

# Cooks Creek – Update of Watershed Conservation Plan



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# Project Funding

*Project funded by Pennsylvania Growing Greener –  
Environmental Stewardship and Watershed Protection Grant  
Program awarded to the Cooks Creek Watershed  
Association (CCWA)*



# Project Goal & Scope

- ✓ **Goal** - Update Cooks Creek Watershed Conservation Plan developed in 2002
- ✓ **Scope**
  - Task 1 – Historical Data Review, Analysis, Summary
  - Task 2 – Update Watershed Characteristics
  - Task 3 – Watershed Survey and Best Management Practices (BMP) Recommendations
  - Task 4 – Final Report, Meetings, & Management

# Cooks Creek

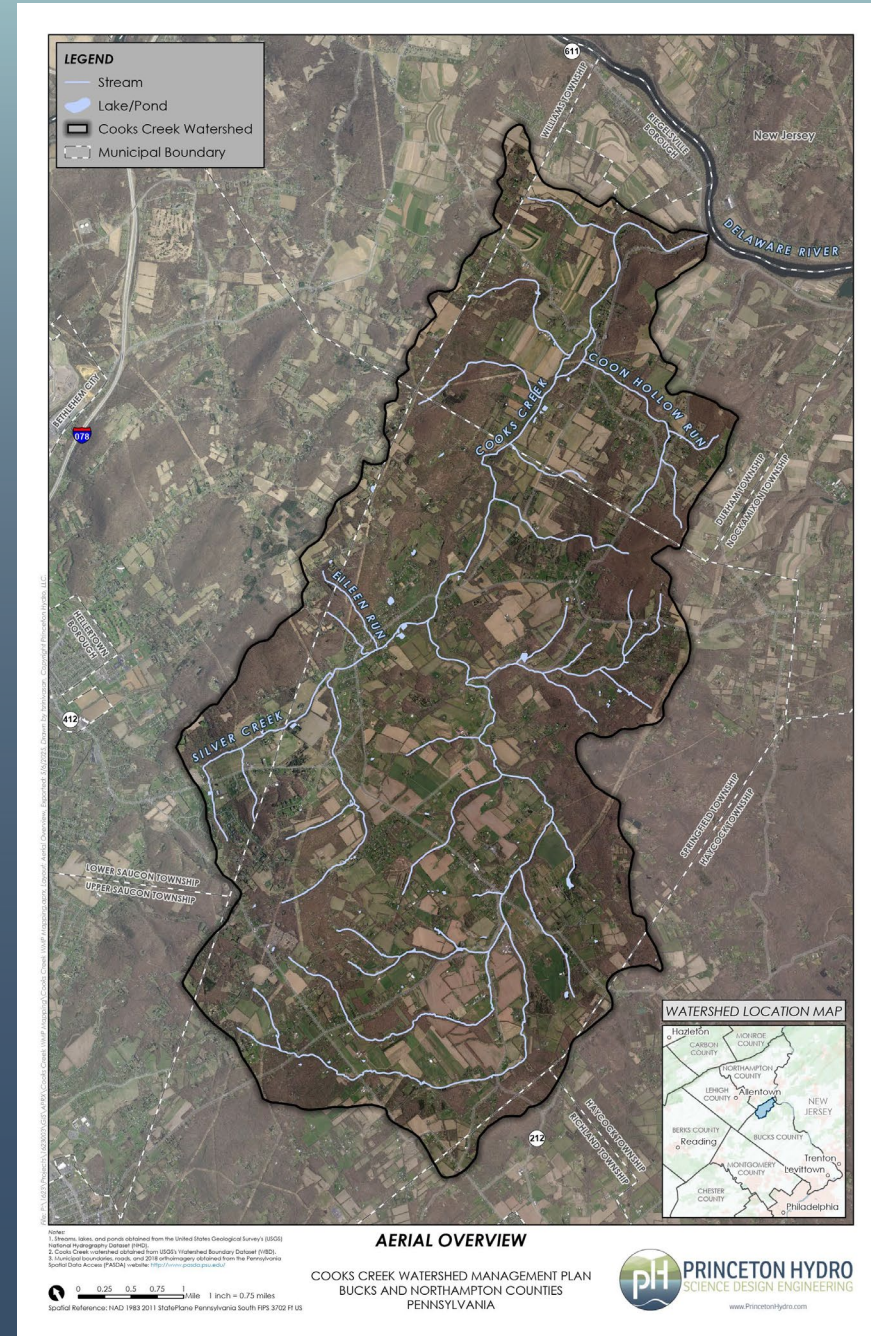
*Key Watershed Characteristics*



SCIENCE  
ENGINEERING  
DESIGN

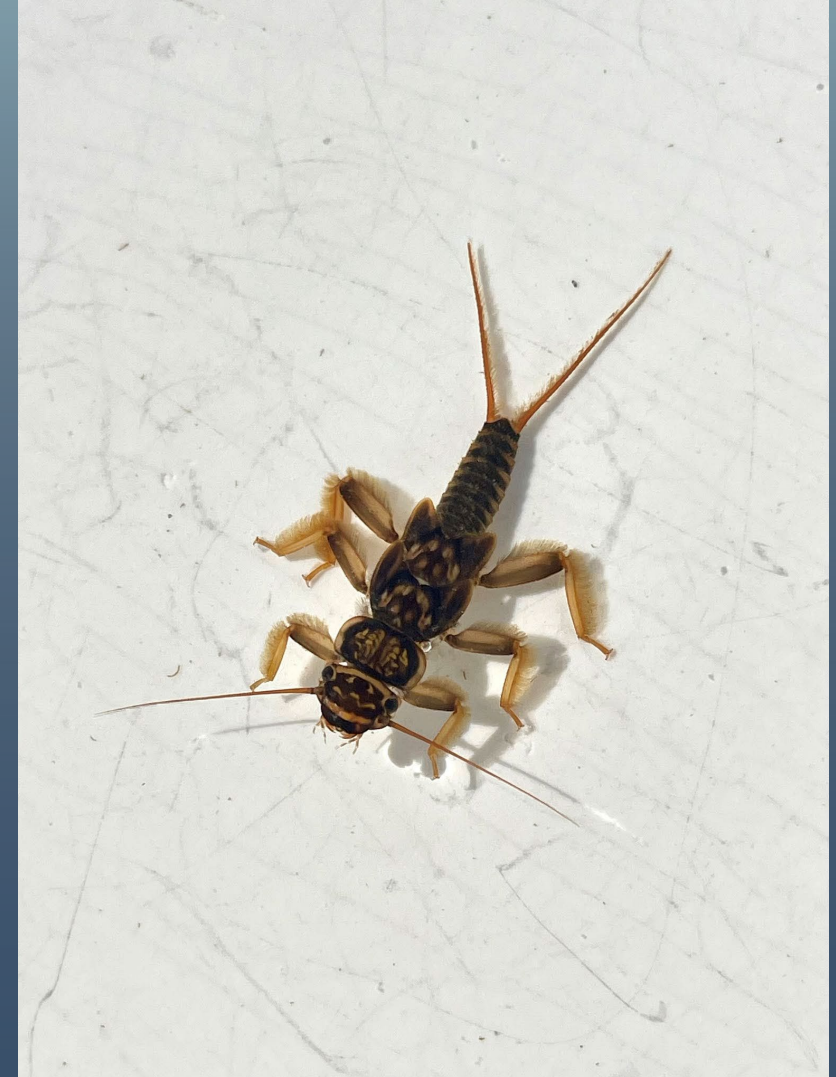
# Watershed Characteristics

- Watershed size ~30 square miles
- Majority lies in Durham and Springfield Townships, Bucks County
- ~75% of land use is agriculture/forest
- ~33% preserved open space



