



# Upper Cocalico Creek Watershed Permit Decision Matrix

**March 4, 2026**

**PA Aquatic Resource  
Restoration Conference**

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LandStudies

**Current Condition**

Drainage Area:		3.23 square miles		
Valley Slope:	Moderate (1%-2%)			
Valley Confinement:	Unconfined			
Wetlands Present?	Yes	Est Acres:	1	
Channel Type:	Single Thread	Est Length:	2800 LF	
		Est Width:	4 feet	

**Degradation**

- Legacy Sediment
  - Lateral Migration
  - Channel Incision
  - Berming/ Ditching/ Straightening
  - Encroachments - Fill(Roads/Bridges/Buildings/Utilities)
  - Encroachments - Infrastructure (Roads/Bridges/Buildings/Utilities)
  - Valley Abandonment (incision through parent material)
  - Other:
- 

Notes: The subject reach of Harnish Run has been ditched and straightened through agricultural fields and has subsequently migrated laterally through a legacy sediment terrace. Multiple road crossings are present within the reach, and the channel has migrated into the road embankment near the downstream limit.

**Constraints**

- Property Boundary/ Landowner Limitations
  - Limited Reach Length
  - Prior Bank Stabilization
  - Cultural Resources
  - Access Issues
  - Roads, Other Infrastructure
  - Bridge/Culvert - Vertical Constraint
  - Buried Utility - Horizontal Constraint
  - Buried Utility - Vertical Constraint
  - Maintenance Potential
  - Other:
- 
- Known Bog Turtle habitat in vicinity

Notes: Landowner participation will limit access to a segment of the reach as well as overall available width, and a prior bank stabilization project at the downstream end of the reach will limit the length of restoration. Limited reach length and existing road crossings create vertical constraints. Known Bog Turtle habitat in the area may create additional restoration limitations.

### Restoration Preferred Option(s)

- Comprehensive Floodplain Restoration
- Floodplain Restoration - Limited Horizontal
- Floodplain Restoration - Limited Vertical
- Floodplain Restoration - Limited Horizontal and Vertical
- Channel/ Valley Fill
- Channel Blockage/ BDA
- Floodplain Bench
- Bank Grading
- Bank Armoring
- No Action

Notes: Floodplain restoration within a narrow corridor is the preferred feasible alternative based on landowner preferences. Although not likely the full historical valley width, the available width is conducive to an effective restoration project. Vertical limitations may be present pending further site analysis, although a preliminary site investigation indicates that the historical floodplain elevation can likely be achieved for the majority of the reach.

