

# BREAKNECK CREEK STREAM RESTORATION

As Part of the Adams Township MS4 Program



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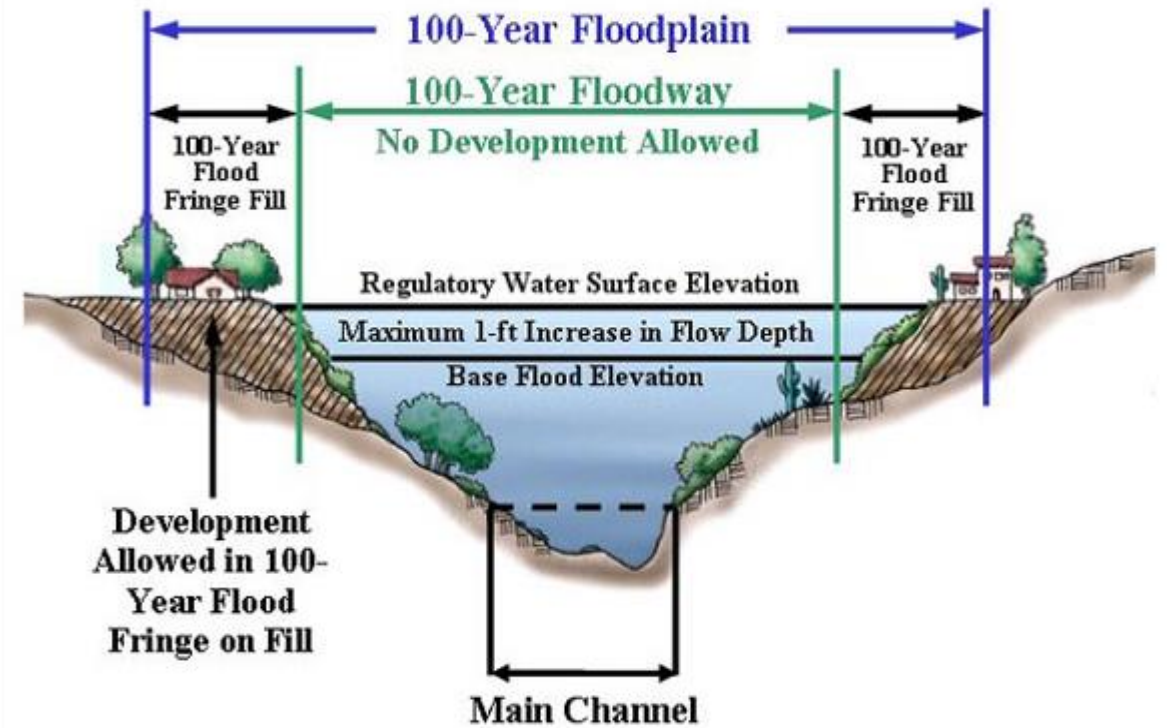
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# TERMINOLOGY

- **MS4** = Municipal Separate Storm and Sewer System
- **BMP** = Best Management Practices
- **NPDES** = National Pollutant Discharge Elimination System
- **PRP** = Pollutant Reduction Plan
- **PAG-13** = Pennsylvania General Permit #13  
(NPDES General Permit for Stormwater Discharges from Small MS4's)
- **FIRM** = Flood Insurance Rate Map
- **Rainfall Intensity** = in/hour
- **100yr Storm Event** = 1% chance/year
- **Volume vs. Peak rate of runoff**



# TERMINOLOGY



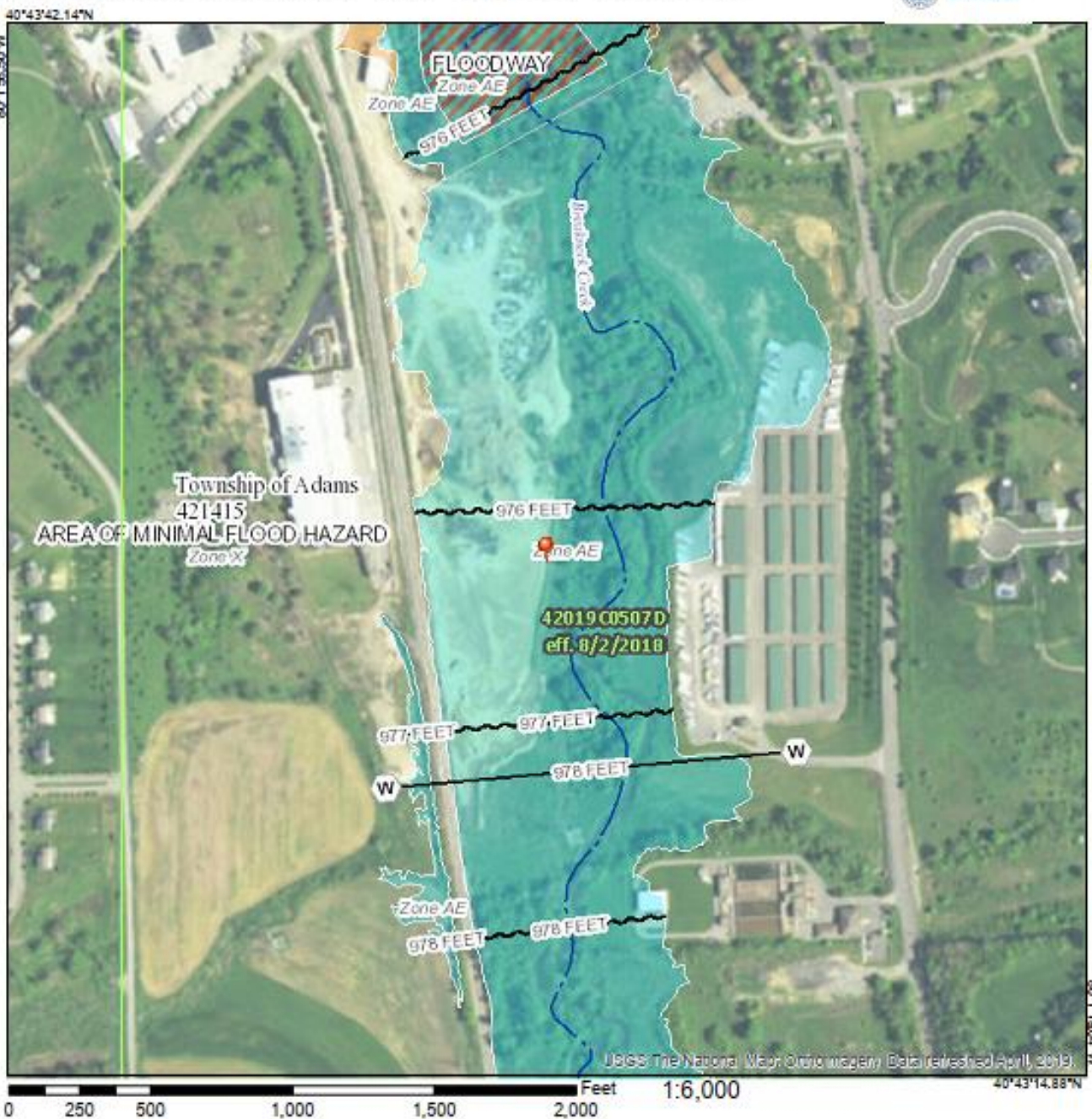


# LEGISLATION

## Title 44 CFR §60.3.C.10

(10) Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

# National Flood Hazard Layer FIRMette



### Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, X99</i>
		With BFE or Depth <i>Zone AE, AD, AH, VE, AH</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone B</i>
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
	MAP PANELS	
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/1/2019 at 1:56:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

- Areas void of FEMA delineated Floodway; the Floodway is assumed 50ft from top of bank



# PA DEP MS4 PROGRAM

## History:

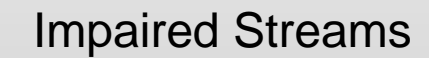
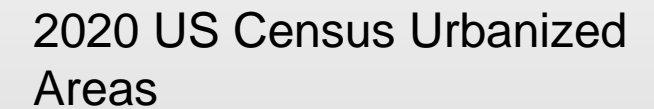
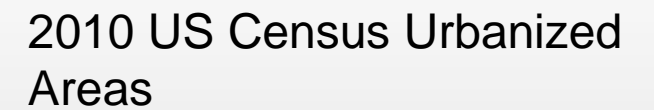
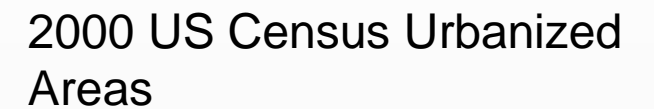
- Federal EPA started back in 1990's under Clean Water Act
- Main focus to be improving the water quality of waterways
- Stormwater runoff is largest contributing factor to water quality.