# Cooks Creek – State Designations

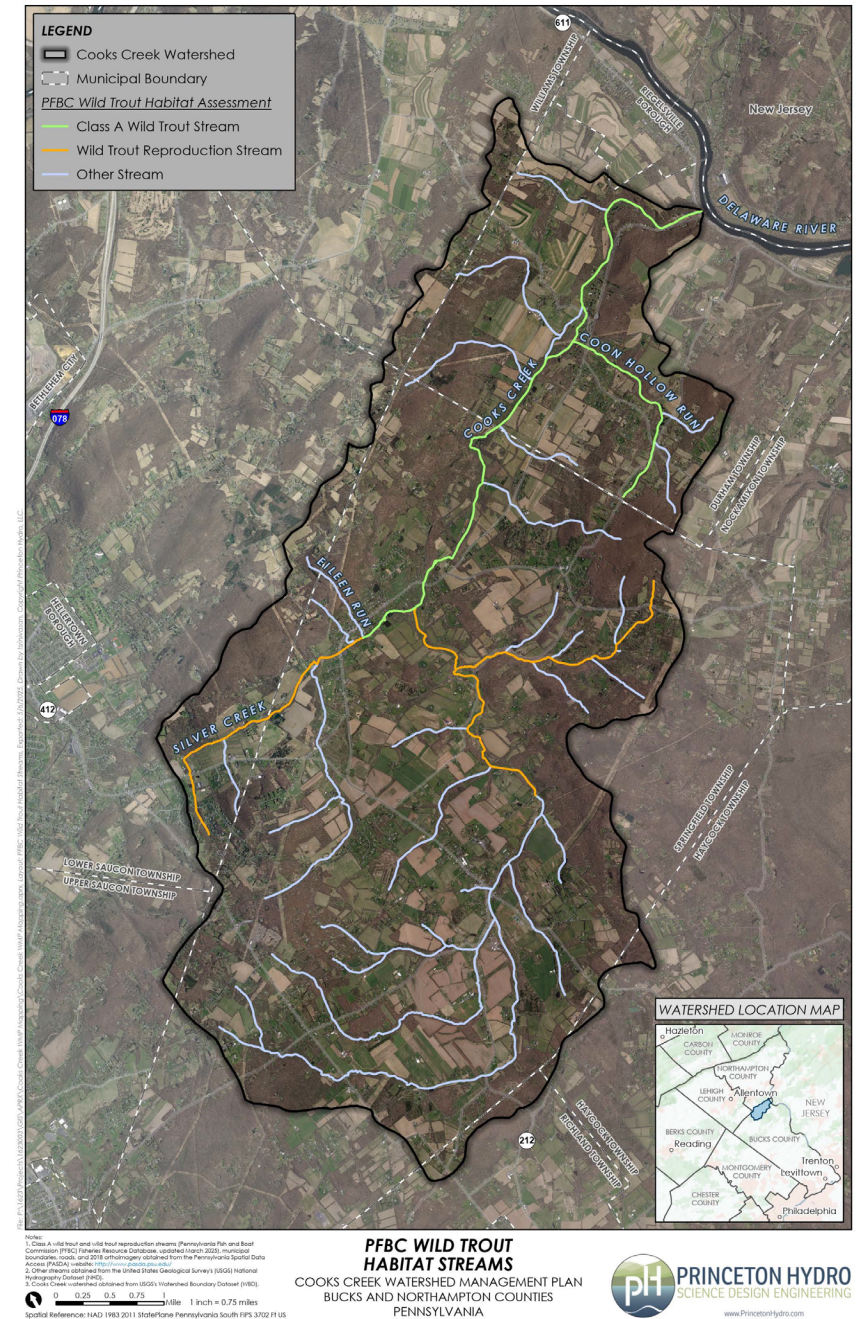
- ✓ PADEP Chapter 93  
Exceptional Value – Cold Water Fishery
  - Exceptional Value afforded highest degree of environmental protection in Pennsylvania
- ✓ PAFBC Class A Wild Trout Stream
  - Support population of naturally produced trout to support and long-term and rewarding sport fishery



# Class A Wild Trout Stream

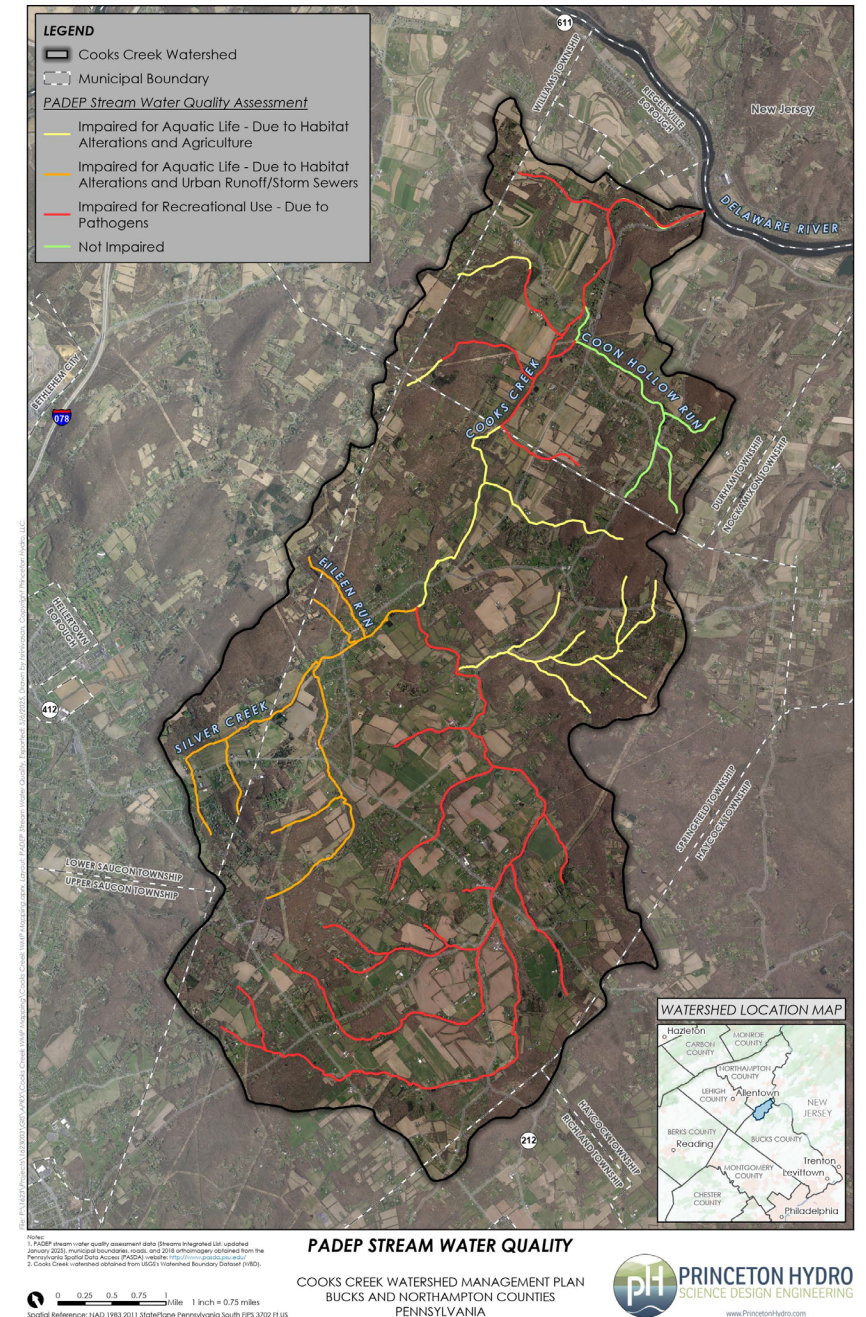
PFBC Wild Trout Reproduction Streams 16.47 linear miles

PFBC Class A Wild Trout Streams 8.42 linear miles



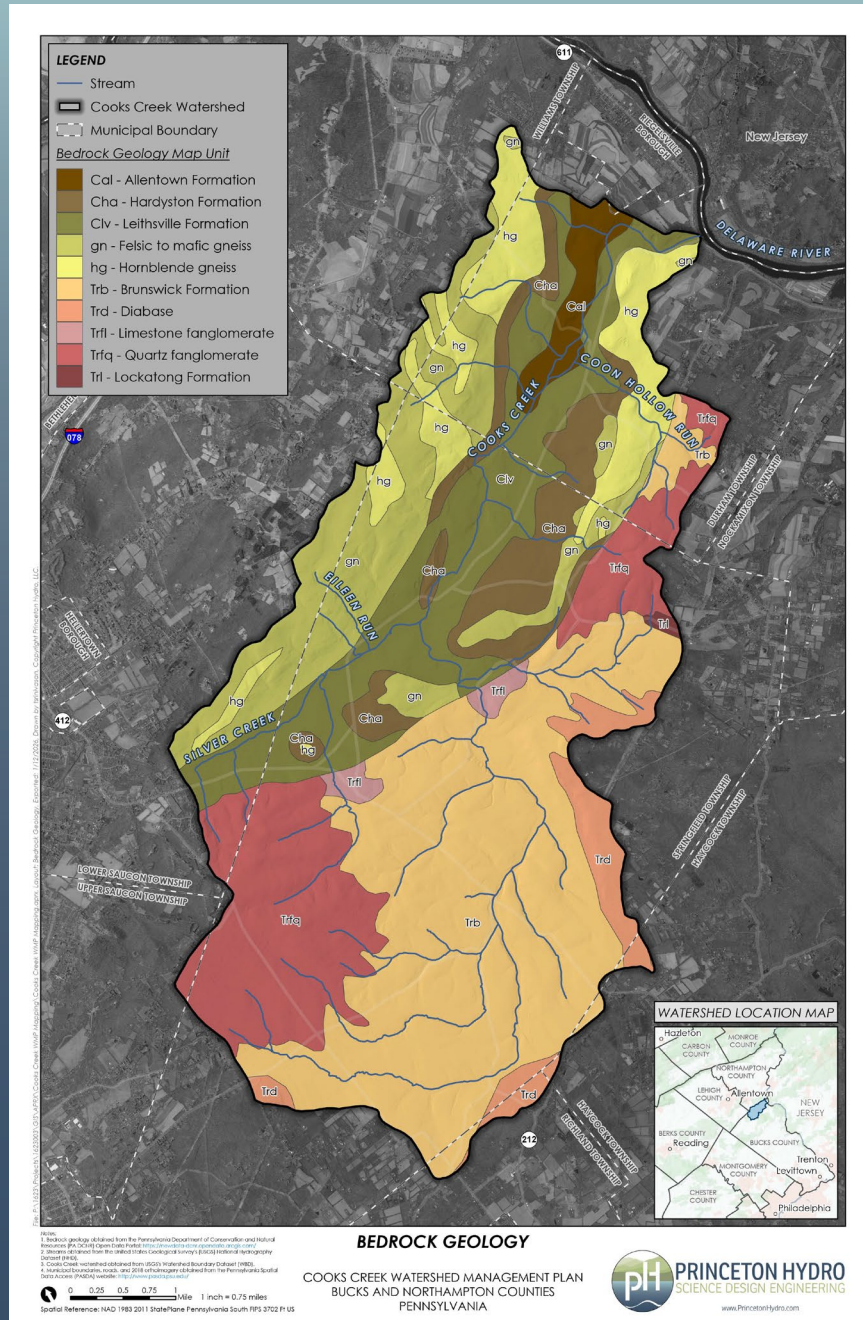
# PADEP Stream Water Quality

- PADEP routinely evaluates state waterways under Section 305b of Clean Water Act
- Impairments
  - Recreational use due to pathogens
  - Aquatic life due to habitat alteration / stormwater
  - Aquatic life due to habitat alterations / agriculture

