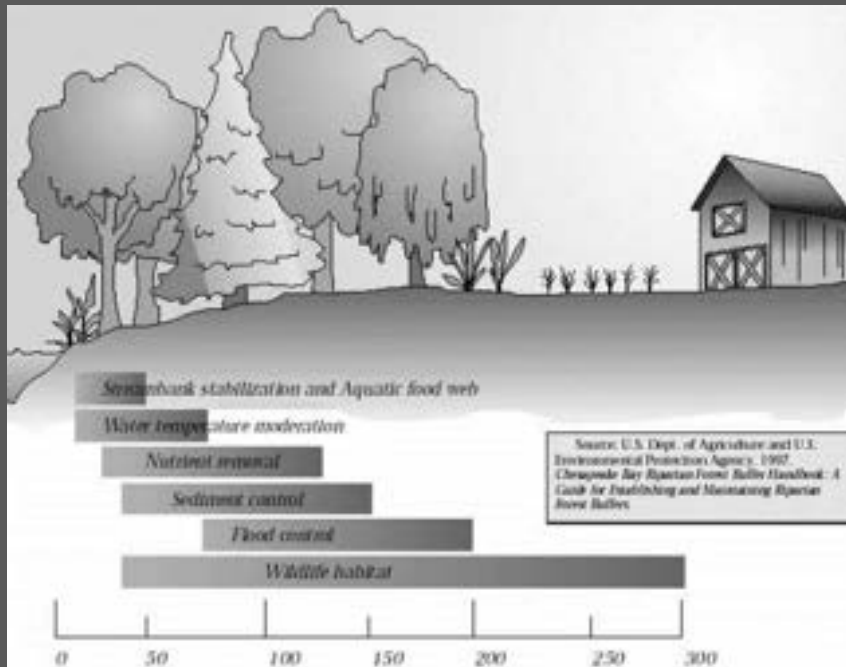
Not wide enough!

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



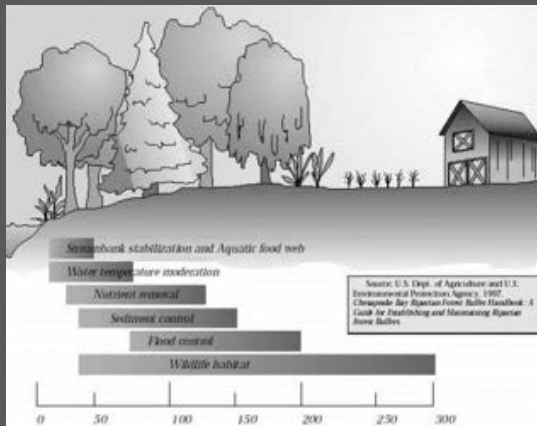
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Riparian Buffer Functions:



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 control	30 to 98 feet
Water quality	
•Nutrients	49 to 164 feet
•Pesticides	49 to 328 feet
•Biocontaminants (fecal, etc.)	30 feet or more
Aquatic habitat	
•Wildlife	33 to 164 feet
•Litter/debris	50 to 100 feet
•Temperature	30 to 230 feet
Terrestrial habitat	15 to 330 feet

THE NEWEST SCIENCE

The Stream as a Processing System



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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.*



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Wider streams have more “ecosystem” because the ecosystem is on the bottom of the stream



Forested



Deforested (grass)



Forested streams are healthier because of more natural conditions

- Temperature
- Food
- Light



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Importance of Forested 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**