## Compliance:

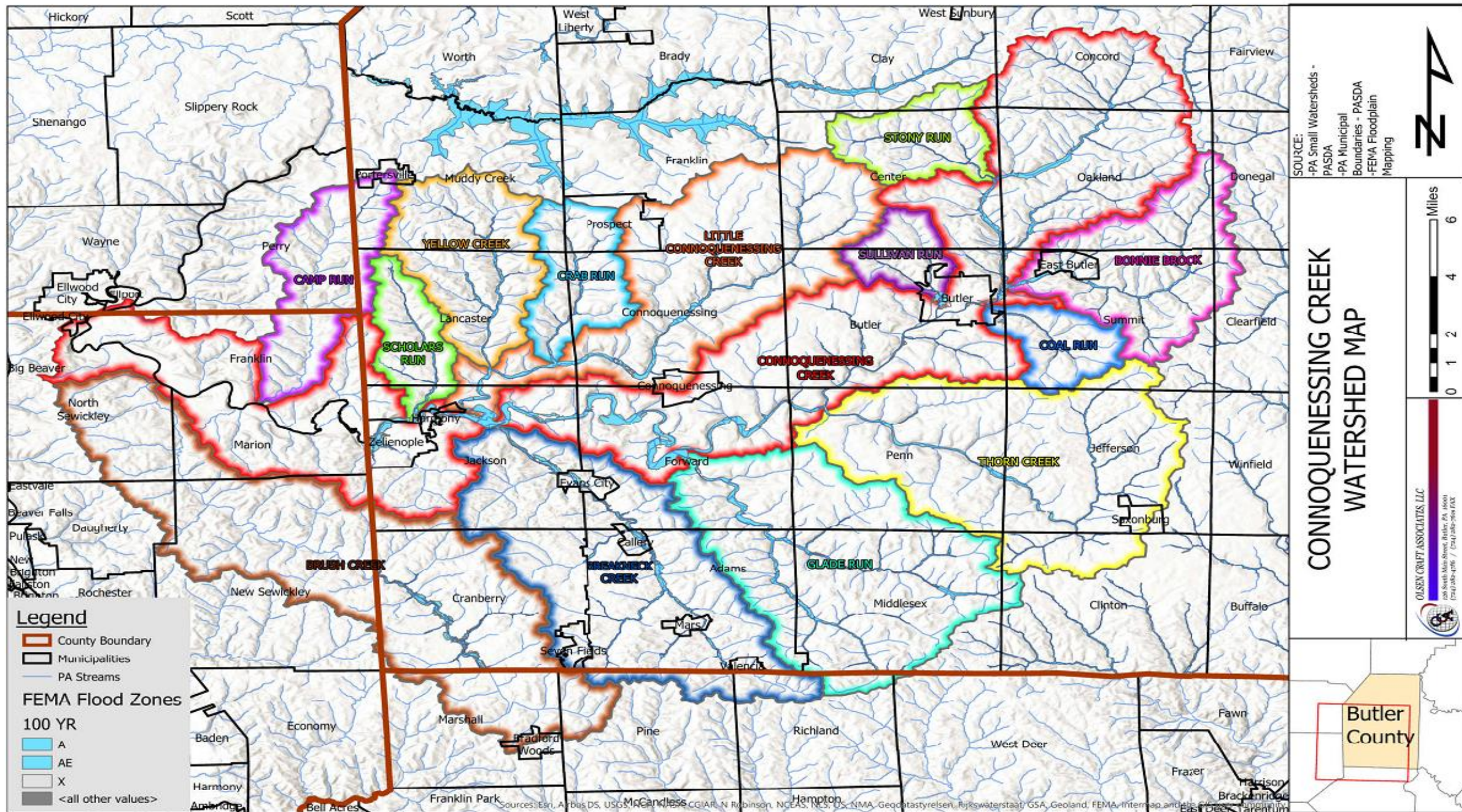
- Based on US Census Urbanization Mapping
- NPDES permits regulate point source discharges to streams
  - Point Source = Any stormwater that is collected or channeled
  - Non-Point Source = Sheet flow from roads, buildings, ect. – not regulated
- 6 Control Measures
  1. Public education and outreach
  2. Public involvement and participation
  3. Illicit discharge detection and elimination
  4. Construction site stormwater runoff control
  5. Post-construction stormwater management
  6. Pollution prevention/good housekeeping for municipal operations
- Municipalities have 5 years from time of notification to become compliant
- Municipalities can choose from list of approved BMP's from DEP ([PA DEP BMP Effectiveness Values](#))
- EPA has fined municipalities found not in compliance. [EPA MS4 fines article](#)



1" of rain on 1 Acre =  
27,154 gallons  
113 Tons









FEE CATEGORY ▾	MS4 STATUS ▾	REGION ▾	COUNTY ▾	MUNICIPALITY ▾
PAG-13 MS4 General Permit	Active	NWRO	Butler	Adams Twp
PAG-13 MS4 General Permit	Active	NWRO	Butler	Butler City
PAG-13 MS4 General Permit	Active	NWRO	Butler	Cranberry Twp
PAG-13 MS4 General Permit	Active	NWRO	Butler	Evans City Boro
PAG-13 MS4 General Permit	Active	NWRO	Butler	Mars Boro
PAG-13 MS4 General Permit	Active	NWRO	Butler	Seven Fields Boro
PAG-13 MS4 General Permit	Active	NWRO	Butler	Valencia Boro
MS4 Waiver - PAG-13	Active	NWRO	Butler	Callery Boro
MS4 Waiver - PAG-13	Active	NWRO	Butler	Forward Twp
MS4 Waiver - PAG-13	Active	NWRO	Butler	Harmony Boro
MS4 Waiver - PAG-13	Active	NWRO	Butler	Jackson Twp
MS4 Waiver - PAG-13	Active	NWRO	Butler	Middlesex Twp
MS4 Waiver - PAG-13	Active	NWRO	Butler	Saxonburg Boro
MS4 Waiver - PAG-13	Active	NWRO	Butler	Zelienople Boro
MS4 Waiver - Individual	Active	NWRO	Butler	Jefferson Twp
MS4 Waiver - Individual	Active	NWRO	Butler	Winfield Twp
MS4 Individual Permit	Active	NWRO	Butler	Buffalo Twp

# BUTLER MS4 COMMUNITIES

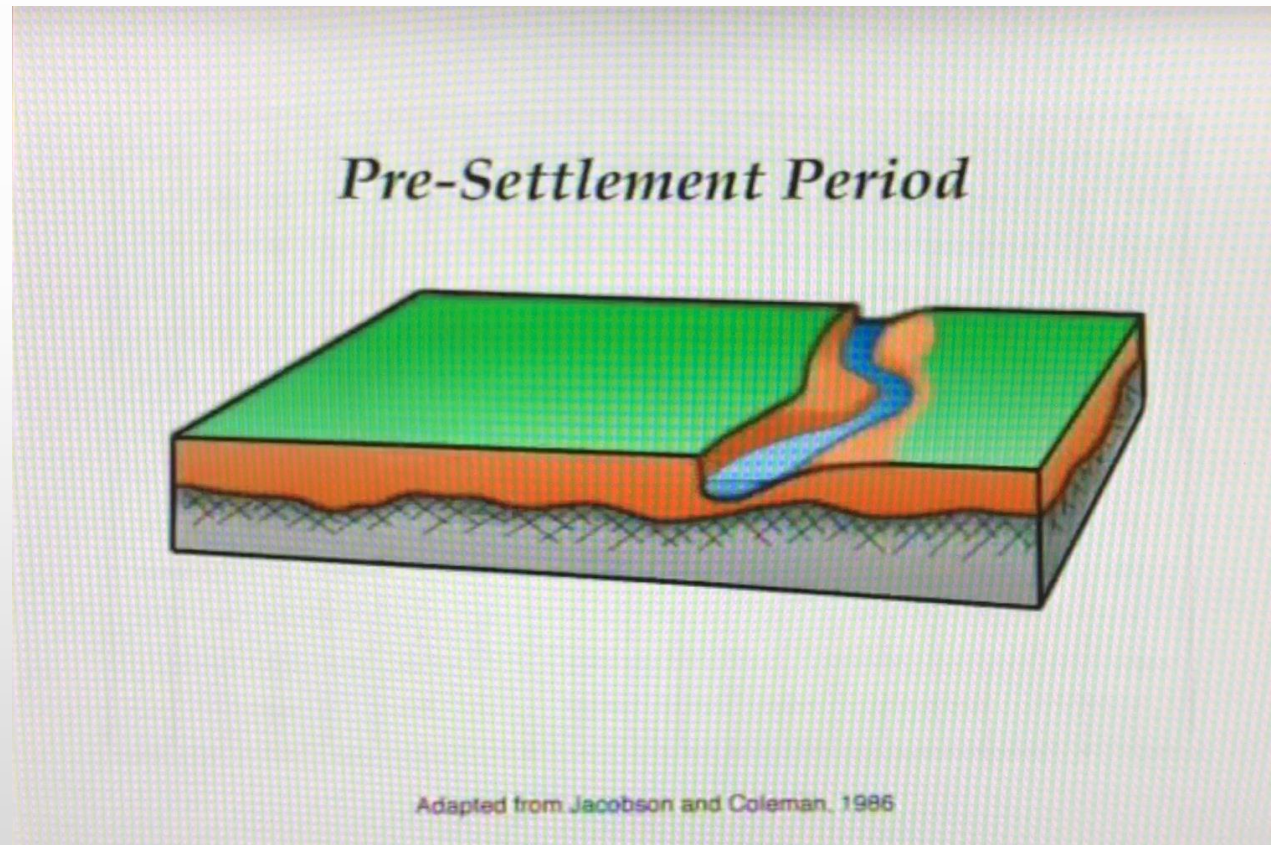
- [PA DEP MS4 Guidelines](#)

List of Butler County MS4 Communities

What to Expect:

- Existing waivers will not continue through next Census more than likely
- Additional municipalities will be added based on census urbanized area.
- Some municipalities are implementing stormwater fees.