Project Name: Upper Cocalico Creek Watershed

Site: Harnish Run

Watershed: Cocalico Creek

Total Assessment Acres: 8.5

Preferred Restoration Approach: Comprehensive Floodplain Restoration

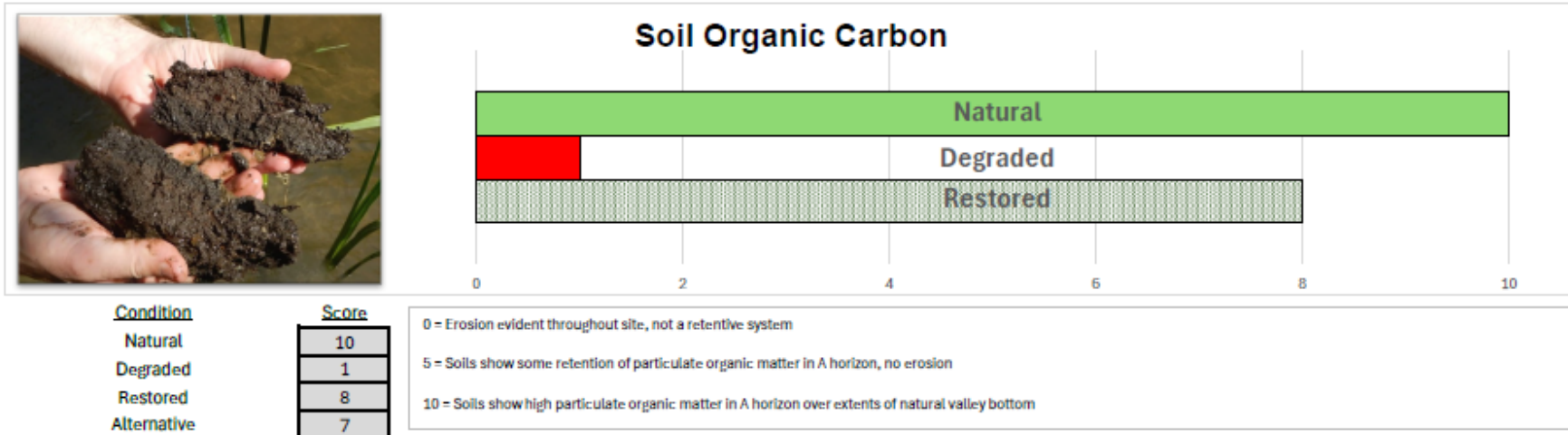
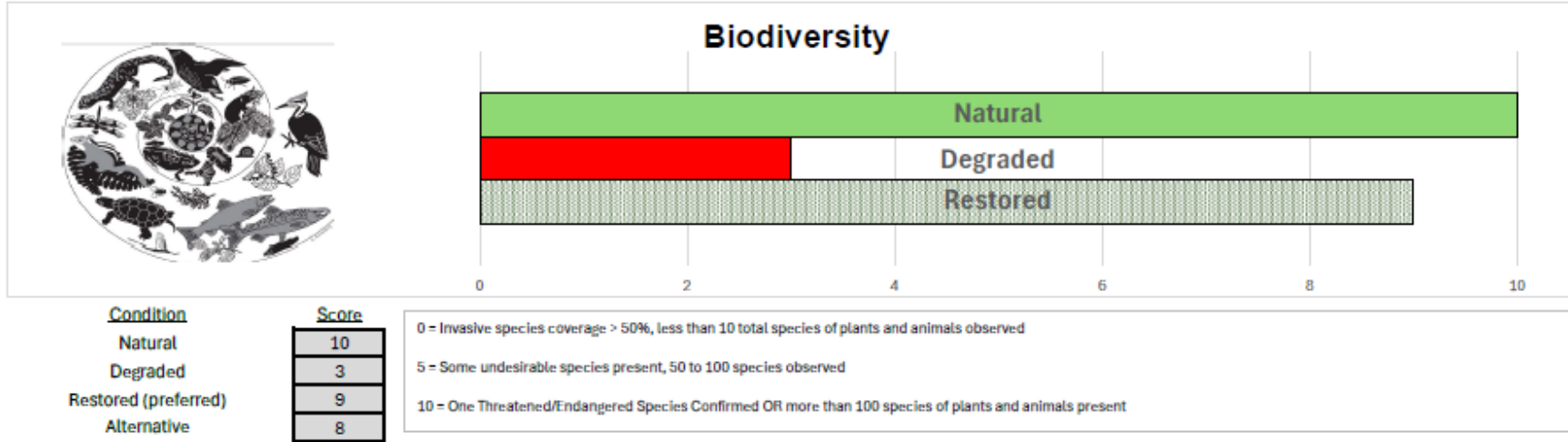
Alternative Approach: Floodplain Restoration - Limited Vertical

Date: 11/26/2024

Project Number: 353.4-24

Preferred Restoration Acres: 5.5

Alternate Restoration Acres: 5.5





Project Name: Upper Cocalico Creek Watershed  
 Site: Harnish Run  
 Watershed: Cocalico Creek  
 Preferred Option: Comprehensive Floodplain Restoration  
 Option 2: Floodplain Restoration - Limited Vertical

Date: 11/26/2024  
 Project Number: 353.4-24

Functional Categories	Condition		Restoration Options		
	Natural	Degraded	Preferred Option	Option 2	No Action
Biodiversity	10	3	9	8	3
Soil Organic Carbon	10	1	8	7	1
Biogeochemistry	10	2	8	6	2
Sediment Storage	10	1	8	7	1
Base Level	10	5	8	5	5
Hyporheic Connectivity	10	2	8	4	2
Flood Attenuation	10	2	7	6	2
Surface Hydrodynamics	10	3	8	7	3
POM Storage	10	2	8	7	2
Food Supply	10	3	8	8	3
Habitat	10	4	9	7	4
Aquatic Organism Passage	10	7	8	8	7
Terrestrial Connection	10	4	8	8	4
<b>Average Resource Function</b>	<b>10.0</b>	<b>3.0</b>	<b>8.1</b>	<b>6.8</b>	<b>3.0</b>
Total Aquatic Resource Area (ac)	8.50	1.00	5.50	5.50	1.00
<b>Functional Magnitude</b>	<b>85.0</b>	<b>3.0</b>	<b>44.4</b>	<b>37.2</b>	<b>3.0</b>
Function Relative to Natural Condition		4%	52%	44%	4%
Function Relative to Degraded Condition			1481%	1241%	100%