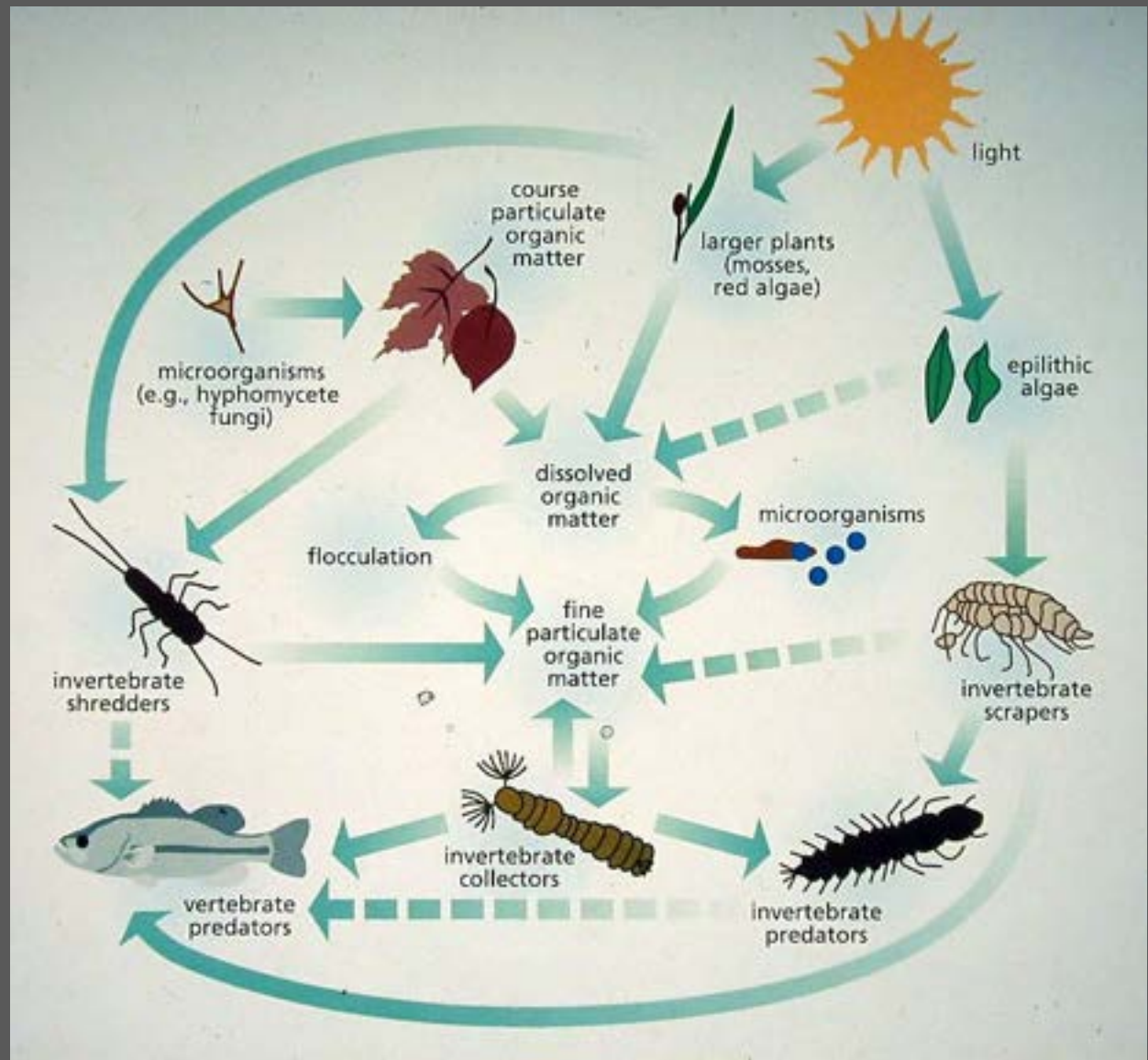


protist.i.hosei.ac.jp/.../Cladophora/index.html

Newest Science

Forested streams have:

- *more ecosystem*
- *healthier ecosystems*



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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 Forested Buffers in Headwaters

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.*



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Putting the Science to Work!

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



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THE “STATE” OF PENNSYLVANIA’S STREAM BUFFER PROTECTIONS



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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 150 foot average buffer width

Maintain native vegetation with 60% canopy

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

Multiple Exceptions



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



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PA Buffer Regulations (current)

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

- are now an option 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!*



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

Within a Zoning Ordinance

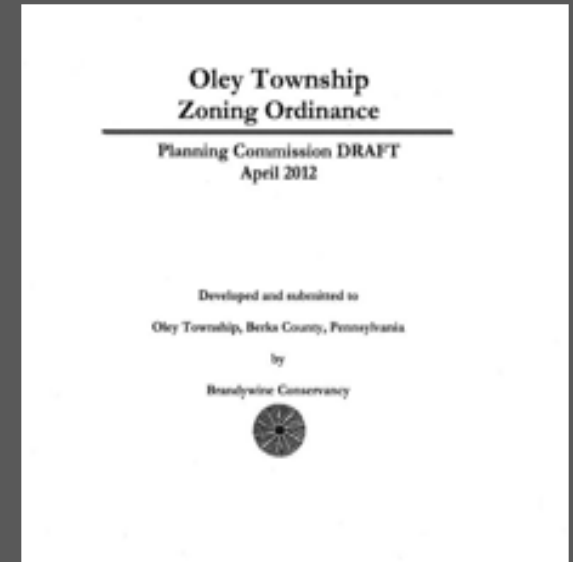
- Overlay district
- Protection standards

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:

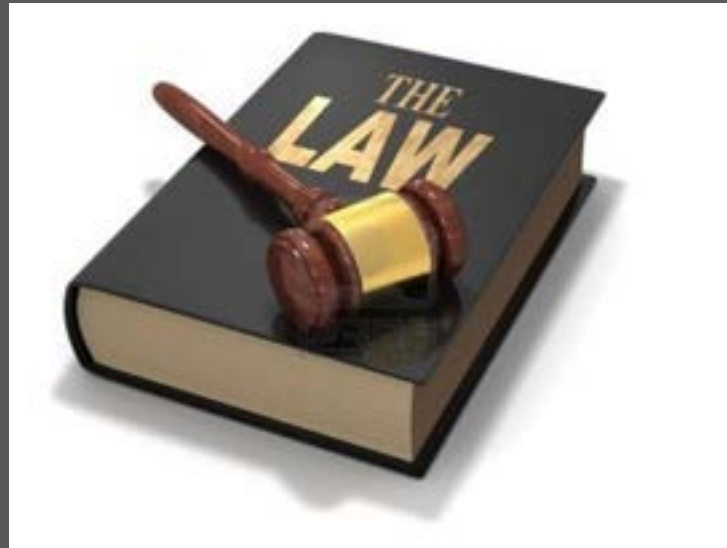
- Pennsylvania Constitution
- Municipalities Planning Code



(-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.”