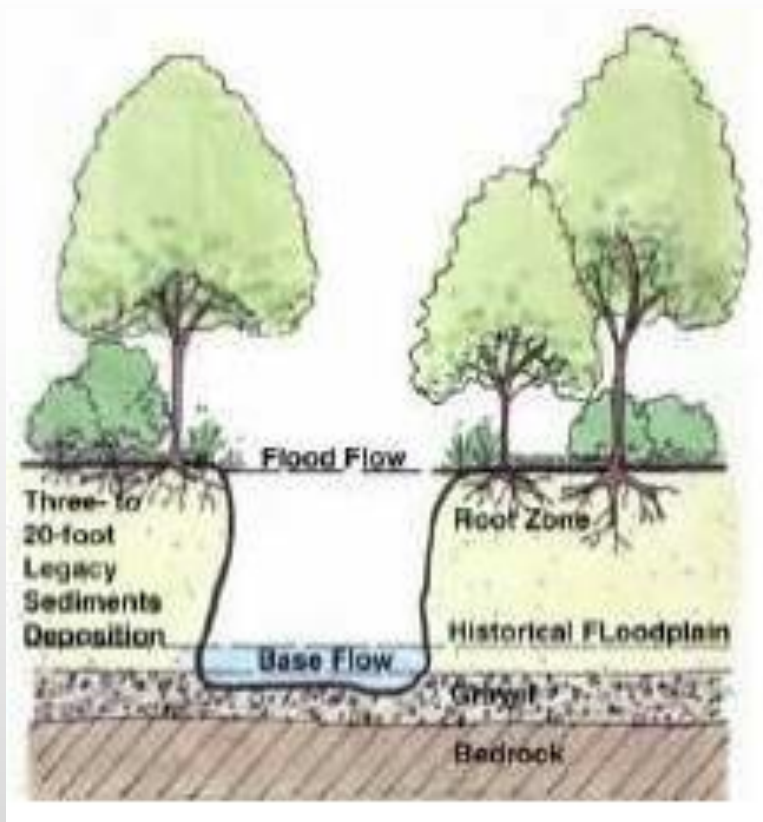
# STREAM HISTORY



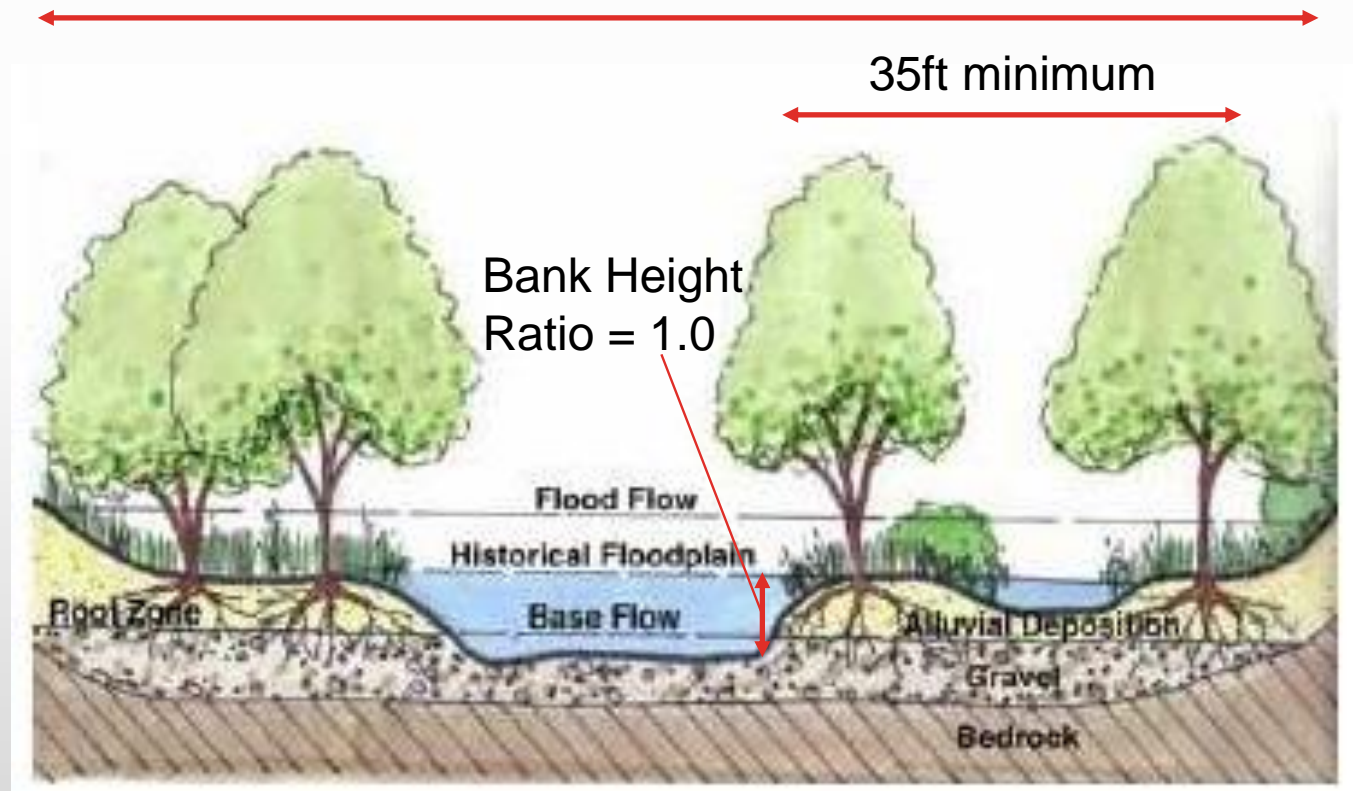


# STREAM RESTORATION AS MS4 BMP

Both sides of stream when “need to do so”



BEFORE



AFTER

# STREAM RESTORATION AS MS4 BMP

## Multi-Faceted:



## Big Spring Run, Lancaster, PA:

Sediment Removed = 25,955 lbs  
Annual Sediment Reduction = 109 Tons  
Linear Feet Restored = 3,000 ft

- In 4 - 7 years targeted BSR-type restorations in Lancaster County alone would meet the PA State phosphorus and sediment load reduction goals for 2025

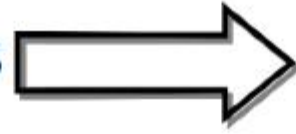




# Big Spring Run, Lancaster County PA

**Typical Existing Conditions**

**9/13/2011**



**Restoration**

**07/27/2012**





# ADAMS TWP. STREAM RESTORATION PROJECT

## Why:

- Controlled sediment removal.
- Nutrient reduction
- Restored floodway/floodplain
- Habitat improvement
- Stormwater control
- Future recreation/education



## Project Area

- **4,695** linear feet of stream bank.
- Estimated **210,710 lbs/yr** of sediment is be removed