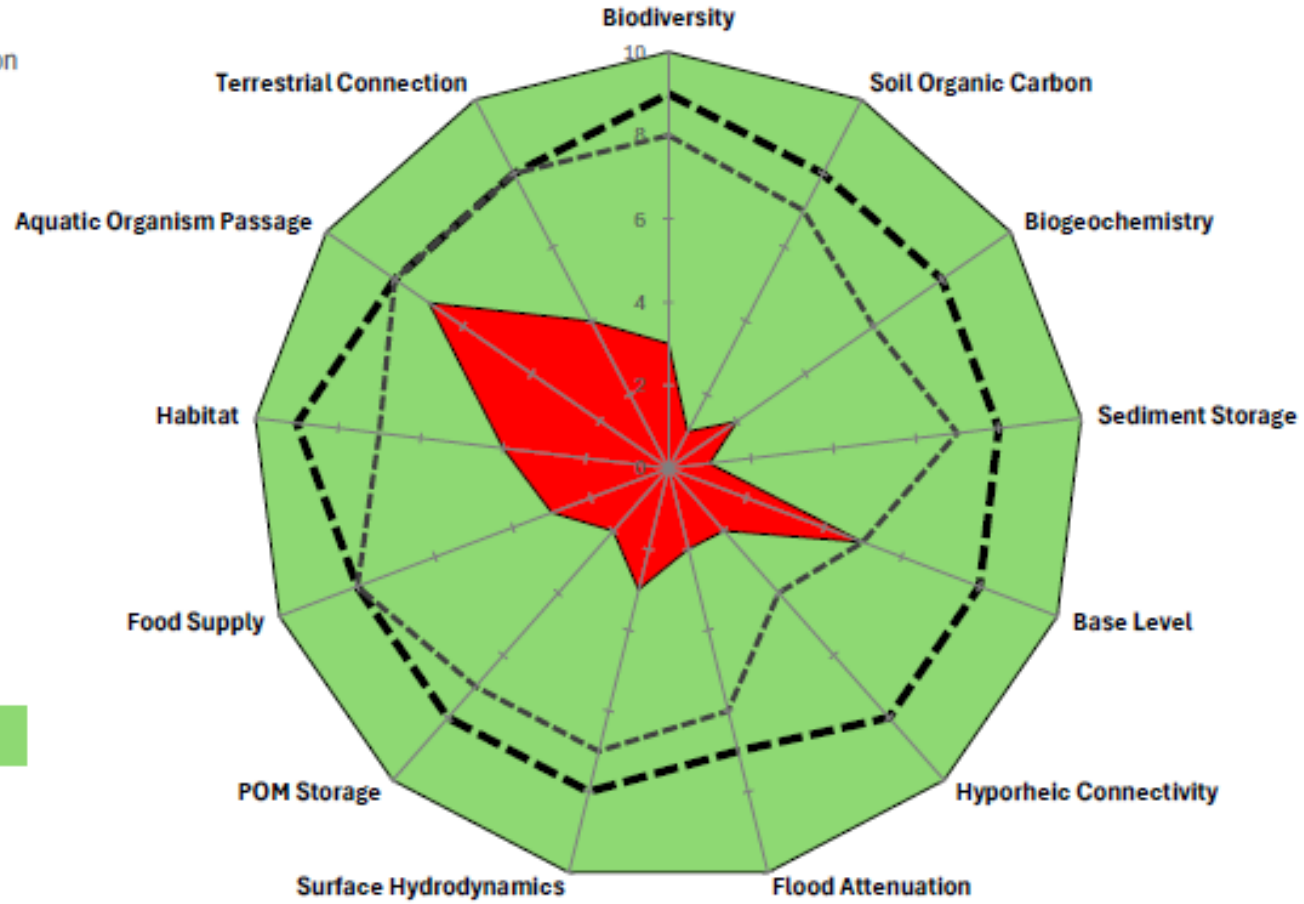
# Functional Categories

 Natural

 Degraded

 Preferred Option

 Option 2



## Functional Magnitude

Natural



Degraded

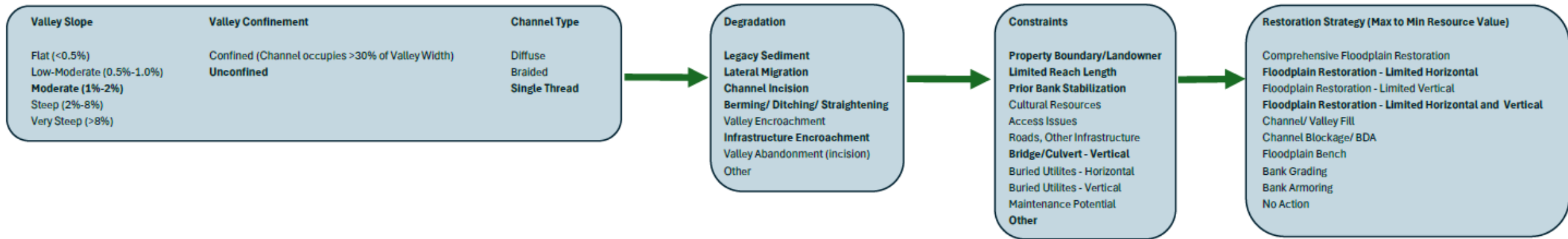


Preferred Option



Option 2





Restoration Approach Typical Score Ranges

	Condition		Restoration Options									
	Natural	Degraded	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J
Biodiversity	10	3	8-10	8-10	6-8	6-8	6-8	6-8	5-7	4-6	0-4	3
Soil Organic Carbon	10	1	8-10	8-10	5-7	5-7	6-8	8-10	5-7	2-4	0-2	1
Biogeochemistry	10	2	8-10	8-10	4-6	4-6	6-8	8-10	5-7	2-4	0-2	2
Sediment Storage	10	1	8-10	6-8	6-8	6-8	4-6	8-10	4-6	2-4	0-2	1
Base Level	10	5	8-10	8-10	4-6	4-6	4-6	4-6	4-6	2-4	3-5	5
Hyporheic Connectivity	10	2	8-10	6-10	4-6	4-6	5-8	6-8	4-6	0-2	0-2	2
Flood Attenuation	10	2	8-10	5-7	5-7	5-7	4-6	4-6	4-6	0-2	0-2	2
Surface Hydrodynamics	10	3	8-10	6-8	6-8	6-8	8-10	8-10	6-8	0-4	0-2	3
POM Storage	10	2	8-10	6-8	5-7	5-7	6-8	6-8	4-6	0-2	0-2	2
Food Supply	10	3	8-10	8-10	8-10	8-10	8-10	6-8	5-7	2-4	0-2	3
Habitat	10	4	8-10	8-10	6-8	6-8	6-8	6-8	5-7	2-4	0-2	4
Aquatic Organism Passage	10	7	8-10	8-10	6-10	6-10	8-10	5-10	0-10	0-10	0-10	7
Terrestrial Connection	10	4	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	5-10	4

Restoration Approaches

- A Comprehensive Floodplain Restoration
- B Floodplain Restoration - Limited Horizontal
- C Floodplain Restoration - Limited Vertical
- D Floodplain Restoration - Limited Horizontal and Vertical
- E Channel/ Valley Fill
- F Channel Blockage/ BDA
- G Floodplain Bench
- H Bank Grading
- I Bank Armoring
- J No Action

# Applications

- Quick visual assessment/ desktop evaluation
- Document causes of degradation and constraints
- Assess current and potential resource functions
- Identify appropriate restoration approach(es)
- Project prioritization
