Urban Stormwater

NRES Capstone 2017

Remediation:

Coldstream Park Urban Stormwater Runoff Project

Pollution and Human Impact

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Hydrology and Wildlife

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Overview:

1. Identify Stakeholders in the Community
2. Site Assessment
3. Remediation Plan
4. Implementation

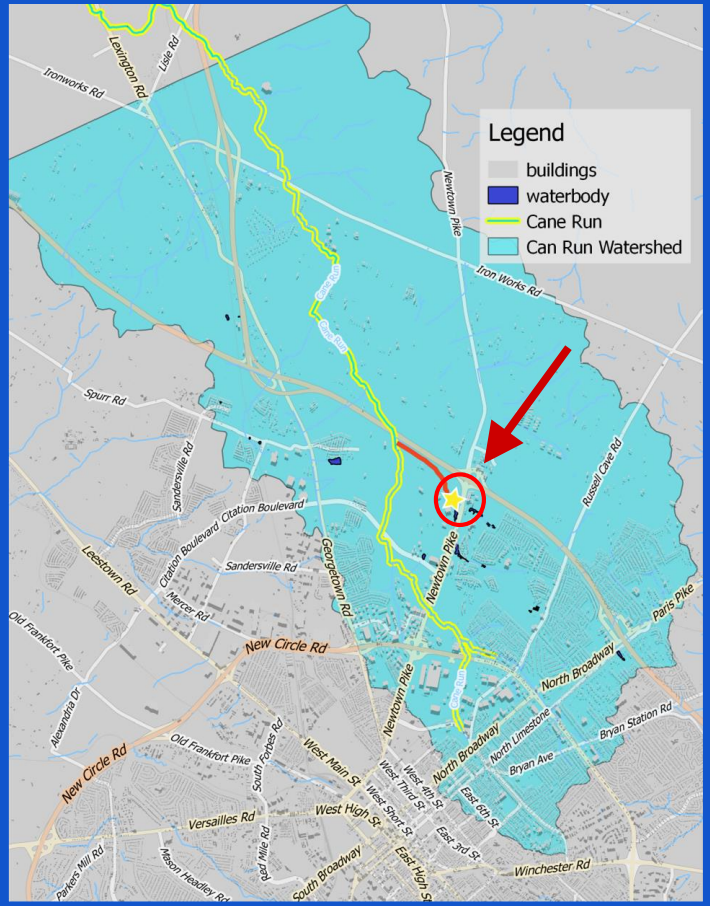
Stakeholder

Lexington-Fayette County Urban County Government

- Provided the location for the project
- $2,000 in funds for remediation
- Loaned tools and equipment for planting

LEXINGTON

Site Overview:



Before...

Rapid Bioassessment Protocol

Kentucky Division of Water's Rapid Bioassessment Protocol

- Rated from Optimal to Poor
- RBP Score of 73 out of 200
- Any score below 141 is considered poor health.

[1]Barbour et al. 1999

Habitat Parameter	Condition Category
Embeddedness	***Poor***
Sediment Deposition	***Poor***
Channel Alteration	***Poor***
Bank Stability	***Poor***
Riparian Zone Width (Veg)	***Poor***
Velocity/ Depth Regime	Marginal
Vegetative Protection	Marginal
Epifaunal Substrate/ Available Cover	Suboptimal
Channel Flow Status	Suboptimal
Frequency of Riffles	Optimal