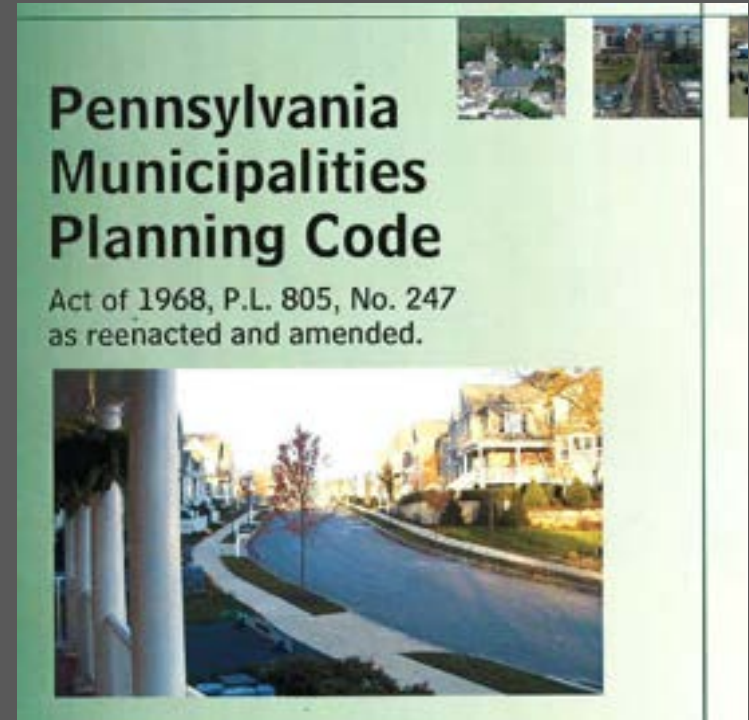


PA MPC Article VI – Zoning

Section 603(b):

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

- (1) Uses of land, watercourses and other bodies of water;
- (2) Protection and preservation of natural and historic resources 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:

- (i) 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.”



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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 numerous water quality and other public benefits. Pennsylvania municipalities may ensure the protection and restoration of riparian buffers with their land use regulations.



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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 watershed 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, so forested 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 waters.

This guide, together with the (draft) *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 substantial public

A Scientific Foundation for Shaping Riparian Buffer Protection Regulations



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

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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 non-point 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/habitat production areas

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 bank and 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; forest corridors for habitat conservation and greenways, and protect associated wetlands.

Forested riparian buffers in headwaters that order stream catchment high levels of organic inputs directly from land to water, which in turn maximize in-stream 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 "ecosystem") 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, maintain erosion of stream or 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, across, or over corridors.

Last updated on May 31, 2014



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



PENNSYLVANIA
LAND TRUST
ASSOCIATION



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Edition of April 25, 2014

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

- Conserve, protect, and restore natural riparian resources through scientifically supported processes.
- 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.
- 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, adsorption, 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.
- Attenuate flooding and reduce soil loss.
- 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.

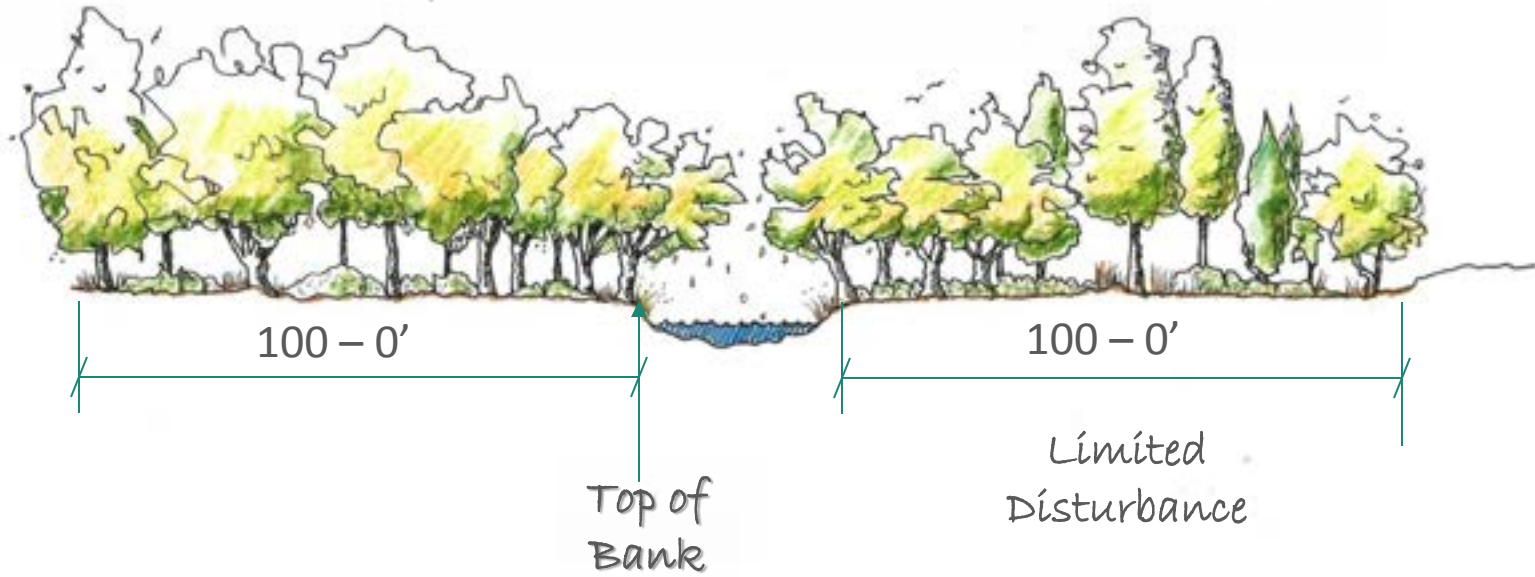
Find the latest edition of this model at ConservationTools.org

NEW MODEL ORDINANCE:

What Does It Do?