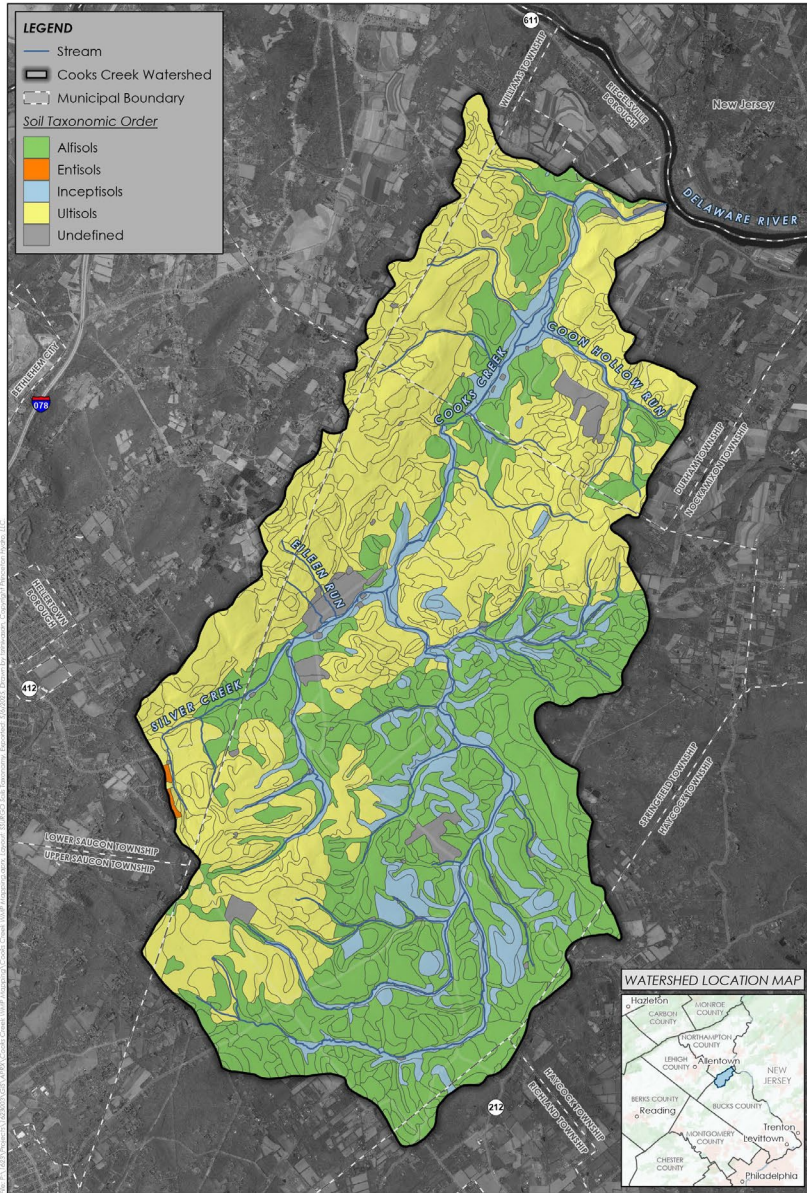


# Bedrock Geology

- 3 major physiographic provinces
  - Reading Prong
  - Great Valley
  - Piedmont
- ✓ Bedrock geology dictates water abundance, geochemistry, erosion potential and therefore water quality.



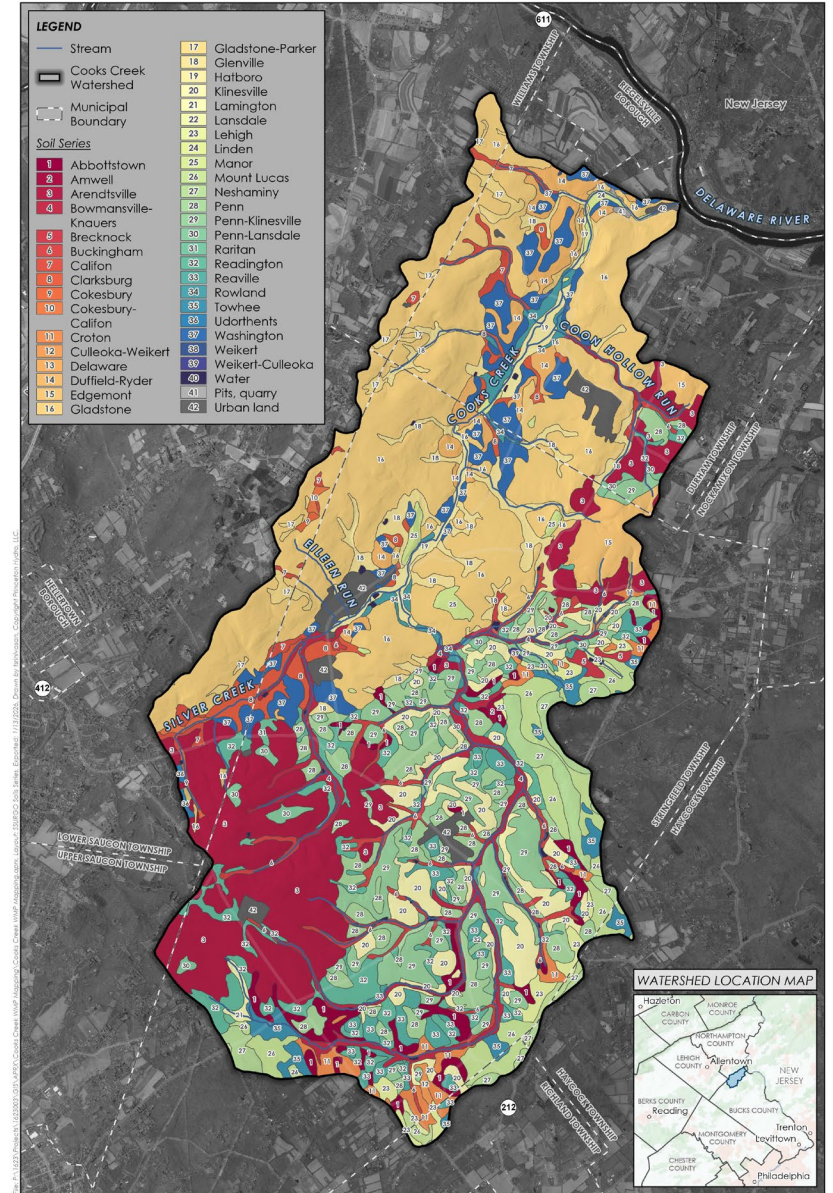
# Soils



**SSURGO SOILS TAXONOMY**  
**COOKS CREEK WATERSHED MANAGEMENT PLAN**  
 BUCKS AND NORTHAMPTON COUNTIES  
 PENNSYLVANIA

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Scale: 1 inch = 0.75 miles  
 Spatial Reference: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702 F1 US