# STREAM PROJECT

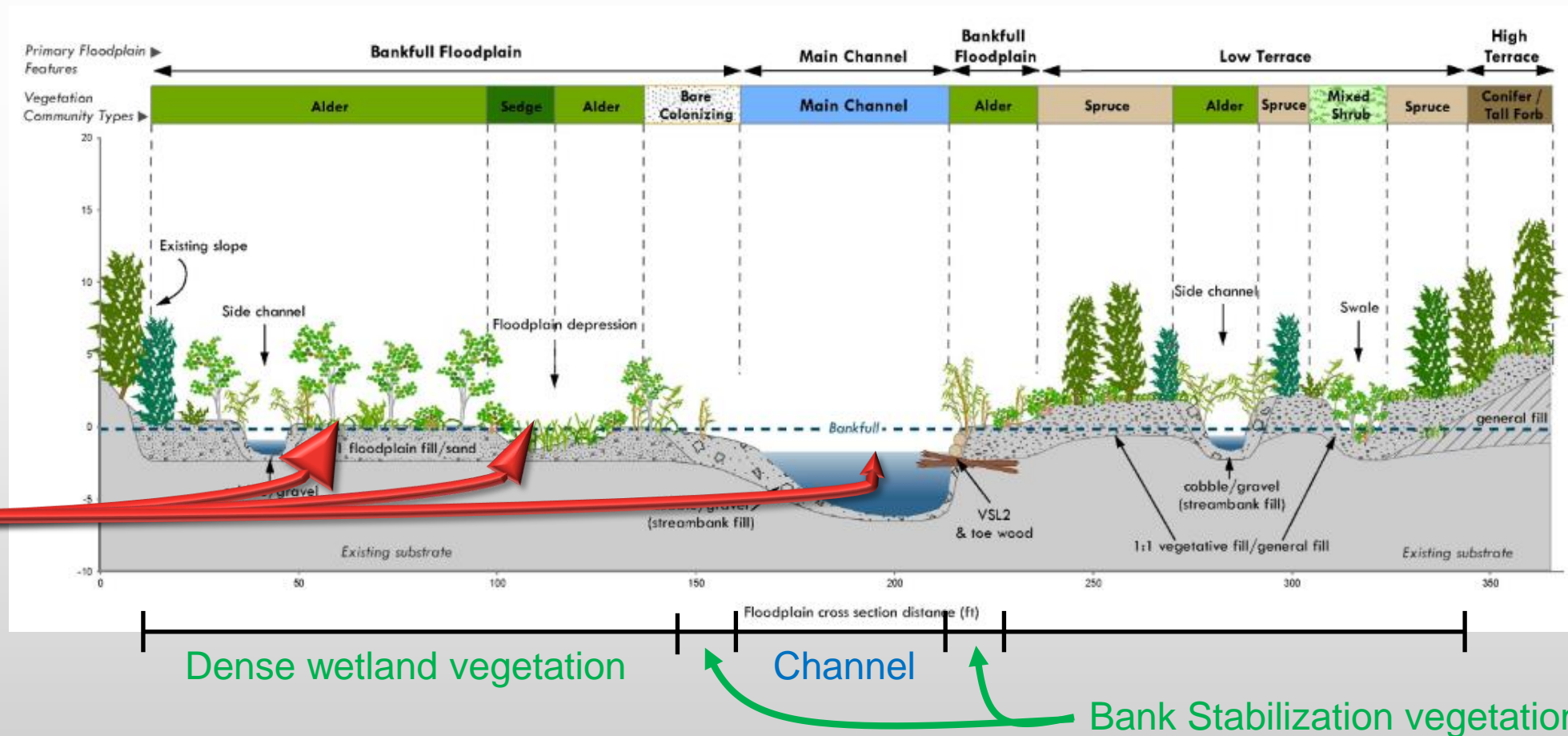
m the project

## WHY ARE WETLANDS IMPORTANT?



# ADAMS TWP. STREAM RESTORATION PROJECT

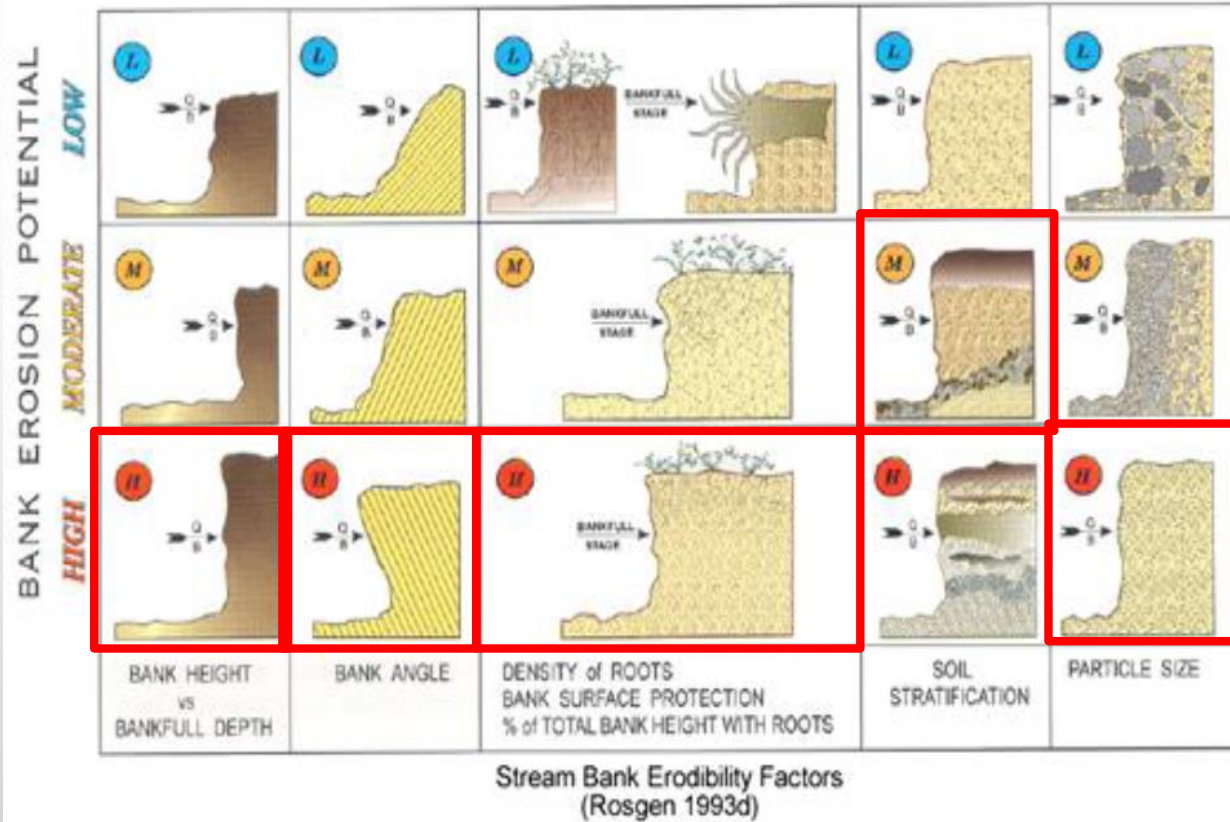
- Wetlands are the “filters” of an ecosystem



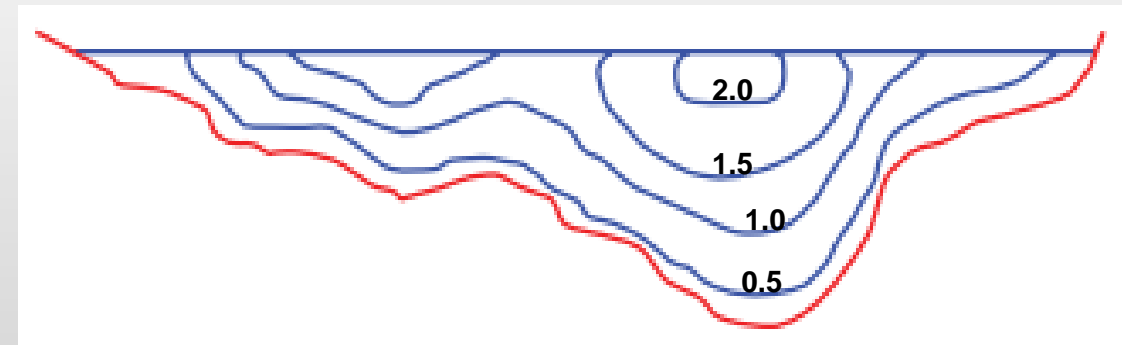


# ADAMS TWP. STREAM RESTORATION PROJECT

## • Stream Bank Erosion Potential



- Breakneck Creek 5-6-foot-high banks
- Sediment soils
- Lack of deep root vegetation
- Bank angle = 90°