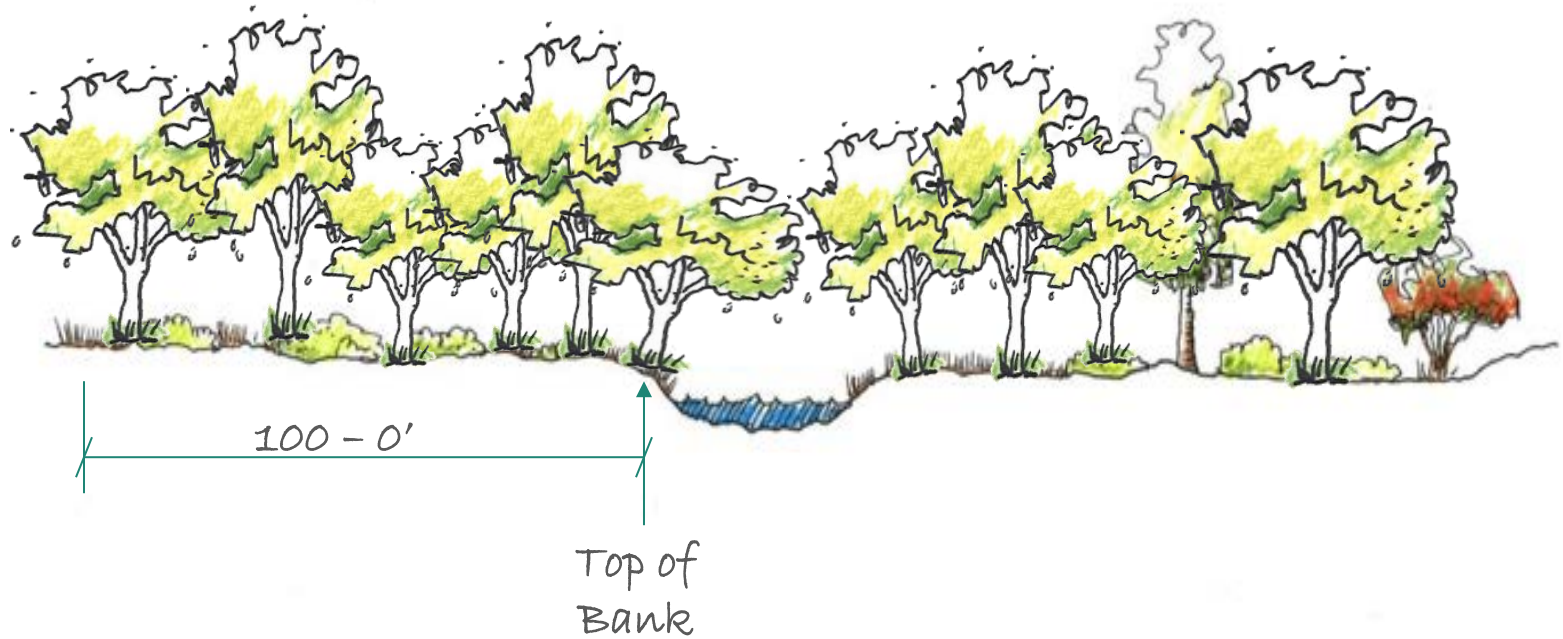
Preserves existing riparian buffers

Forested Riparian Buffers (existing)



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Minimum of 60% native tree
canopy in riparian buffer



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Restoration to minimum 60% native tree canopy
in riparian buffer

Restores impacted riparian buffers

CONSERVANCY MODEL APPLIES TO WETLANDS



AND CAN BE MODIFIED FOR WIDE
FLOODPLAINS AND STEEP
SLOPES.



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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