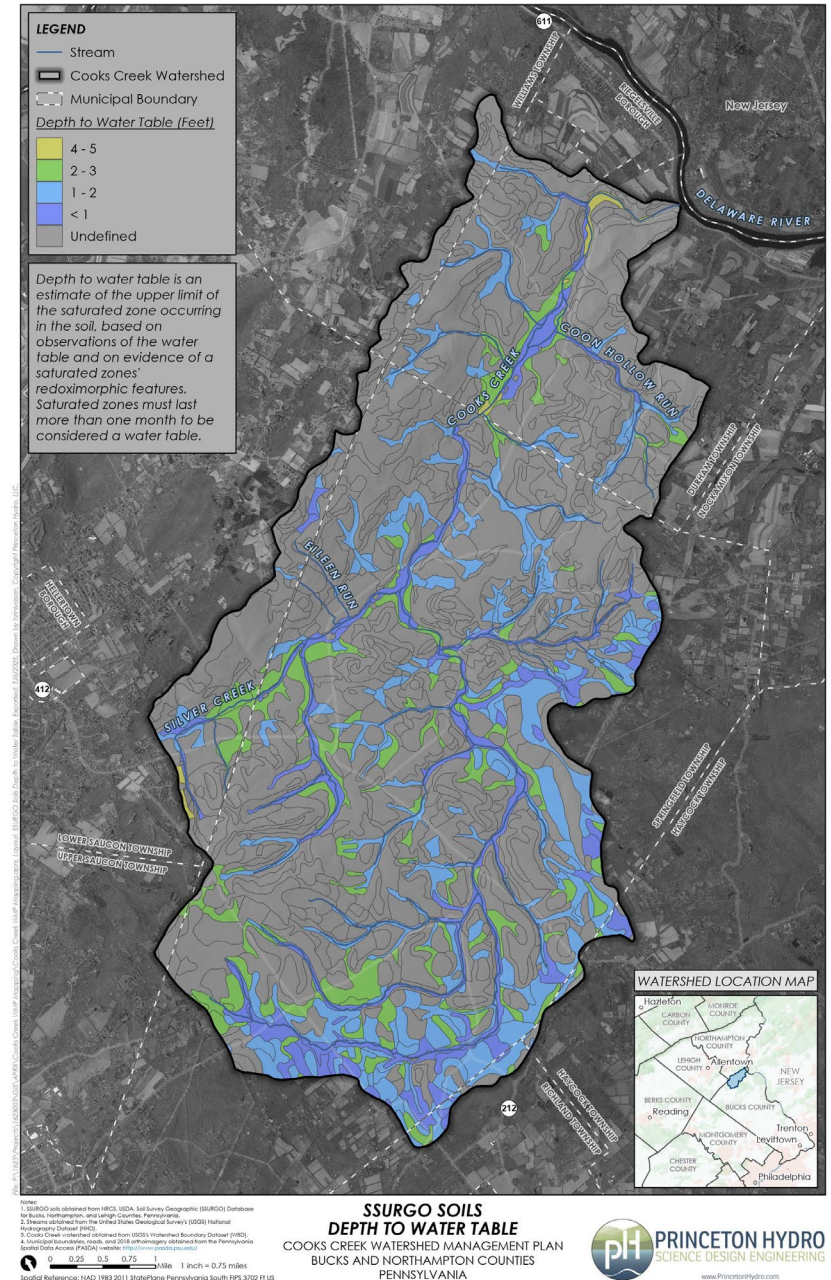
**SSURGO SOILS SERIES**  
**COOKS CREEK WATERSHED MANAGEMENT PLAN**  
 BUCKS AND NORTHAMPTON COUNTIES  
 PENNSYLVANIA

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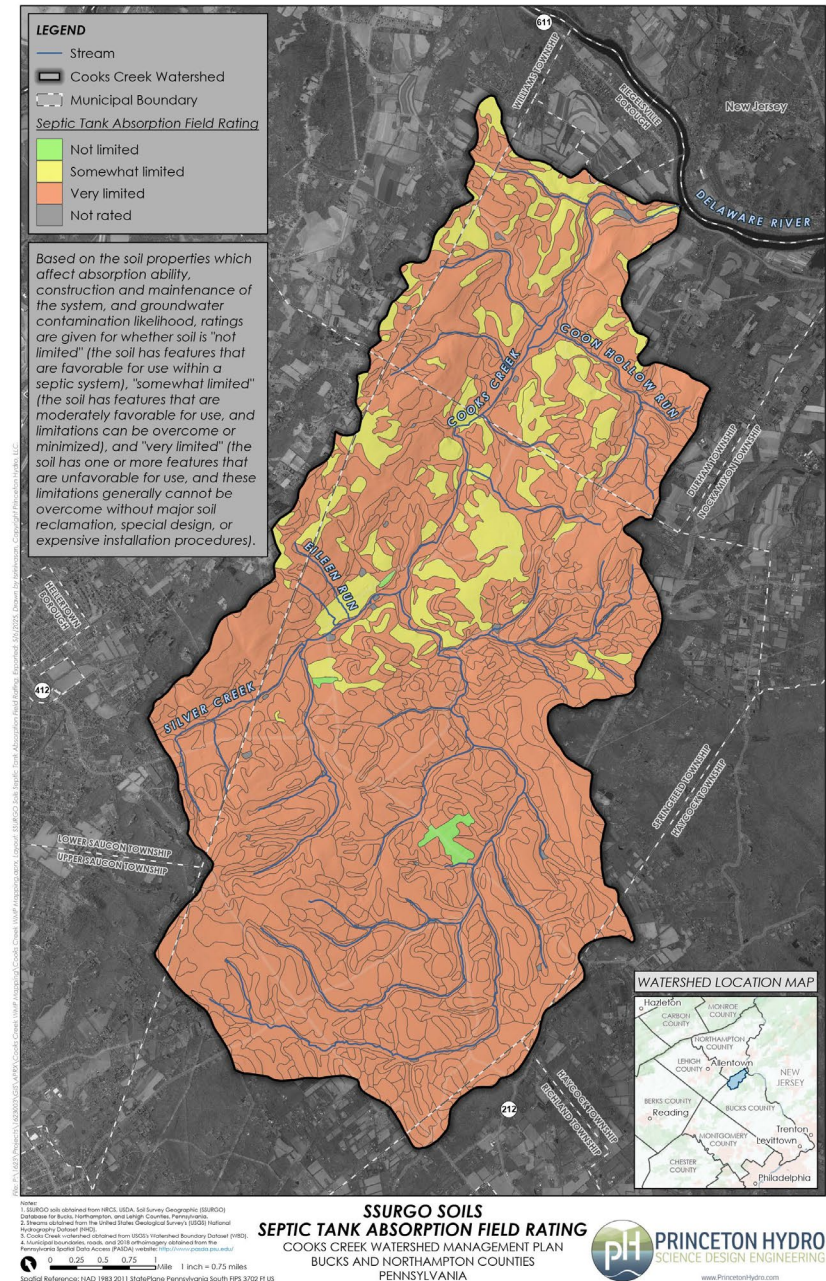
# Depth to Water Table

Depth to Water Table (Feet)	Watershed Area Square Miles	Watershed Area %
4 - 5	0.11	0.4%
3 - 4	0.00	0.0%
2 - 3	2.28	7.7%
1 - 2	4.27	14.4%
< 1	2.28	7.7%
Undefined	20.65	69.8%



# Septic Tank Absorption Rating

Septic Tank Absorption Field Rating	Watershed Area Square Miles	Watershed Area %
Not limited	0.13	0.4%
Somewhat limited	3.14	10.6%
Very limited	26.20	88.6%
Not rated	0.10	0.3%