Vegetative Assessment

Macroinvertebrate Assessment

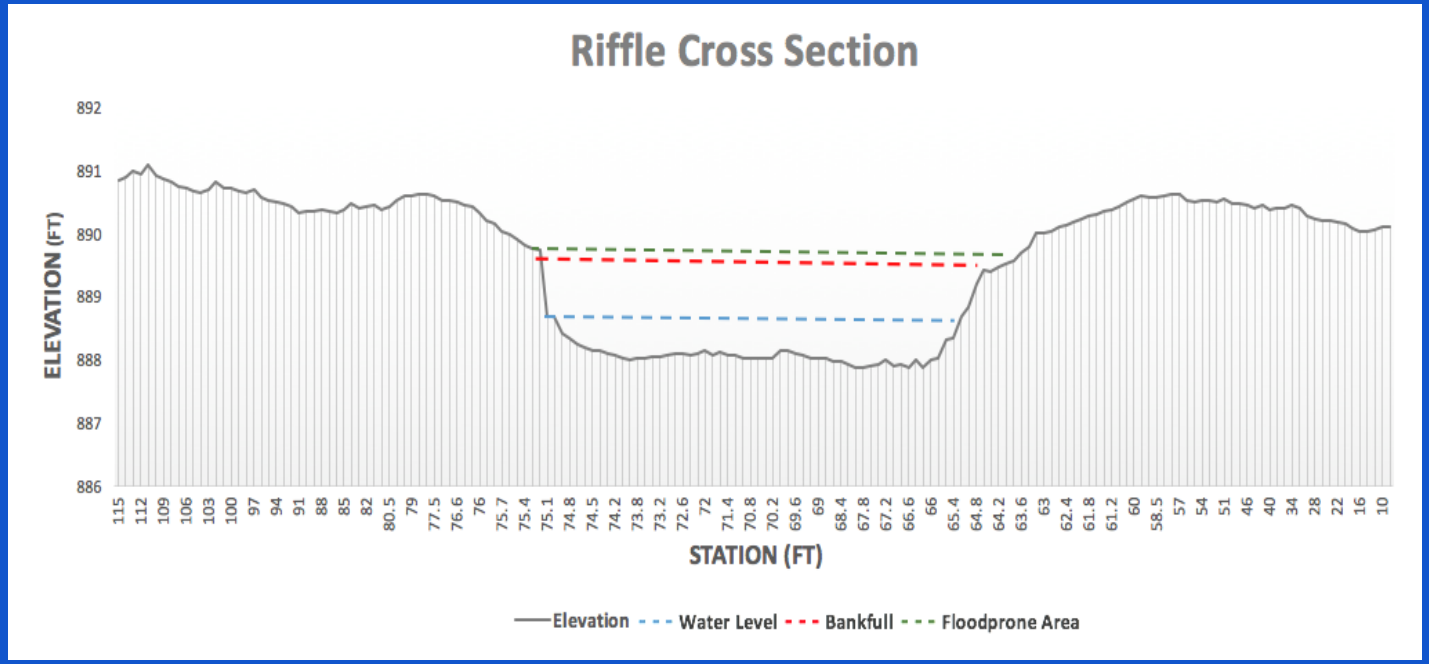
Survey Results:

- Crayfish
- Water striders
- Midge larva
- Sowbugs

Table 14. KDOW MBI narrative scores

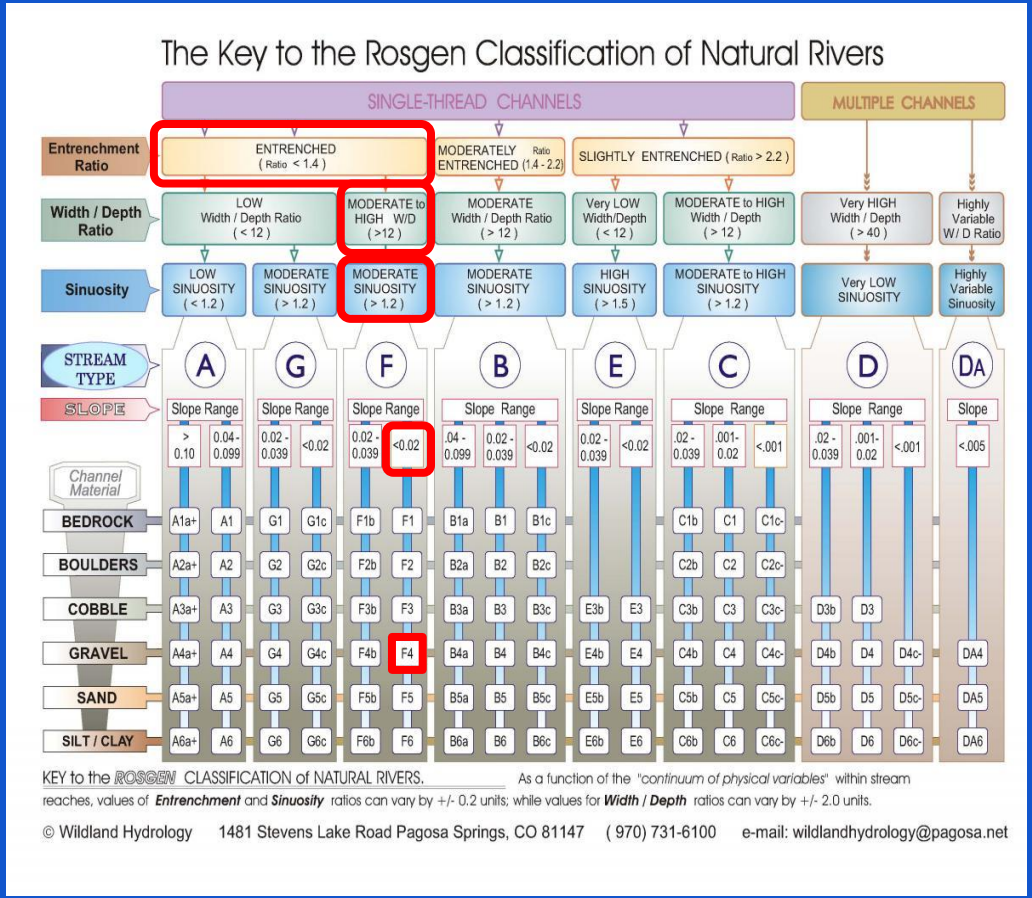
Collection Date	Macroinvertebrate Bioassessment Index (MBI) Narrative Score
7/7/1998	N/A[1]
9/3/2009	Fair
6/10/2009	Fair
3/27/2007	Poor
9/2/2009	Poor
9/2/2009	Fair