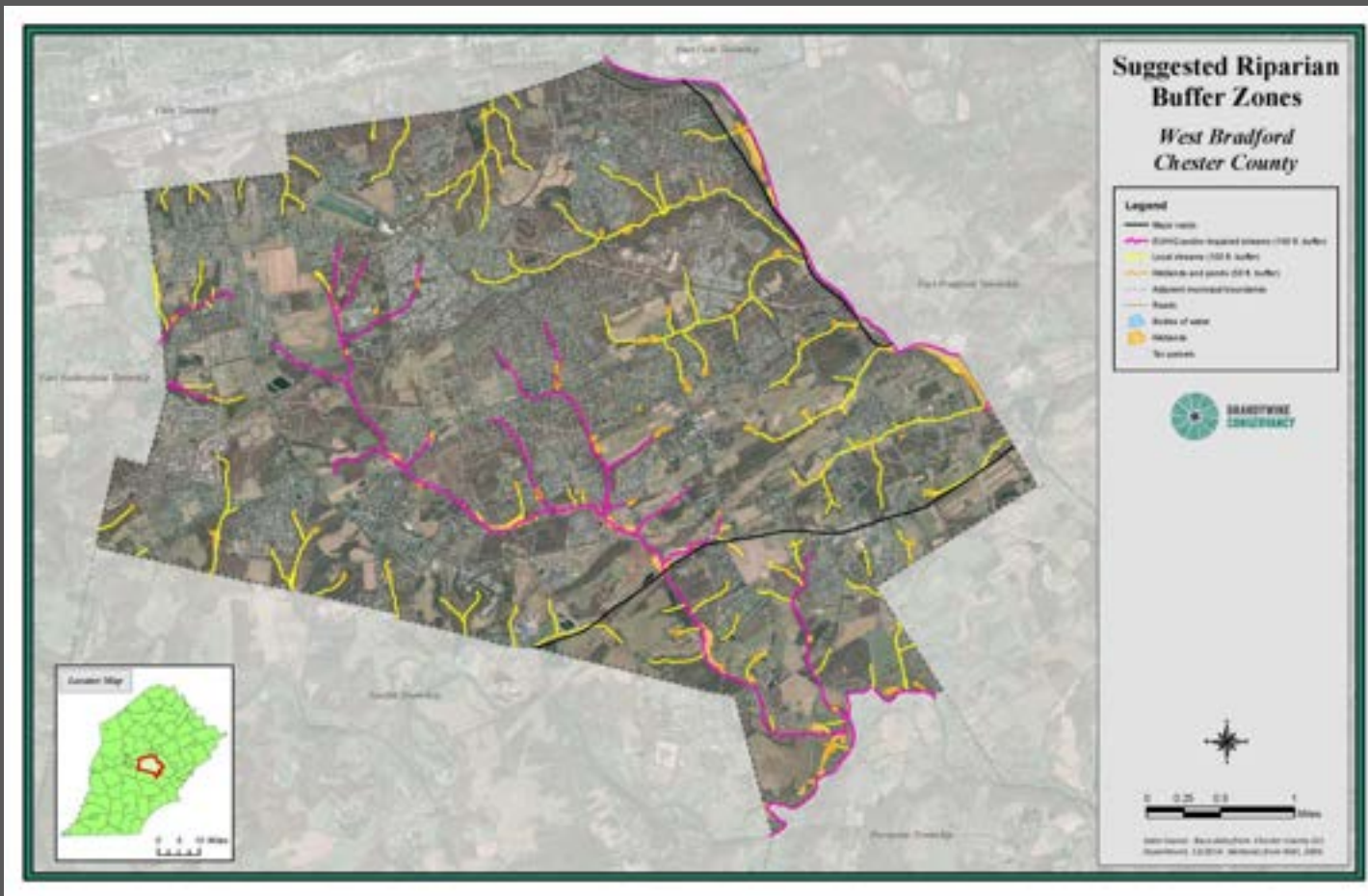
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RIPARIAN BUFFER ANALYSIS