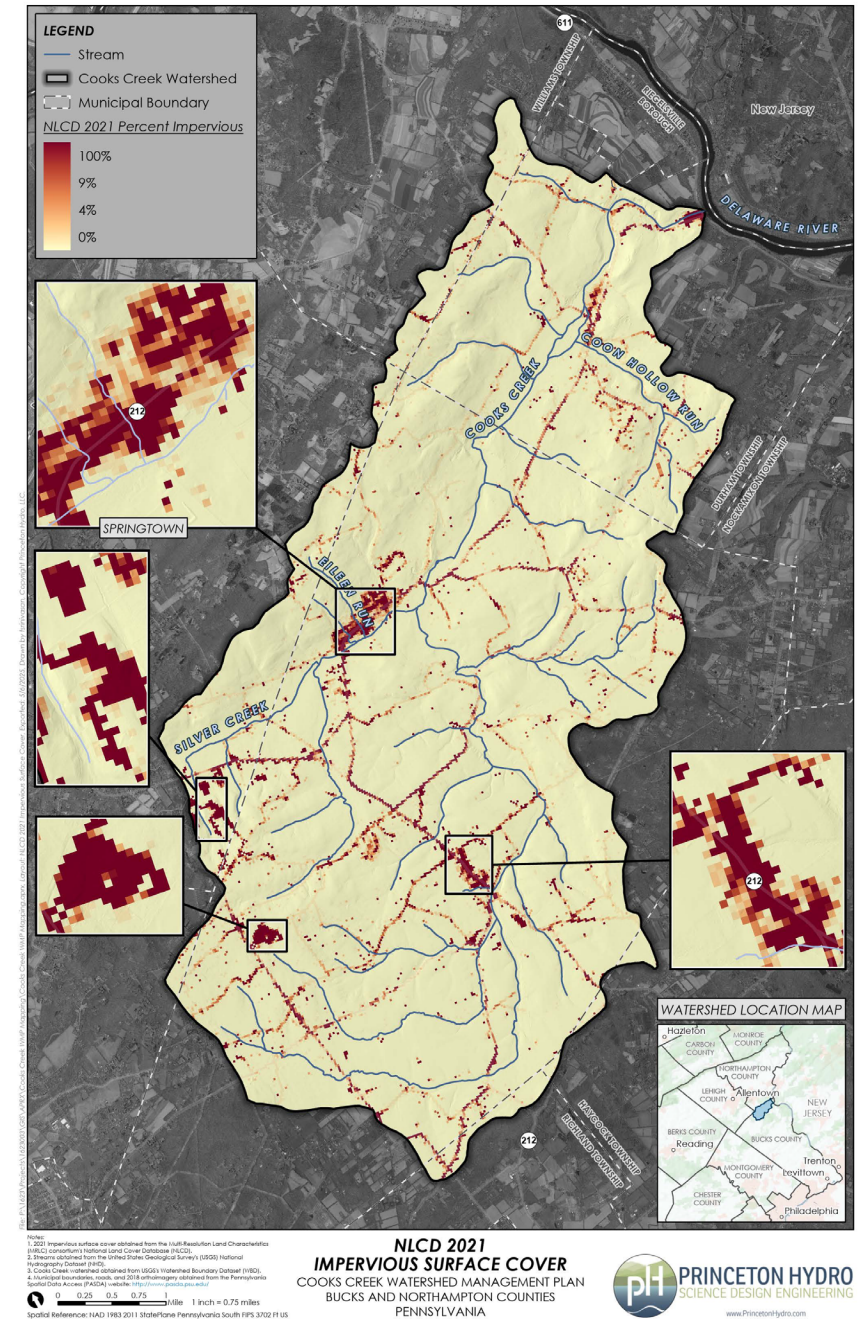
# Cooks Creek Watershed Land Use

DVRPC Land Use (Only within Bucks County)	Watershed Area %							
	1990	1995	2000	2005	2010	2015	2023	1990-2023
Non-Urban	86.37%	86.29%	83.60%	83.07%	81.86%	77.31%	76.41%	-9.97%
Agriculture	49.34%	49.27%	45.69%	45.78%	44.80%	36.68%	35.80%	-13.54%
Recreation	0.13%	0.13%	0.14%	0.14%	0.14%	0.20%	0.23%	0.09%
Wooded	36.65%	36.64%	37.38%	36.75%	36.52%	39.82%	39.72%	3.08%
Water	0.26%	0.26%	0.39%	0.40%	0.40%	0.62%	0.66%	0.40%
Urban	13.63%	13.71%	16.40%	16.93%	18.14%	22.69%	23.59%	9.97%
Residential	9.48%	9.57%	12.22%	12.68%	13.49%	16.59%	17.44%	7.96%
Commercial	0.39%	0.39%	0.60%	0.56%	0.49%	0.27%	0.26%	-0.13%
Community Services / Institutional	0.26%	0.26%	0.25%	0.25%	0.25%	0.38%	0.38%	0.13%
Industrial	0.07%	0.07%	0.07%	0.07%	0.07%	0.23%	0.23%	0.16%
Transportation	Not distinguished					1.36%	1.37%	0.01%
Utility	1.33%	1.33%	1.83%	1.83%	1.83%	2.12%	2.08%	0.76%
Other Developed	0.01%	0.01%	0.04%	0.04%	0.04%	Not distinguished		0.03%
Vacant/Undeveloped	2.09%	2.09%	1.40%	1.49%	1.97%	1.72%	1.82%	-0.26%
<i>Total</i>	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	0.00%



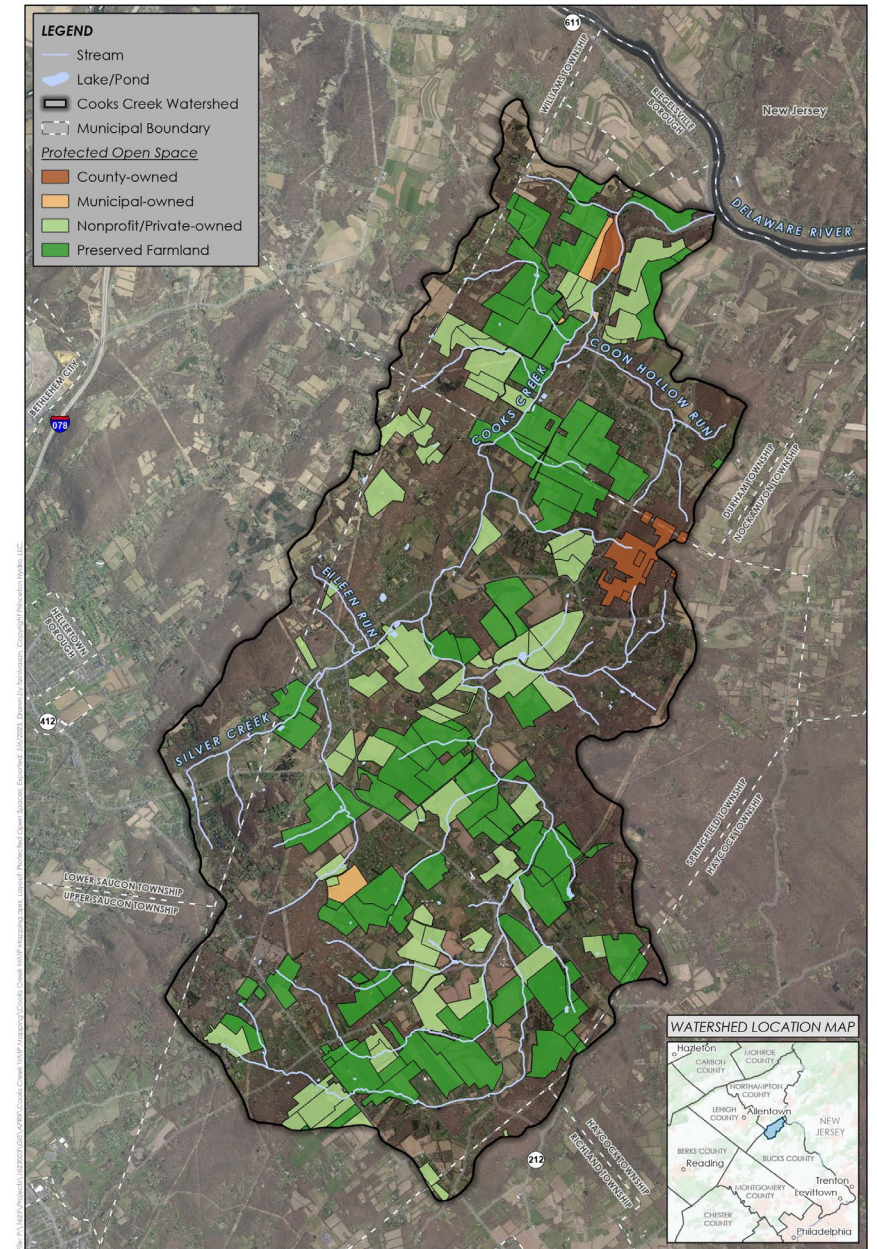
# Impervious Cover (2021 NLCD)

Impervious Surface Cover %	Watershed Area Square Miles	Watershed Area %
0	26.21	88.67%
1 - 20	2.80	9.48%
21 - 40	0.34	1.15%
41 - 60	0.14	0.47%
61 - 80	0.05	0.18%
81 - 100	0.01	0.04%



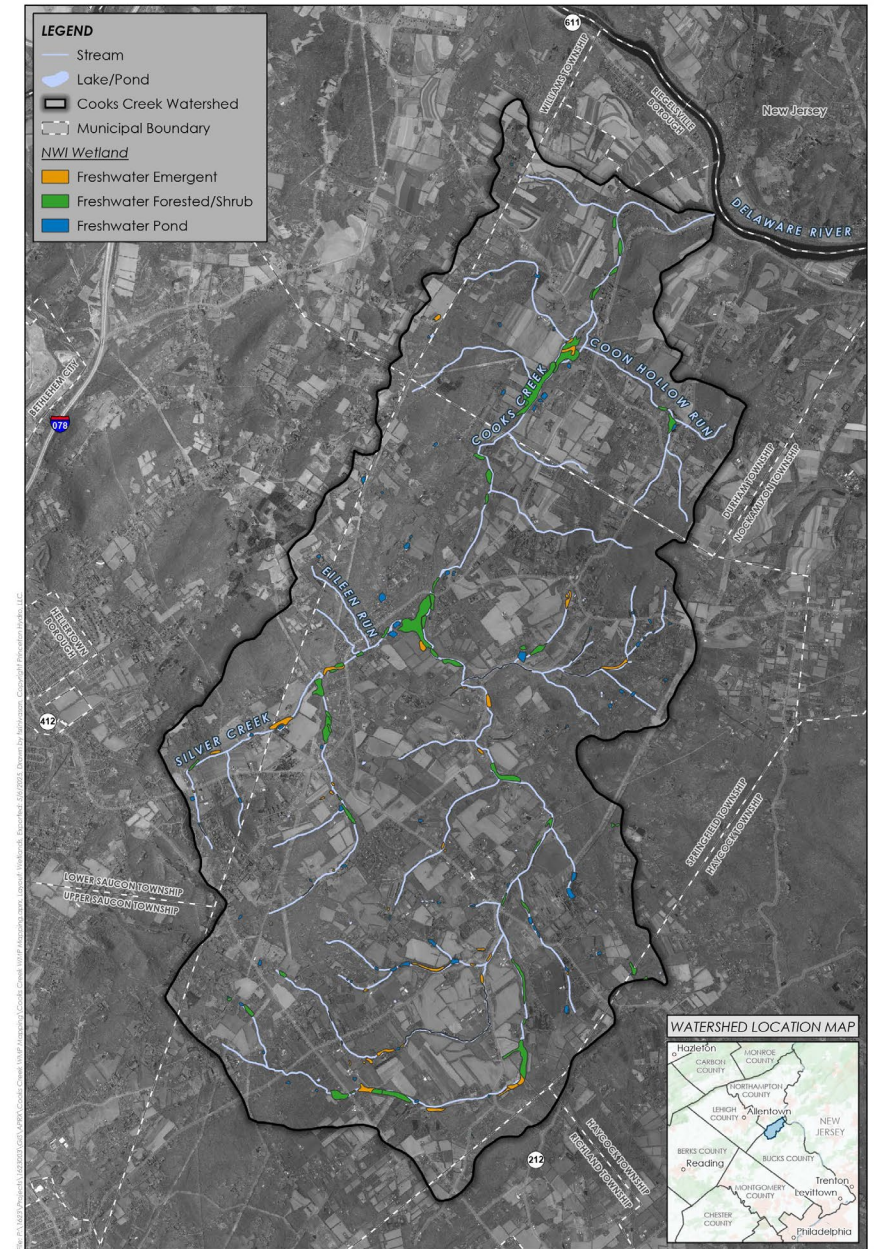
# Protected Open Space

Protected Open Space	Watershed Area Square Miles	Watershed Area %
County-owned	0.34	1.2%
Municipal-owned	0.13	0.4%
Nonprofit/Private-owned	3.23	10.9%
Preserved Farmland	6.18	20.9%
<i>Total</i>	9.87	33.4%