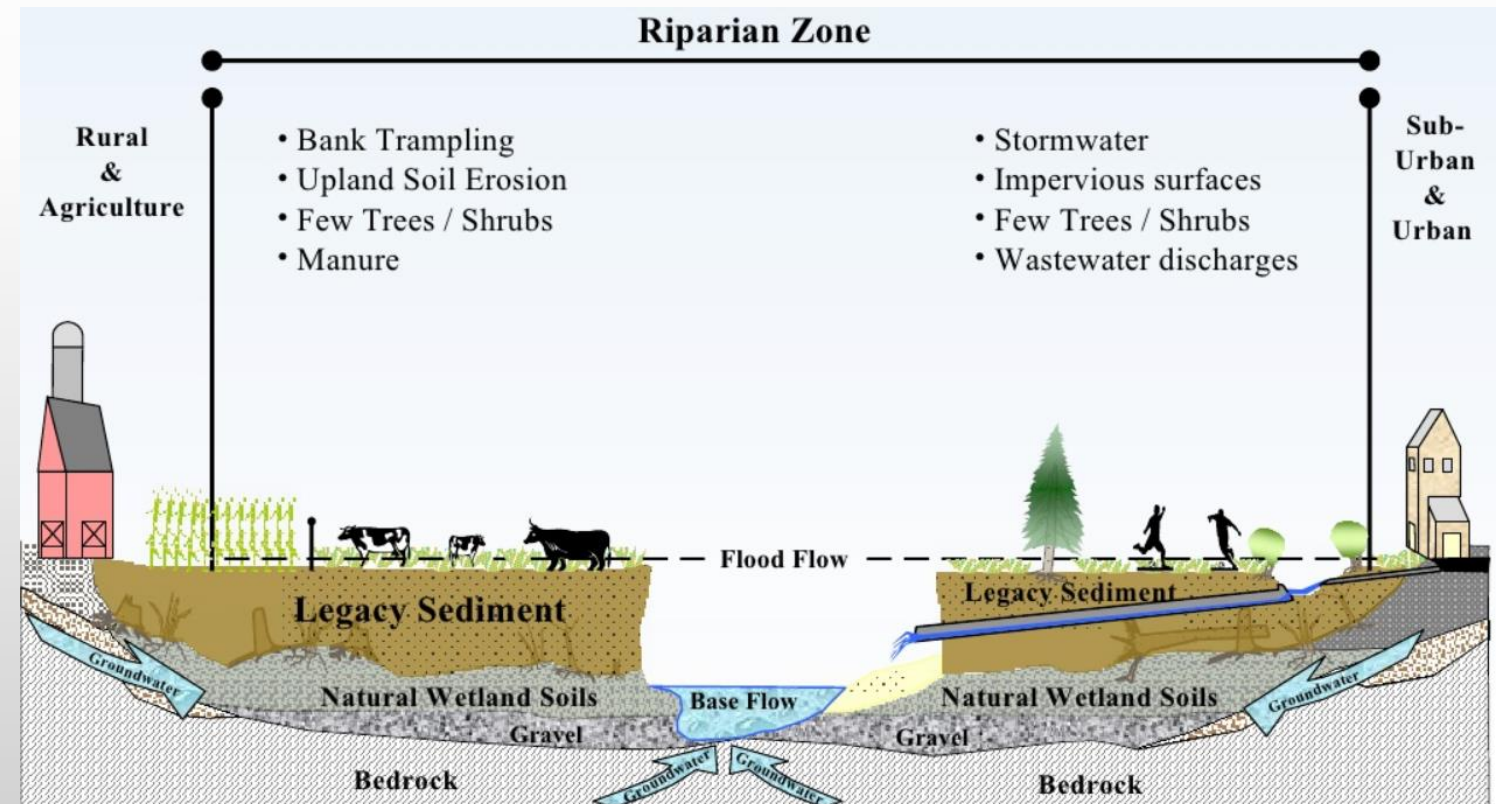
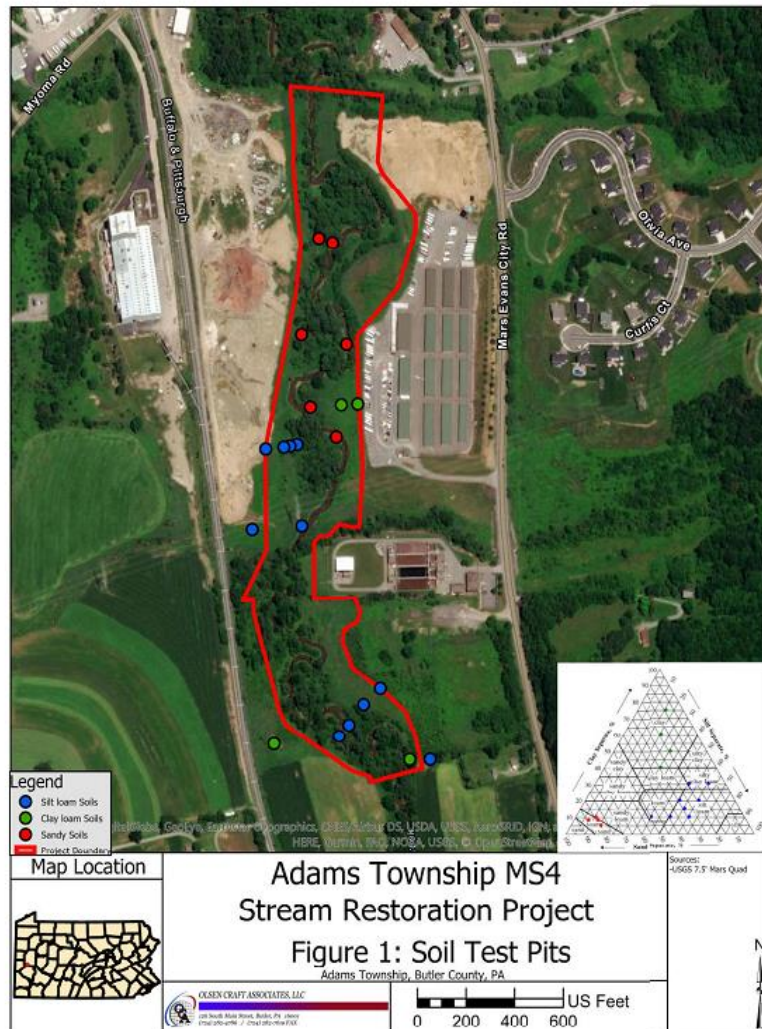


Natural Stream Velocities Profile



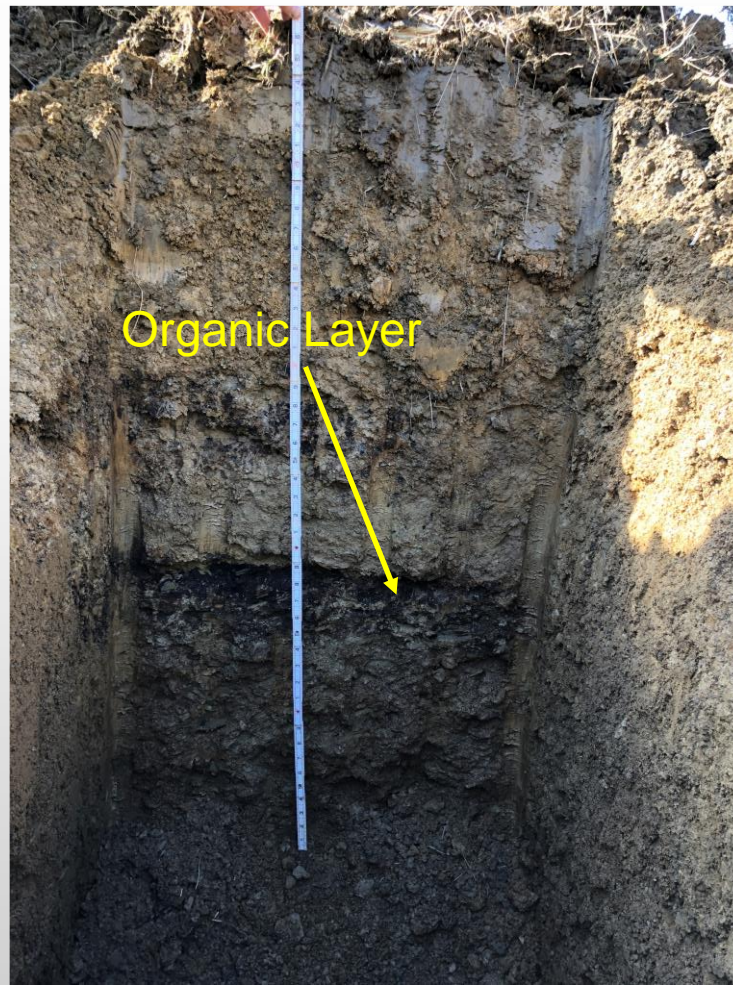
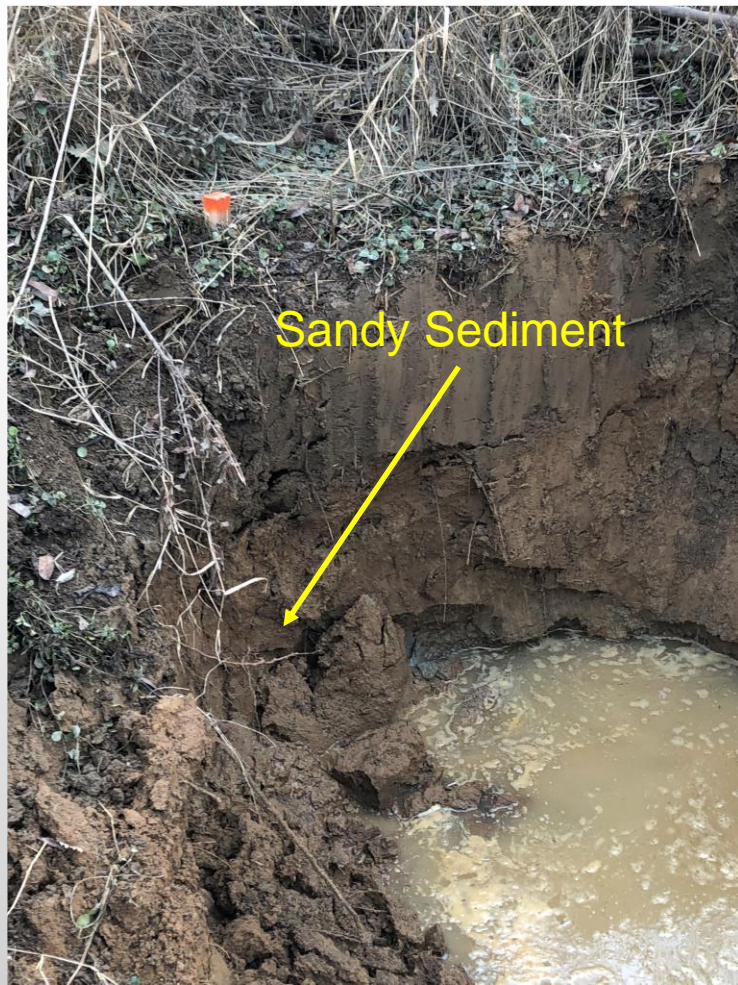
# ADAMS TWP. STREAM RESTORATION PROJECT