- Communication to stakeholders



# Limitations

- Not a comprehensive resource assessment
- Relative assessment, subject to individual interpretation
- Value of watershed position not explicitly considered
  - Headwaters vs. large systems
  - Proximity to other projects
- Varying scale of assessment reaches
  - Reach length may “wash out” significant problem areas
  - Impairment conditions and constraints may vary throughout assessment reach



# Cocalico Watershed Results

Upper Cocalico Watershed Permit							
Resource Function Value Summary							
Reach	Reach Length (LF)	Restoration Area (ac.)	Degraded Condition Value	Average Resource Function Preferred Option	Functional Magnitude Degraded Condition	Functional Magnitude Preferred Option	Functional Magnitude Increase- Preferred Condition
Cocalico at S. Cocalico Rd Reach 3	5,770	29.3	1.7	10.0	5.1	293.0	287.9
Cocalico at S. Cocalico Rd Reach 4	7,500	26.1	1.8	10.0	11.1	261.0	249.9
Cocalico at S. Cocalico Rd Reach 2	4,300	20.7	2.9	9.8	14.6	202.2	187.6
Cocalico at Swamp Bridge	2,800	18.7	3.4	9.8	63.4	184.3	120.9
Little Cocalico at 897 (Gockley)	3,500	12.5	1.9	9.8	1.3	122.1	120.8
Little Cocalico at Reinholds Rd	2,750	15.7	2.5	8.3	19.7	130.4	110.7
Little Cocalico at Galen Hall Rd (Gockley Extended)	4,500	11.3	2.3	7.1	16.2	80.0	63.8
Cocalico at S. Cocalico Rd Reach 1	2,625	5.0	2.8	9.4	1.9	62.9	61.0
Cocalico at Greenville	3,100	12.0	5.5	7.6	31.6	91.4	59.8
Harnish Run	2,800	5.5	3.0	8.1	3.0	44.4	41.4
Little Cocalico at Fry Run	1,613	4.5	2.6	7.9	4.5	35.7	31.2

# Potential Improvements

- Refine scoring benchmarks based on peer review
- Additional scoring credit for headwater reaches/ strategically grouped reaches
- Bracket reach lengths for a given set of comparison reaches
- Add a cost-effectiveness metric





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