# Wetlands

National Wetlands Inventory Feature	Watershed Area Acres	Watershed Area %
Freshwater Emergent Wetland	57.65	0.3%
Freshwater Forested/Shrub Wetland	201.31	1.1%
Freshwater Pond	55.99	0.3%



Notes:  
 1. National Wetlands Inventory (NWI) wetlands obtained from the United States Fish & Wildlife Service.  
 2. Stream, Lake, and Pond points obtained from the United States Geological Survey's 30-second National Hydrography Dataset (NHD).  
 3. Cocks Creek watershed obtained from USGS's Watershed Boundary Dataset (WBD).  
 4. Municipal boundaries, roads, and 2011 Borough boundary obtained from the Pennsylvania Spatial Data Access (PSDA) website: <http://www.pspa.net/>

Scale: 1 inch = 0.75 miles  
 Spatial Reference: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702 F1US

## WETLANDS

COCKS CREEK WATERSHED MANAGEMENT PLAN  
 BUCKS AND NORTHAMPTON COUNTIES  
 PENNSYLVANIA

# Township Area

<b>PA Townships Intersecting Cooks Creek Watershed</b>	<b>Watershed Area Square Miles</b>	<b>Watershed Area %</b>
<i>Bucks County</i>		
Durham Township	5.72	19.3%
Riegelsville Borough	0.005	0.0%
Haycock Township	0.13	0.4%
Richland Township	0.22	0.8%
Springfield Township	20.83	70.4%
<i>Northampton County</i>		
Williams Township	0.59	2.0%
Lower Saucon Township	2.01	6.8%
<i>Lehigh County</i>		
Upper Saucon Township	0.07	0.2%
<i>Total Watershed</i>	29.58	100.0%

# Population

Municipalities	Population		
	2000	2020	Change
<i>Bucks County</i>			
Durham Township	1,313	1,094	-219
Riegelsville Borough	863	847	-16
Haycock Township	2,191	2,200	9
Richland Township	9,920	13,837	3,917
Springfield Township	4,963	5,175	212
<i>Northampton County</i>			
Williams Township	4,470	6,581	2,111
Lower Saucon Township	9,884	11,094	1,210
<i>Lehigh County</i>			
Upper Saucon Township	11,939	16,973	5,034

# Stream Evaluation

*Rapid Assessment Protocol*

# Stream Evaluation

- ✓ Field evaluation of two (2) discrete stream reaches with volunteers
- ✓ Methodology – Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol
- ✓ Utilize this information to broaden watershed scale evaluation of stream reaches

# Riverine Condition Level 2 Assessment

- ✓ Five (5) Criteria
  - Channel condition
  - Riparian vegetation
  - Riparian zone of influence
  - In-stream habitat
  - Channel alteration
- ✓ Scoring – Scale of 1 (Poor) to 20 (Optimal)
- ✓ Standardized scoring of stream resources

# Cooks Creek Assessment

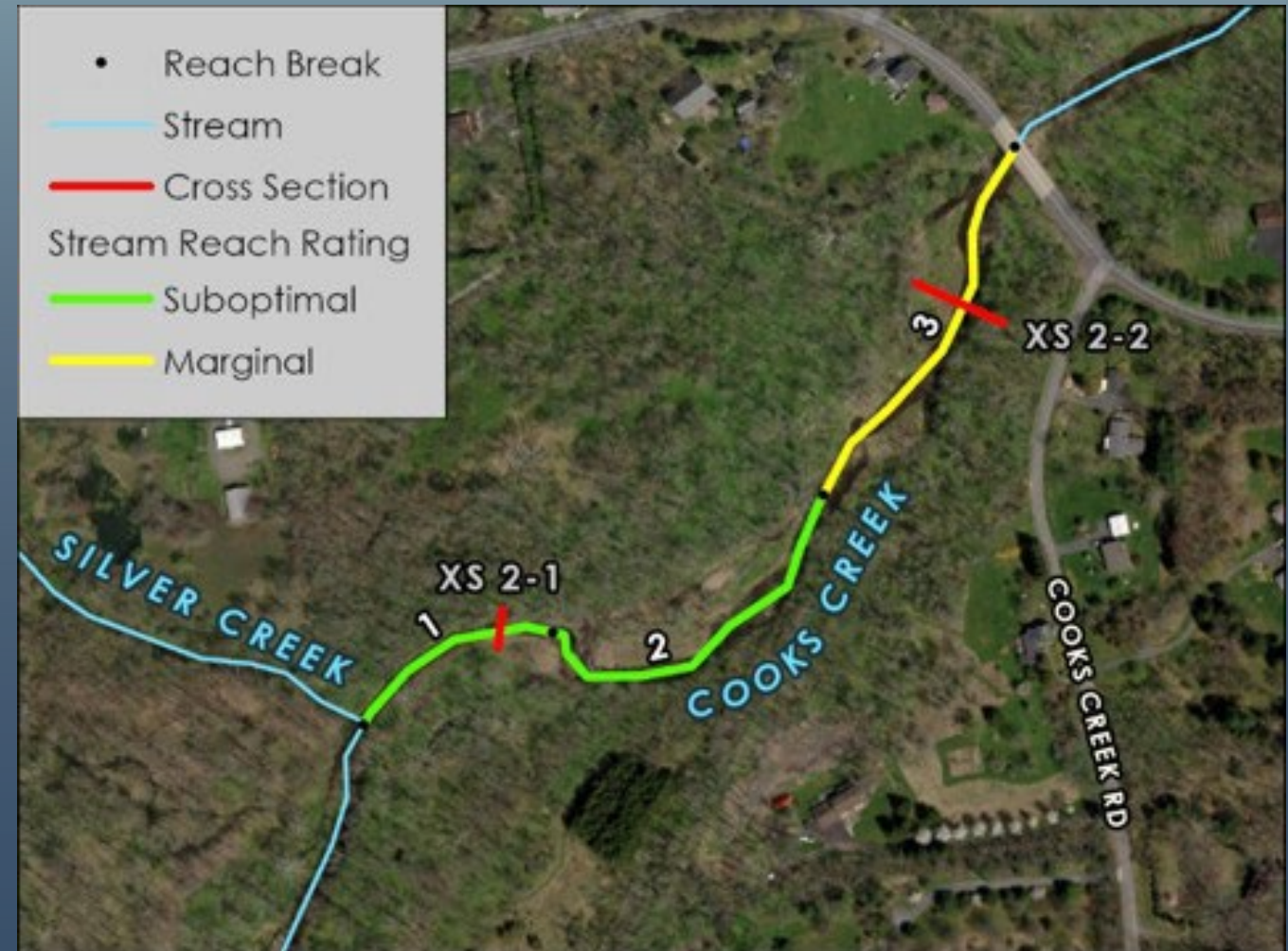
- ✓ Conducted over two days in January 2024
- ✓ Princeton Hydro engineers and fluvial geomorphologists
- ✓ Representatives from the CCWA and townships