- Project determined to be “Legacy Sediment” site





# ADAMS TWP. STREAM RESTORATION PROJECT







Facing Upstream



Facing West Bank

Extreme bank  
erosion



Photo  
Point ↓



Facing East Bank



Facing Downstream



## Textbook stream bank erosion

### **POINT BAR**

Slower moving water on inside bend deposits sediment

### **CUT BANK**

Faster moving water on outside bend erodes bank and undercuts vegetation, exposing raw roots







Shallow root structure

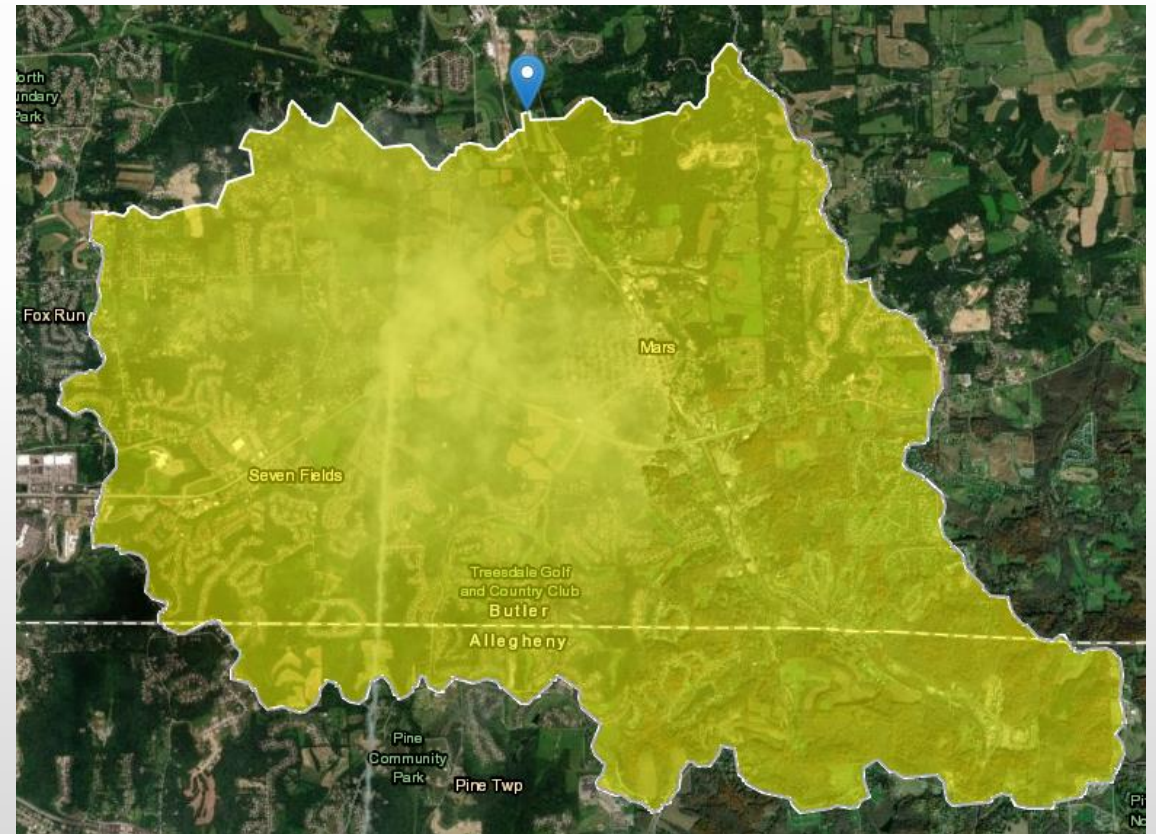
Large chunks of soil  
fall off into creek due  
to bank undercutting.



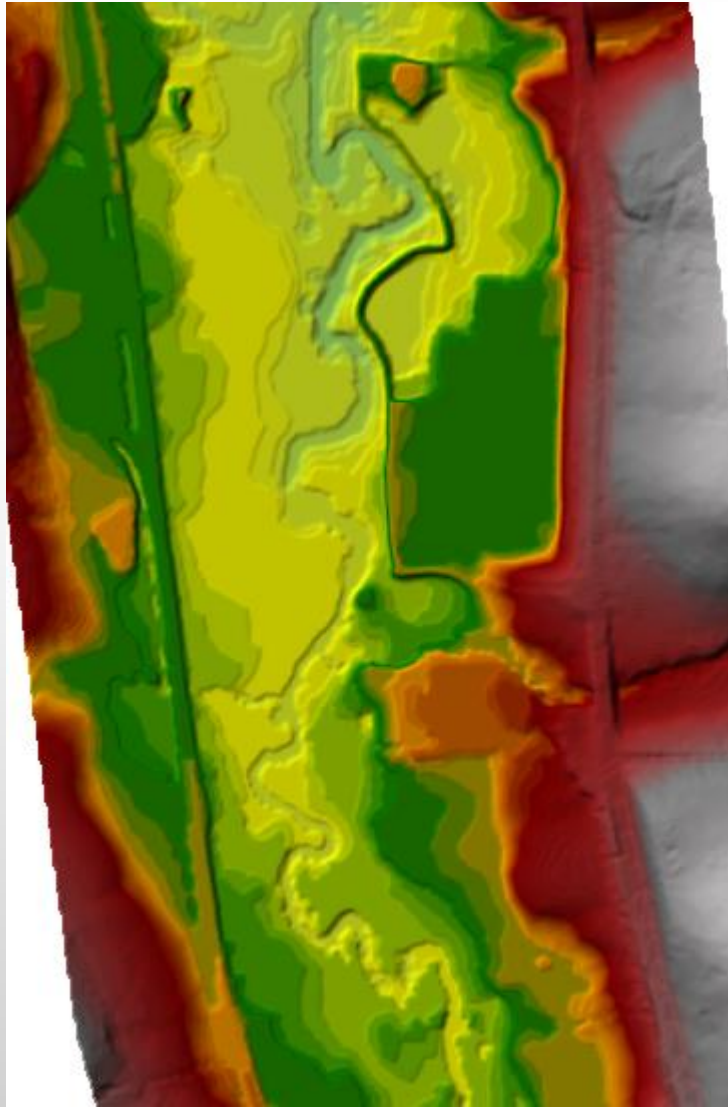
# STORMWATER STATISTICS

- Watershed = 20.7 sq. miles or 13,248 Ac.
- Avg. Annual Precipitation = 39 in.
- Avg. Bankfull Depth = 2.41 in.
- Avg. Bankfull Area = 137 ft<sup>2</sup>
- Flow Data:

Storm	Flow
1.25-YR	817 $ft^3/sec$
2-YR	938 $ft^3/sec$
5-YR	1570 $ft^3/sec$
10-YR	2060 $ft^3/sec$
50-YR	3290 $ft^3/sec$
100-YR	3880 $ft^3/sec$