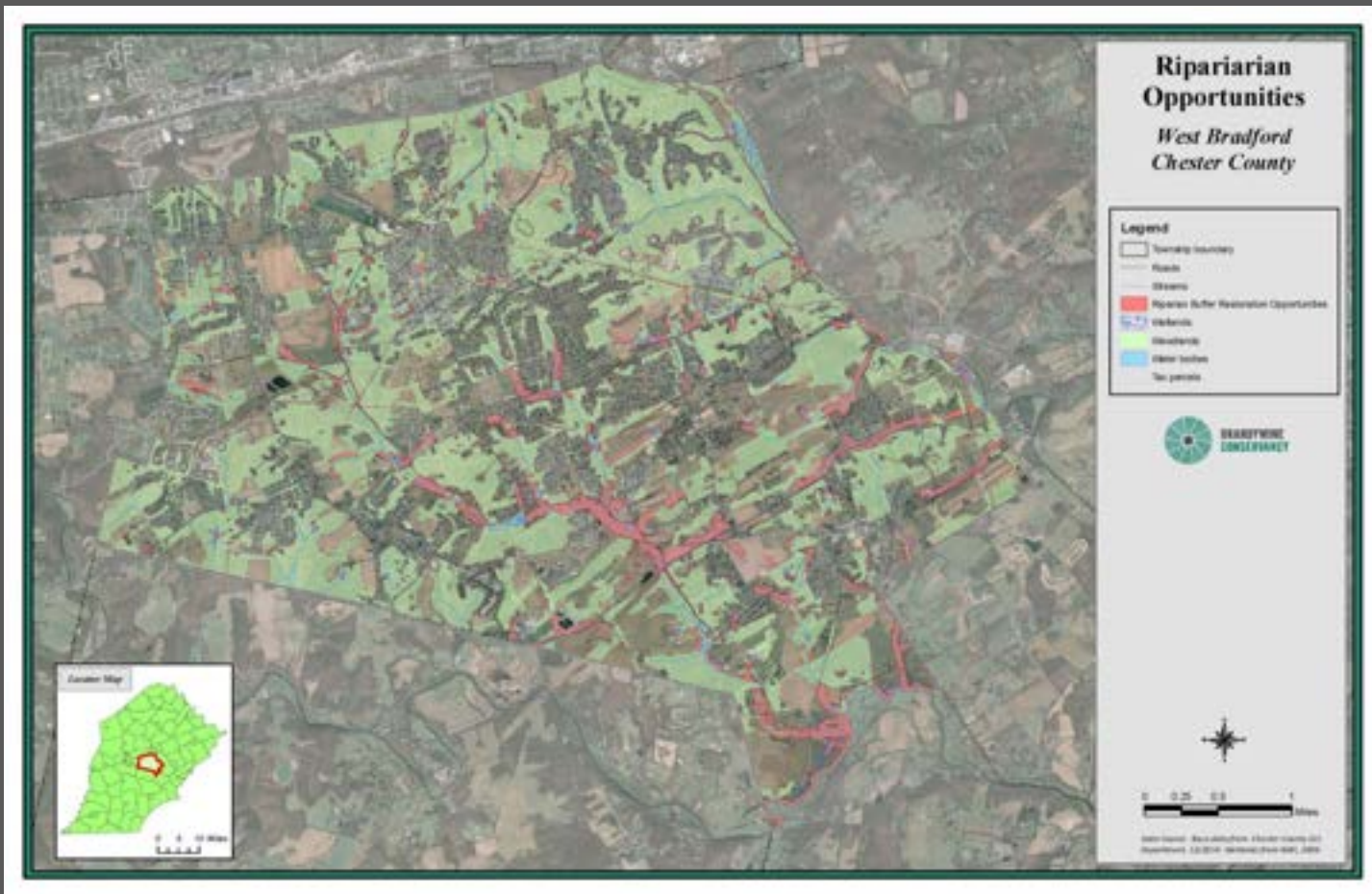


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Riparian Buffer Zones



Riparian Restoration Opportunities

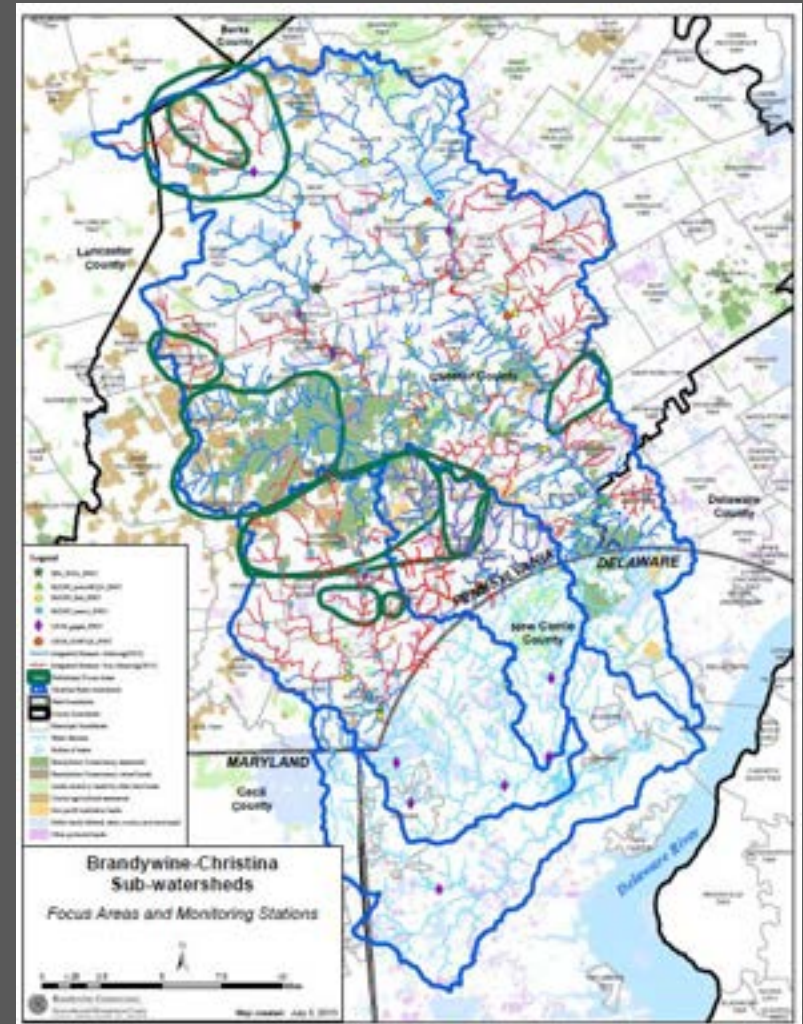


William Penn Foundation/Delaware River Watershed Project

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



William Penn Foundation Grant Project Brandywine-Christina Cluster

Chester County, PA



Additional Municipal Outreach

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



William Penn Foundation Grant Project Brandywine-Christina Cluster

Chester County, PA



0 2.5 5 10 Miles

Legend

- Streams (non-attaining)
- Streams (attaining)
- Municipalities
- Chester County boundary

10 Municipalities for Assessments

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



William Penn Foundation Grant Project Brandywine-Christina Cluster

Chester County, PA



0 2.5 5 10 Miles

Legend

- Streams (non-attaining)
- Streams (attaining)
- Municipality
- Chester County boundary