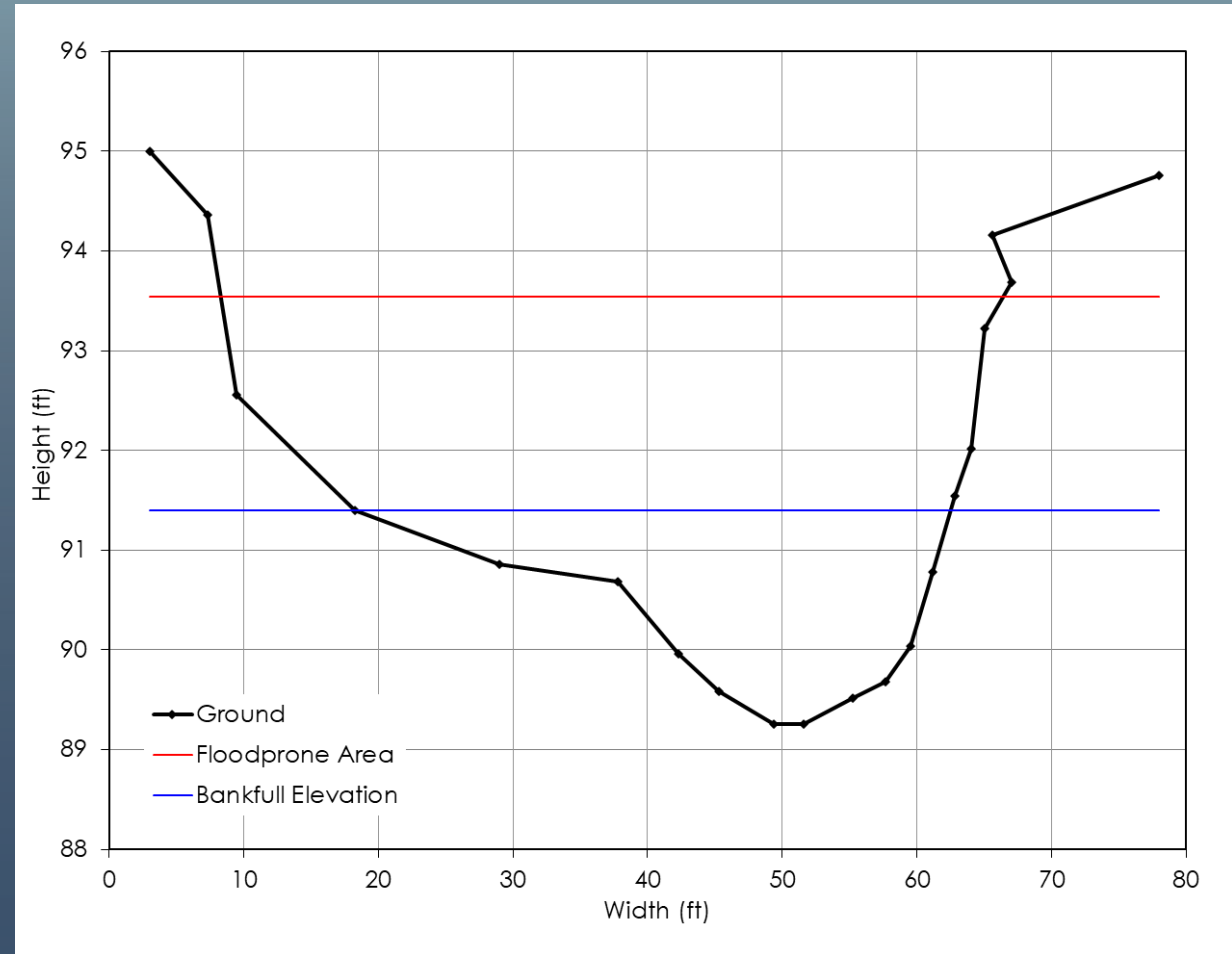
# Upstream Reach

Confluence with Silver Creek downstream to Route 212 bridge

- ✓ Approximately 1/3 mile surveyed
- ✓ 3 discrete segments /reaches surveyed



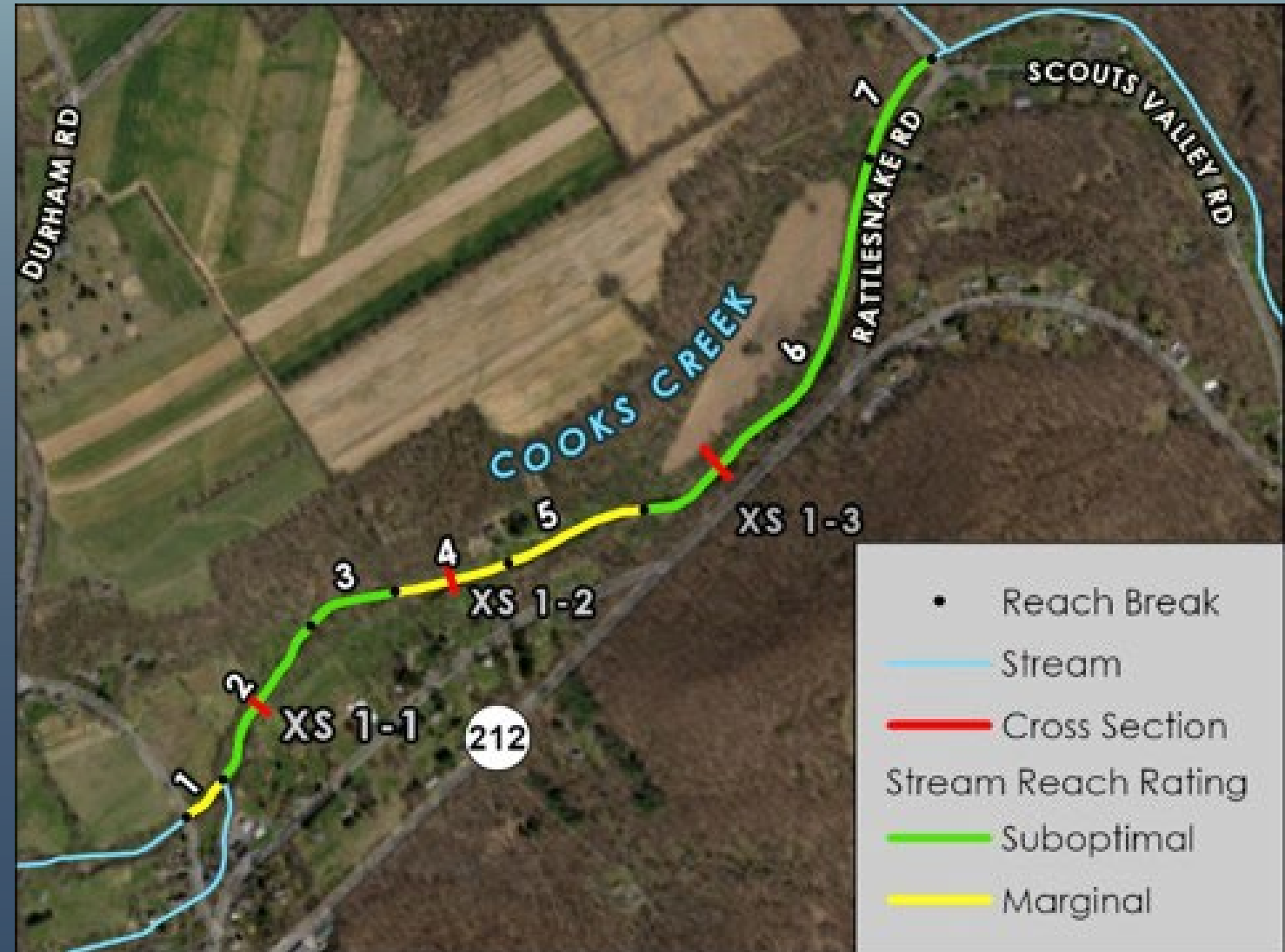
# Upstream: Reach 3, Cross Section 2-2



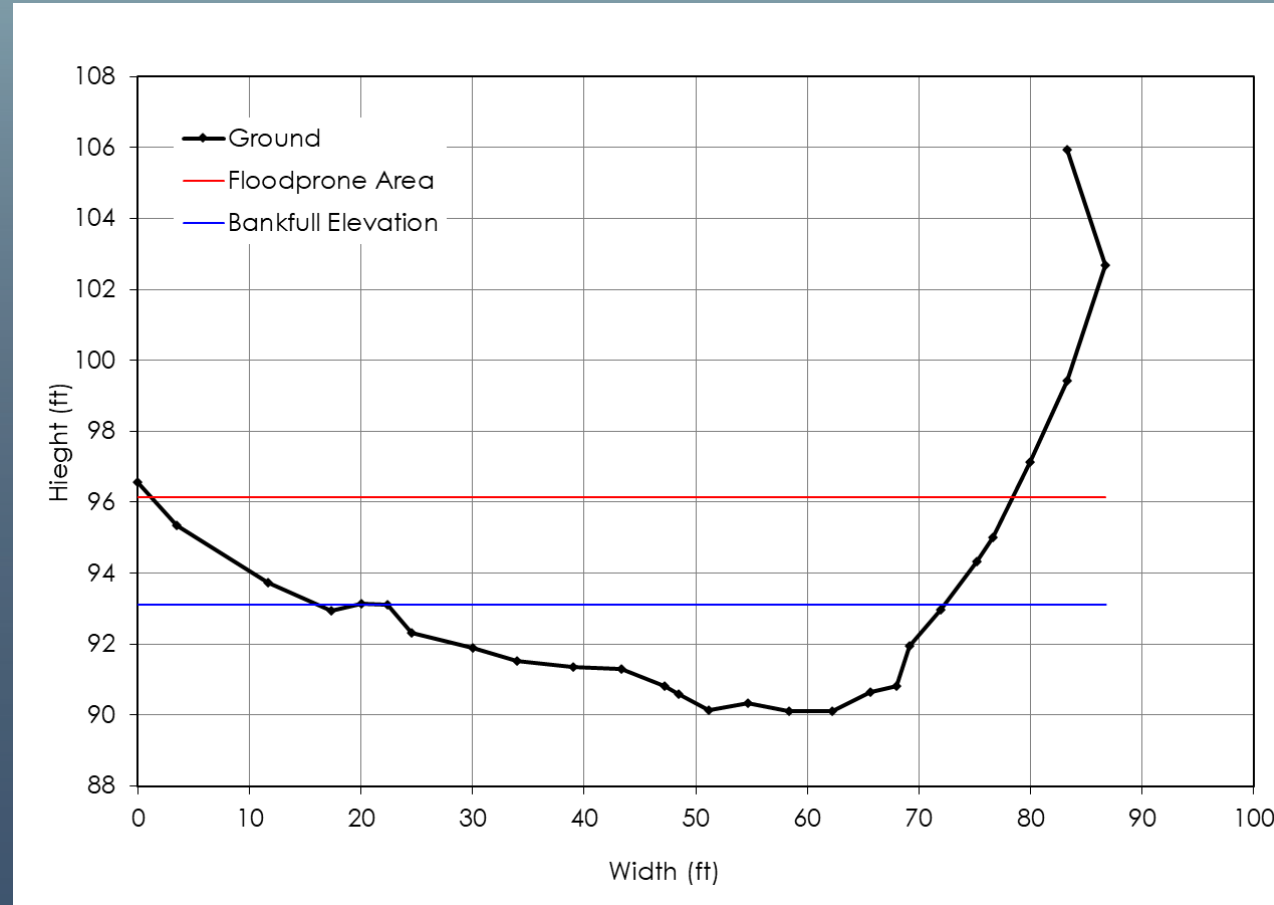
# Downstream Reach

Durham Road to Scouts Valley Road

- ✓ Approximately 1 mile was surveyed
- ✓ 7 stream segments identified and surveyed within entire reach



# Upstream: Reach 4, Cross Section 1-2



# Upstream: Reach 7



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# Overarching Observations

- ✓ General lack of connection to floodplain in areas with steep banks
- ✓ Upstream Reach
  - General instability derived from potential higher flows, increased upstream erosion, or both.
  - Riparian vegetation generally in good condition
- ✓ Downstream Reach
  - Exhibited signs of instability with eroded banks and areas of embeddedness suggestive of high flow and sediment input
  - Riparian impacts greater as result of nearby residences / farm fields

# Recommendations & Implementation Projects

# Original CCWCP Recommendations

- ✓ Five broad categories
  - Water management and monitoring
  - Stormwater and land use management
  - Water quality protection
  - Habitat and ecosystem protection
  - Public education and Outreach

# Water Management and Monitoring

- ✓ Continue to update groundwater safe yield studies accounting for climate change, current usage, forecasted population trends
- ✓ Continue and expand stream gauging and aquifer monitoring
- ✓ Particularly important due to sensitive karst geology, role of aquifer, and land use changes

# Stormwater and Land Use Management

- ✓ Focus on retrofitting existing stormwater infrastructure in more urbanized portions of watershed
- ✓ Incorporate changing design storm guidelines to meet increasing severity of storm events
- ✓ Utilization of green infrastructure BMPs
- ✓ Encourage utilization of agricultural BMPs including cover cropping, nutrient management, winter ground cover, livestock exclusion from streams

# Water Quality Protection

- ✓ Expand water quality monitoring through community programs
  - Nutrients / sediments
  - Pathogens / coliforms
  - Temperature, oxygen, pH, and specific conductance
- ✓ Foster septic system improvements and maintenance outreach

# Habitat & Ecosystem Protection

- ✓ Conduct periodic biological inventories
- ✓ Enhance / restore riparian buffers
- ✓ Maintain open space protection initiatives and increase number of protected sites
- ✓ Implement systemic invasive species management program

# Stream Channel & Riparian Restoration

- ✓ Target restoration at high priority sites
- ✓ Implementation of hard structures including use of wood/stone to arrest head cutting and erosion
- ✓ Improve bank stability through utilization of rootwads / soil wraps combined with live plantings
- ✓ Improve riparian buffers at high priority sites
- ✓ Improve floodplain connectivity via bank grading to reduce in-stream shear stress and increase flood storage

# Project Implementation Types

Name	Location	Benefit	Estimated Cost
Well/Aquifer Monitoring	Watershed	Updating depth to water table maps; will support safe yield studies	\$60,000 - \$70,000
Safe Yield Study	Watershed	Utilizing aquifer mapping provided above safe yield studies can dictate water usage and allocation	\$80,000 - \$100,000
Inlet Retrofits	Durham, Springtown, Pleasant Valley	Improved capture of particulates and prevention of road flooding, requires regular cleaning to maintain performance	\$5,000 - \$10,000 each, annual maintenance \$1,000
Raingardens	Community	Designed to foster infiltration, reduce stormwater, and capture nutrients	Professional installation up to \$50/square foot
Bioswale Installations	Durham, Springtown, Pleasant Valley	Bioswales utilize native vegetation to reduce stormwater velocity thus limiting erosion, and capture solids and nutrients	Engineered systems cost approximately \$200 - \$300/liner foot
Cover Cropping/Winter Ground Cover	Agricultural Sites	Reduction of soil erosion	\$100/acre
Farm Nutrient Management Plan	Agricultural Sites	Cultural BMP to reduce fertilizer use and waste management	\$50/acre