Hydrological Surveys



Rosgen Classification

Surveying Calculations	
Entrenchment Ratio (ER)	1.187 ft/ft
Width to Depth Ratio (W/D)	15.398 ft
Sinuosity (k)	1.18 ft
Slope of Water (S)	0.0196 ft/ft
Channel Aggregate (D50)	23.11 mm (Gravel)
Rosgen Classification	**F4**

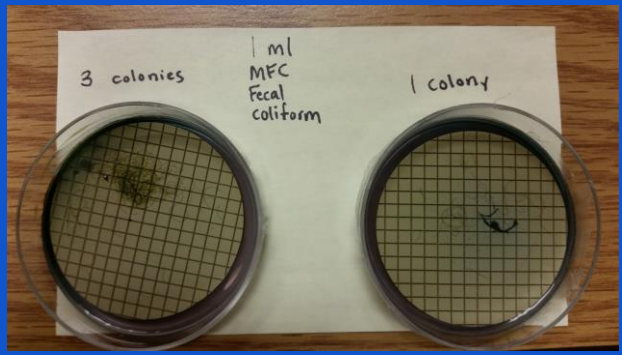


Soil & Water Assessment

Soil Profile (Soil Probe)	Silty clay loam, 6.5-6.7, hydric indicators

E. Coli (Fecal Coliform)	200 colonies per 100 ml water
E. Coli (Fecal Streptococci)	100 colonies per 100 ml water
E. Coli (Total Coliform)	1,000 colonies per 100 ml water

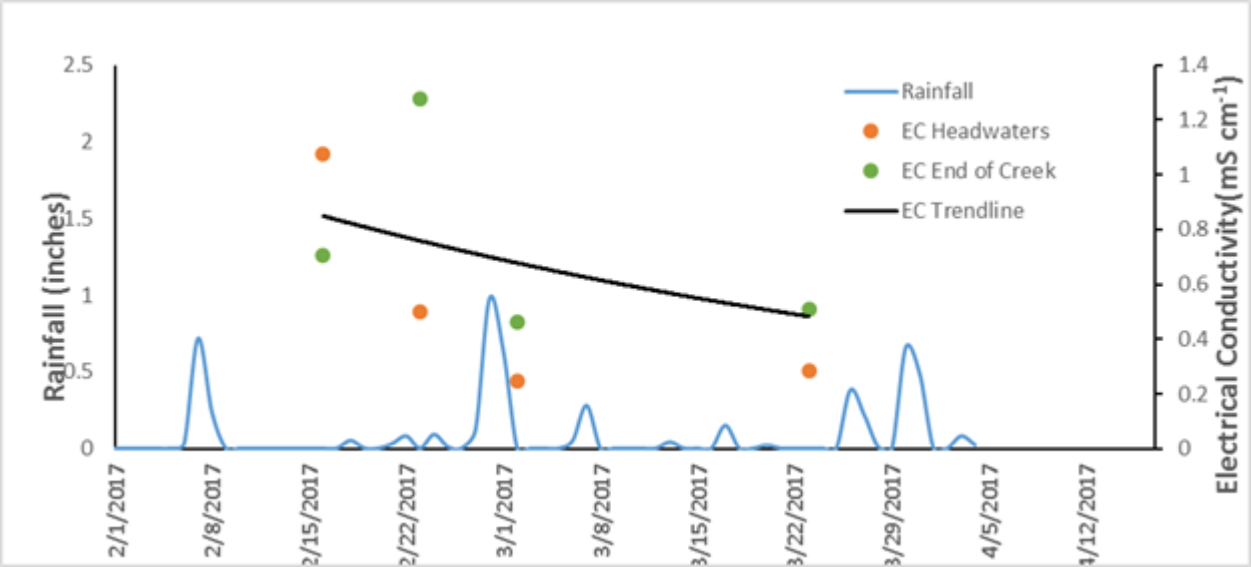
Region 4: Freshwater	
Primary	200 FC
Secondary	1000 FC



Water Quality

- Trending down over time
- Possible causes: Road Salt Rainfall

Location	pH	EC	Concentrations (Mg L^{-1})	
		mS cm^{-1}	Sodium	Chloride
Headwaters	7.70	0.9415	56.27	85.83
End of Creek	7.85	0.7375	58.95	85.21
Regional AVG*	6.96	0.5565	15.01	0.77