10 Municipalities for Assessments

Summary of Assessment Findings:

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



William Penn Foundation Grant Project Brandywine-Christina Cluster

Chester County, PA



Potential Riparian Buffer Ordinance Adoption

7 potential adoptions

William Penn Foundation Grant Project Brandywine-Christina Cluster

Chester County, PA



0 2.5 5 10 Miles

Legend

- Streams (non-attaining)
- Streams (attaining)
- Municipalities
- Chester County boundary



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Riparian Buffer Ordinance Adoption

4 Confirmed

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Chester County, PA



0 2.5 5 10 Miles

Legend

- Streams (non-attaining)
- Streams (attaining)
- Municipalities
- Chester County boundary



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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



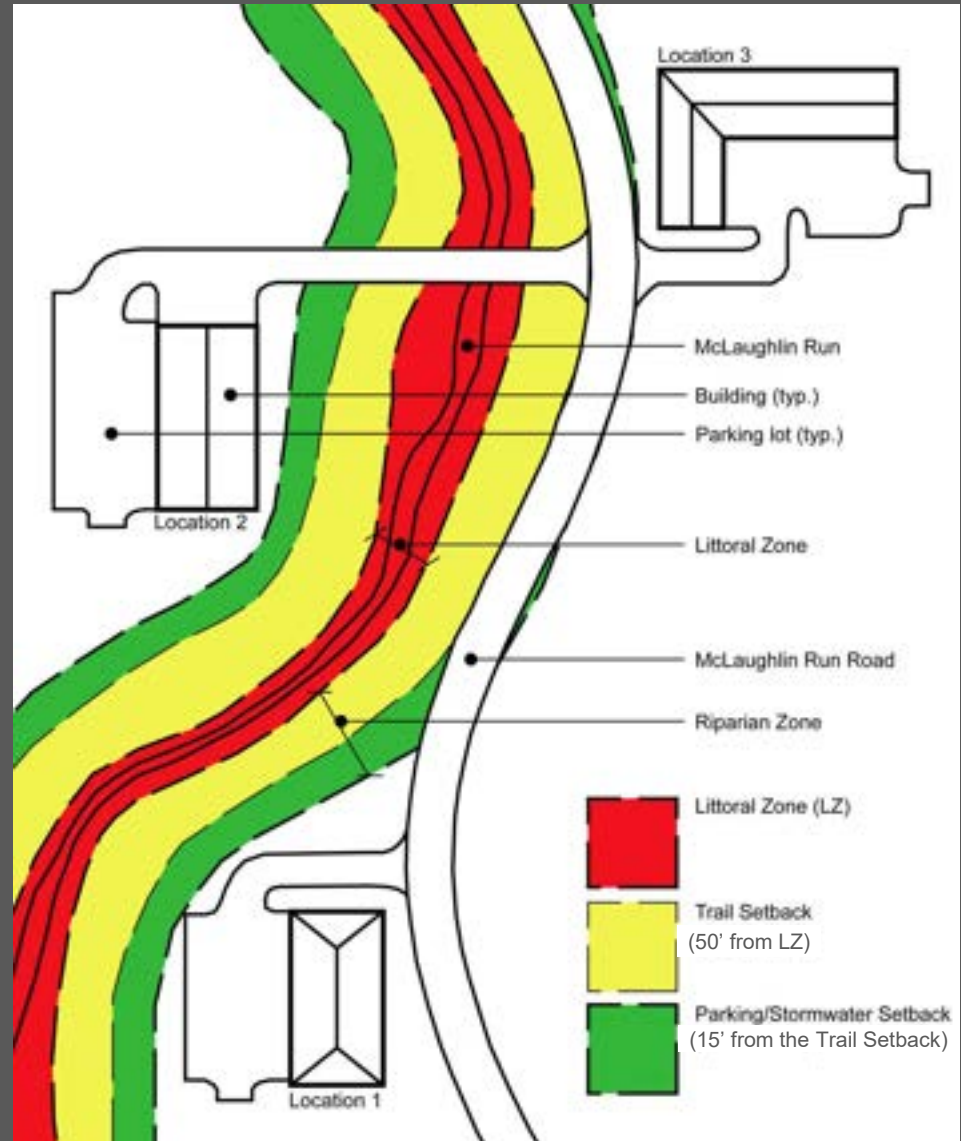
Approach

Used stream morphology as the organizing structure of the ordinances provision

Employed an incentives-based system to induce and encourage property owner/developer to 'raise' the bar