Livestock Stream Exclusion	Agricultural Sites	Excludes livestock from accessing streams reducing potential erosion, nutrient loading, and bacterial loadings	Various wire fence types cost \$2 - \$7/ft installed
Water Quality Monitoring Program	Tributary Network	May include monitoring of nutrients, physical/chemical parameters, and bacteria	\$20,000 - \$40,000 depending on analytes and sampling frequency

# Project Implementation Types

Name	Location	Benefit	Estimated Cost
Septic System Maintenance and Tank Inspection	Residences and Commercial Settings	Regular pumpouts and tank inspection improve nutrient renovation and decrease failure rates	\$300 - \$500
Septic System Replacement	Residences and Commercial Settings	Replacement of failing septic systems prevents bacterial and nutrient loading to groundwater and surface water resources	\$25,000 - \$50,000 per unit dependent on soil characteristics, use, and size
Roadside Erosion Control Practices	Durham, Springtown, Pleasant Valley	Implementation of various erosion control BMPs, particularly near road crossings, reduces erosion and sedimentation	\$30,000 - \$40,000/acre of catchment
Periodic Biological Inventories	Watershed	Identification of various taxa including plants, fish, macroinvertebrates, mammals	\$40,000 - \$60,000 per major taxa
Riparian Buffer Enhancements	Tributary Network	Riparian buffer enhancements typically focus on planting with native vegetation improving shading, lowering temperatures, improving bank stability, and decreasing solids and nutrient loads	\$3,000 - \$6,000/acre dependent on plant selection and site preparation needs such as invasive species removal
Invasive Species Control	Watershed/Tributary Network	Invasive species control is usually paired with subsequent restoration techniques intended to improve habitat quality	\$1,500 - \$4,000/acre with a wide range from commercial application to mechanical removal
Channel Grade Control Structures	Tributary Network	Channel grade control structures improve channel stability and can arrest head cuts and other erosional process	\$20,000 - \$80,000/structure dependent on design, channel width, and permitting
Bank Stability Improvements	Tributary Network	The use of root wads, soil wraps/lifts, live fascines, and planting are all used to improve bank stability and reduce erosion and sedimentation	\$200 - \$400/linear foot

# Project Implementation Types

Name	Location	Benefit	Estimated Cost
Floodplain Connectivity	Tributary Network	These projects may use a variety of techniques including floodplain regrading, legacy sediment removal, floodplain benching, and planting to provide flood storage, reduce downstream flooding, decrease erosion, and improve bed and bank stability	\$75,000 - \$500,000/acre dependent on many site characteristics, including access, and related factors
US Reach 2 Right Bank Stabilization	Springtown, approx. N 40.5506, W 75.27446	Installation of bank stabilization measures of 250 linear feet to reduce erosion and downstream sedimentation	\$100,000
US Reach 3 Grade Control and Bank Stabilization	Springtown, approx. N 40.5506, W 75.27446	Installation of instream grade controls to improve bed stability and right bank stabilization to arrest severe erosion	\$250,000 - \$300,000
DS Reach 1 Right Bank Stabilization	Durham, approx. N 40.57746, W75.22350	Installation of bank stabilization measures of 200 linear feet to reduce erosion and downstream sedimentation	\$80,000
DS Reach 4 Floodplain Connectivity	Approx. N 40.58007, W75.22030	Restoring floodplain connectivity through regrading	\$250,000 - \$350,000
DS Reach 5 Grade Control and Floodplain Connectivity	Approx. N 40.58076, W75.21730	Restoring floodplain connectivity and channel stability through a combined effort installing grade control and regrading the floodplain	\$400,000 - \$500,000
DS Reach 6 Riparian Buffer Enhancements	Approx. N 40.58477, W 75.21257	Multiple opportunities in the lower reach to enhance riparian buffers through planting along 400 to 500 linear feet	\$6,000

# Next Steps

- ✓ Updated Watershed Conservation Plan available via CCWA for review and comment for next 4 weeks
- ✓ Comments will be reviewed and integrated as appropriate into final plan

# QUESTIONS?



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