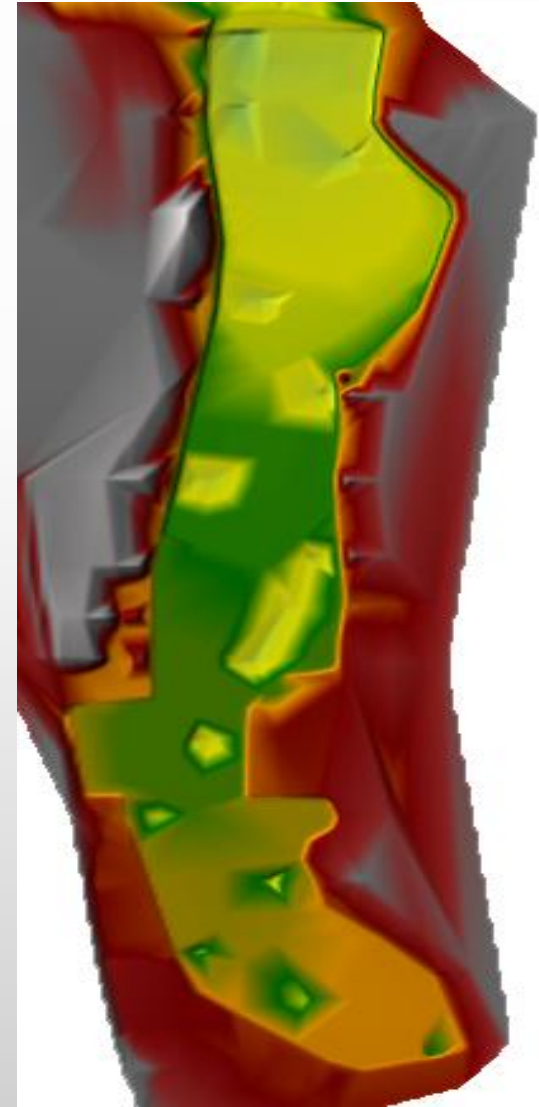


# STORMWATER IMPACTS



2006 LiDAR  
SURFACE  
CONDITIONS

## DIGITAL ELEVATION MODELS



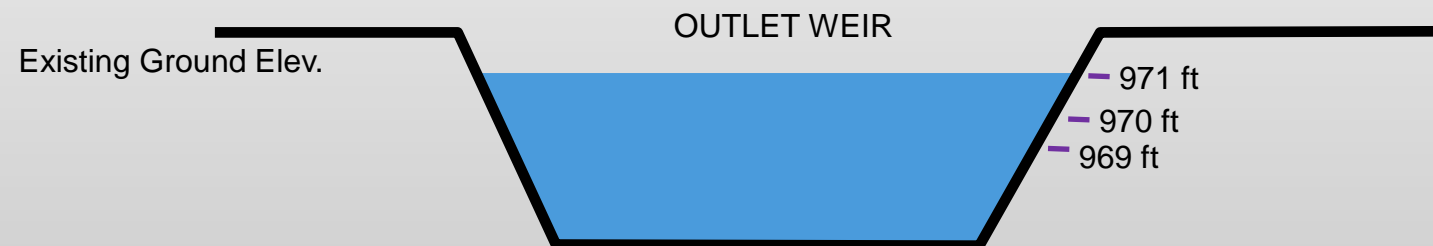
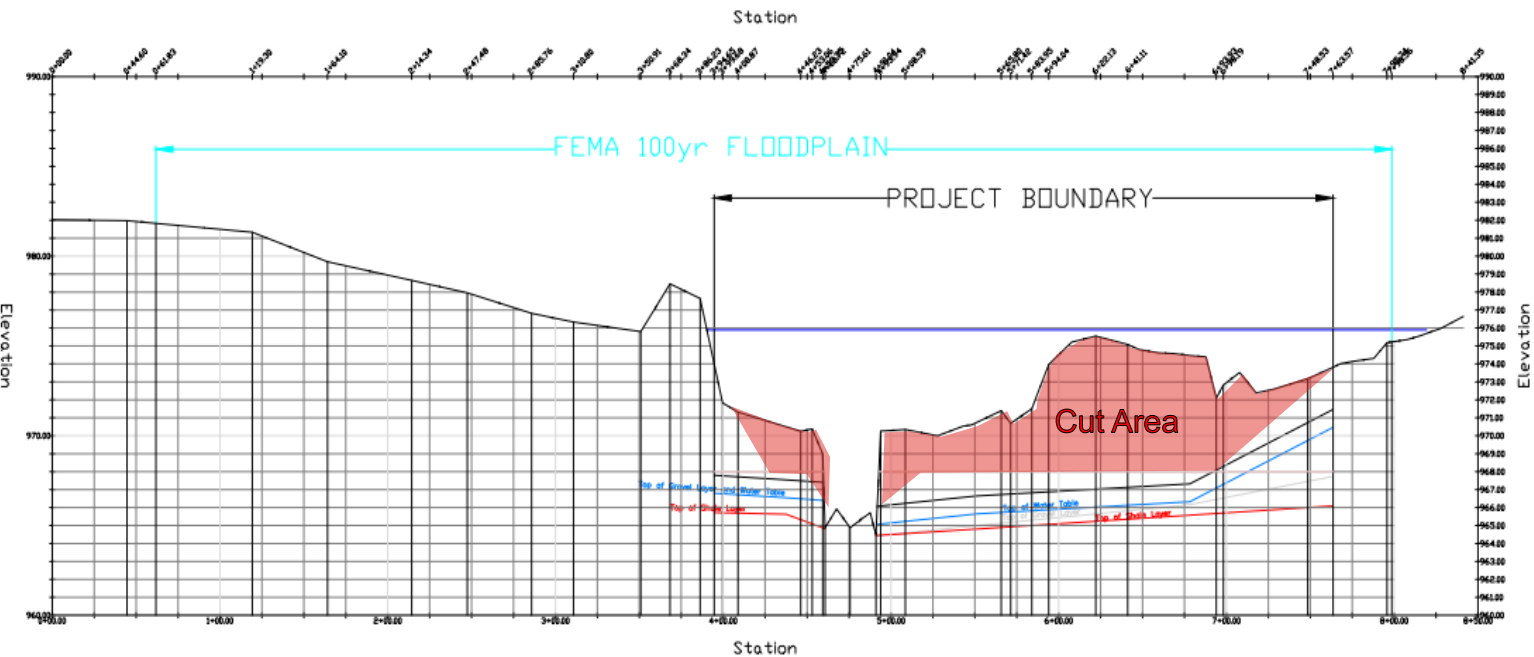
EXISTING &  
PROPOSED  
CONDITIONS