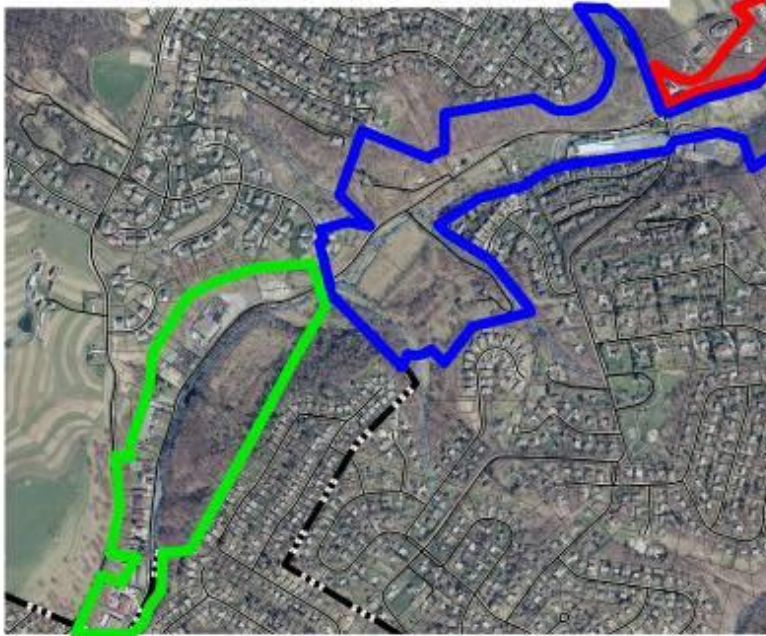
A balance between the ecological objectives and the property owner's right to realize a "reasonable" use of their properties

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



Overlay Boundary

Northern: 61 acres
Central: 49 acres
Southern: 112 acres



Northern: 36 parcels
Central: 14 parcels
Southern: 18 parcels
TOTAL: 68 parcels

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 ½" 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

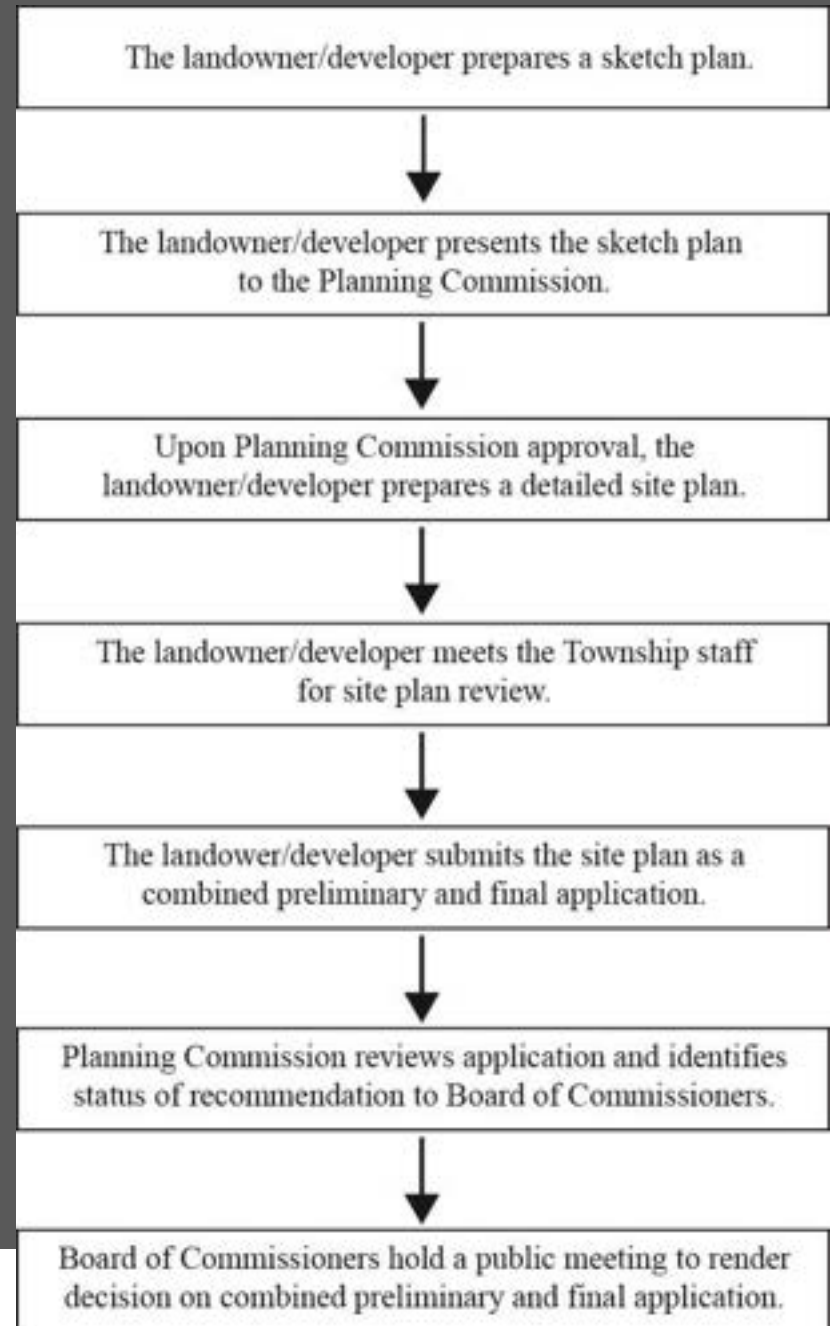
The overlay imposes conditional use status

A sketch plan is required 1st for the Planning Commission

A combined preliminary and final plan submission is available to the applicant; a draft site plan is required 2nd for Staff review

A final site plan is submitted to Planning Commission

Public hearing requirement as per the conditional use



Questions?

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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

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Design, LLC

APA PA Conference 2015
Pittsburgh, PA
October 2015



BRANDYWINE
CONSERVANCY