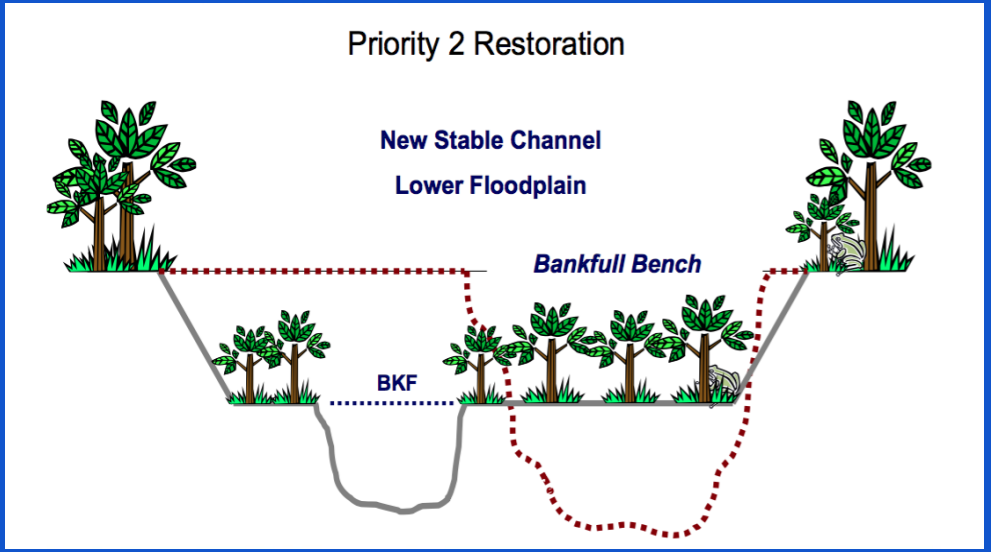


*FOR 460 Class Data, Fall 2016

Ideal Remediation Plan

Priority 2 Restoration Option

- Grade banks and restore floodplain access
- Reduce flow rate from storm drain entrances
- Improve riparian zone (>18m)
- Increase sinuosity
- Bankfull Model Simulation
    - Turbulence + our values
    - Restoration



Impacts of Riparian Zone Development on Water Quality

- Plan: restoring riparian zone
- Benefits:
  - Coarse rooting system significantly reduces bank erosion rates[1]
  - Clear-cut streams carry 4x sediments[2]

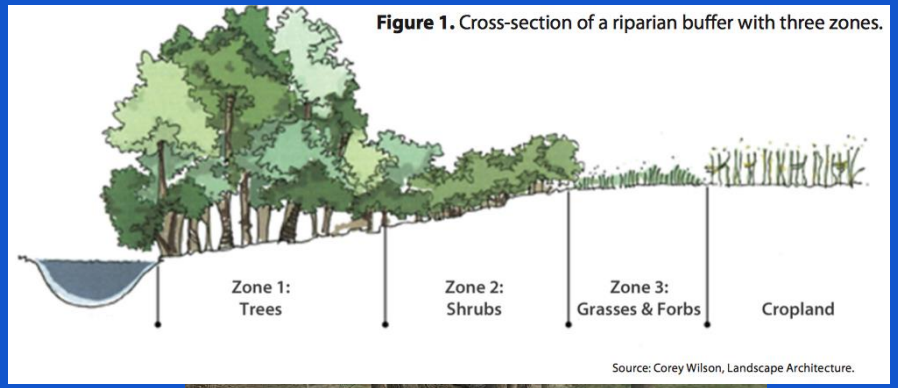


Figure 1. Cross-section of a riparian buffer with three zones.

Source: Corey Wilson, Landscape Architecture.

Table 2. Vegetation effectiveness for select buffer benefits.

Benefit	Vegetation Type: Trees	Shrubs	Grasses
Streambank stabilization	High	High	Low
Filtering sediment	Low	Low	High
Filtering nutrients, pesticides, pathogens	Moderate	Low	Moderate
Improving aquatic habitat	High	Moderate	Low
Improving forest habitat	High	Moderate	Low
Improving field (pasture) habitat	Low	Moderate	High
Flood protection	High	Moderate	Low
Visual diversity	High	Moderate	Low

[1] Langendoen et al. 2009, [2] Karr and Schlosser 1978

Remediation Layout

Livestakes
Black Willow
Ninebark
Silky
Dogwood
Elderberry

Kentucky Native Cane

Riparian and Quick Erosion Seed Mix

Erosion Control Blanket

Swamp White Oak

amp White Oak

Wetland Meadow Seed Mix

Methods to Control & Limit Upstream Stormwater Volume and Pollution

- Green roof implementation
- Rain gardens
- Widening buffer zones along major roads

Source: Ace Weekly

Source: EPA.gov

Acknowledgements

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Thank you!

We welcome your questions and feedback