# STORMWATER IMPACTS

## OUTLET DESIGN AND VOLUME CONTROL

Profile View of Alignment - 2153



Elev.  
968 ft

969 ft

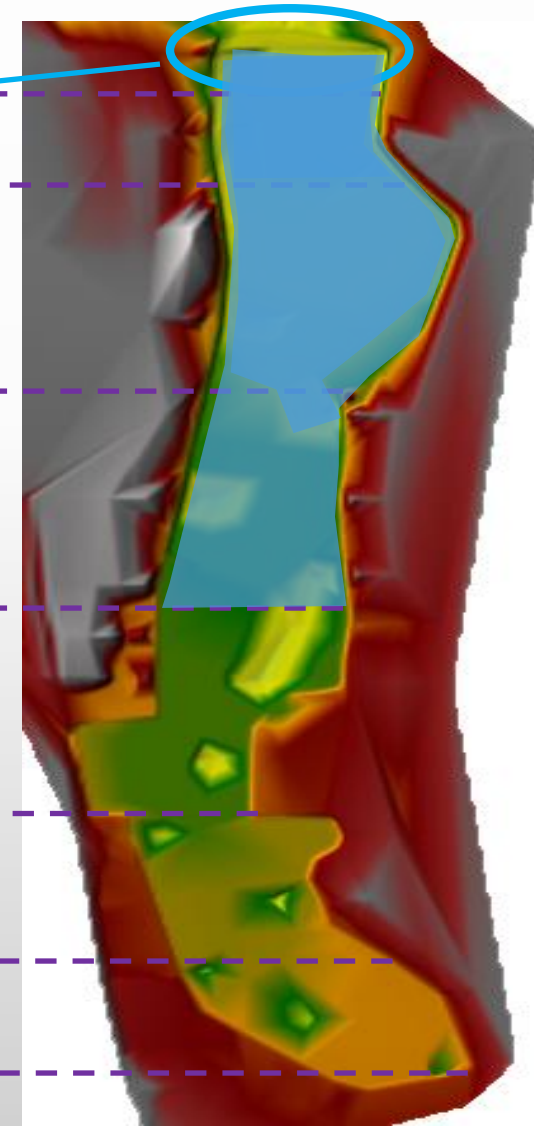
970 ft

971 ft

972 ft

973 ft

974 ft



- 51 Mill Gal. capacity

# STORMWATER IMPACTS

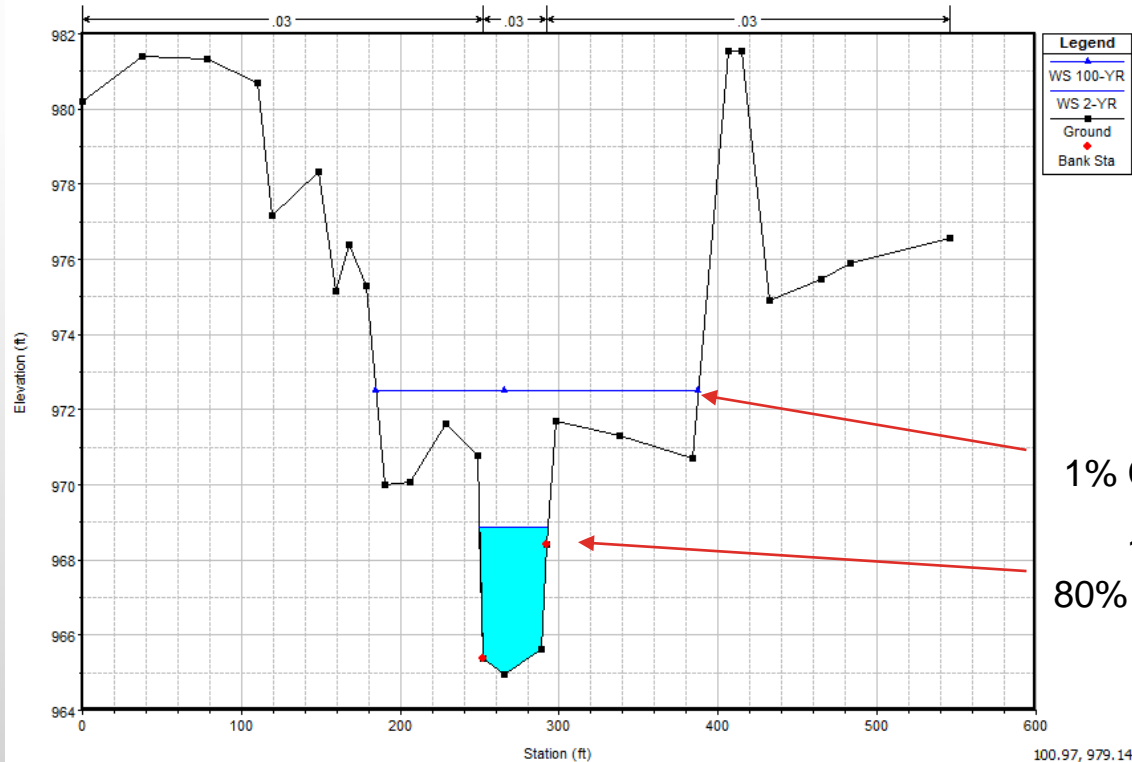


- HEC-RAS Stream Modeling
- Base Flood Elevation



## Existing Conditions

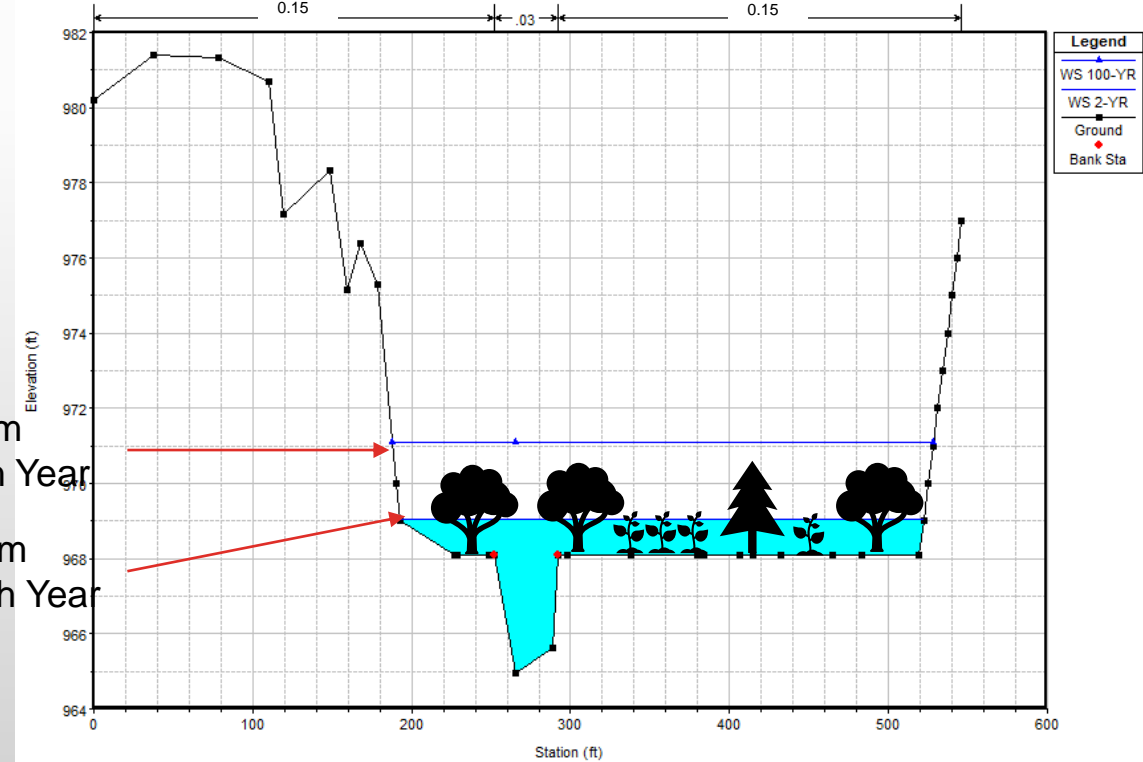
AdamsTwp MS4 Existing Conditions Plan: Strand Plan 1/28/2020  
RS-2345



100-YR Storm  
1% Chance Each Year  
1.25-YR Storm  
80% Chance Each Year

## Proposed Conditions

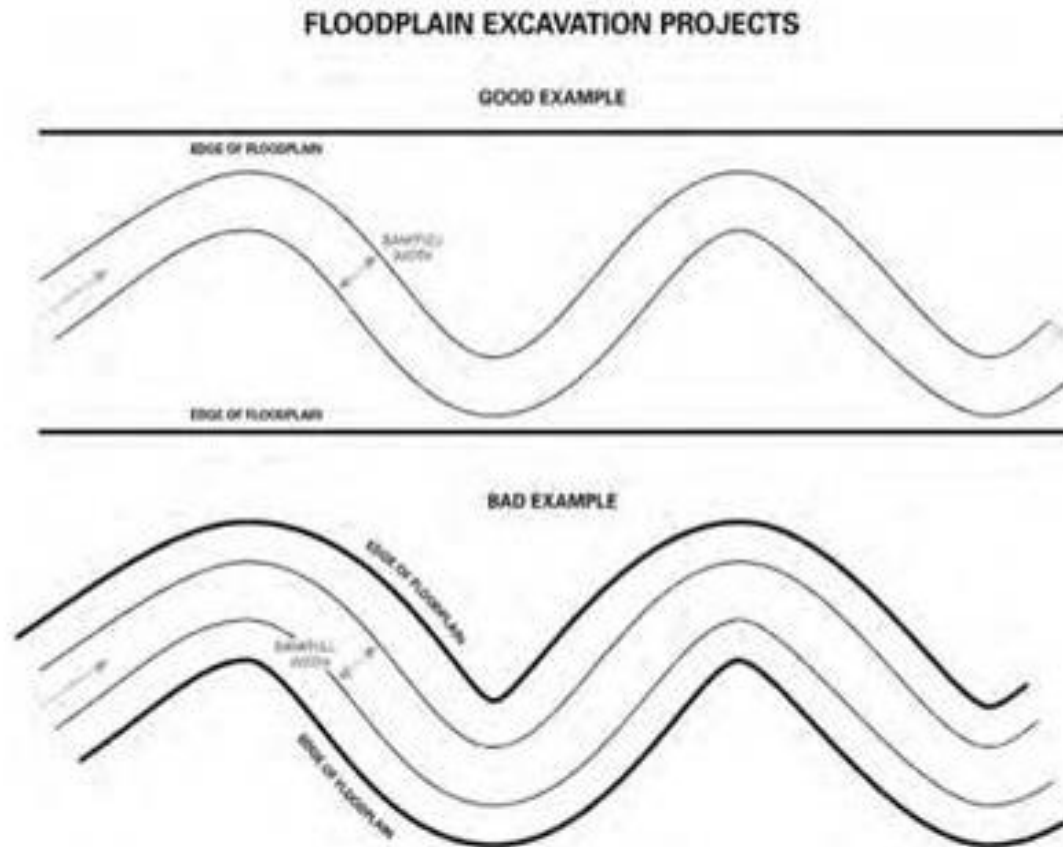
Strand Preliminary Design Plan: Strand Plan 1/28/2020  
RS-2345





# PLANNING CONSIDERATIONS

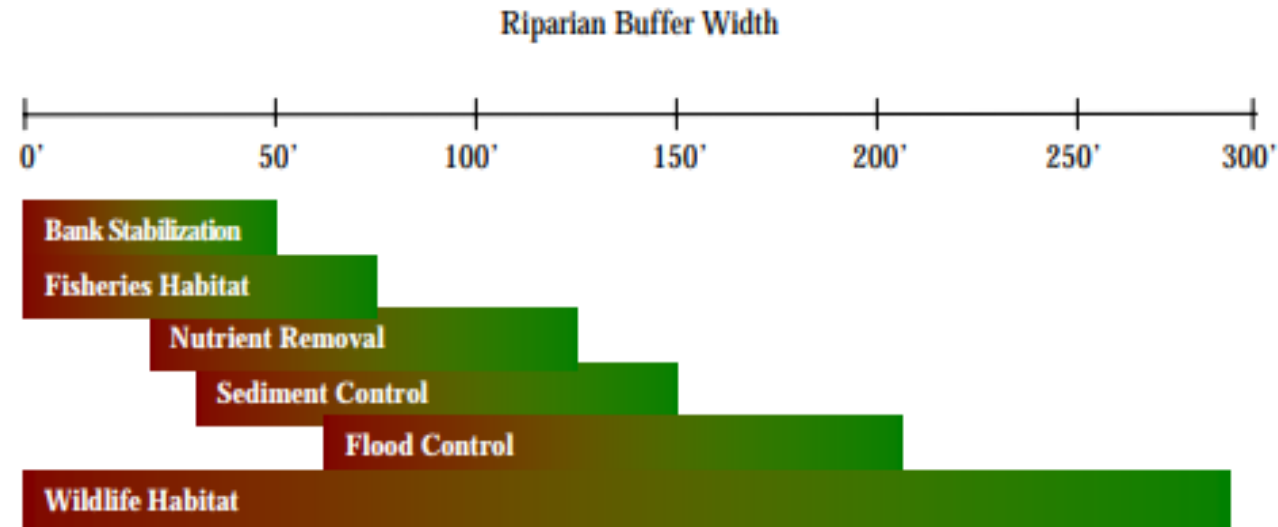
FIGURE 10: PLAN VIEW OF PROPER AND IMPROPER EXCAVATION OF FLOODPLAIN LIMITS



Source: NRCS Stream Design Manual

- Easements – time
- Field Investigations – seasonal
- Survey's – weather dependant

Figure 3-2 Recommended Riparian Buffer Widths



Source: PA DCNR





# QUESTIONS???

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