2014

Stream Restoration Proposal 2014, Plum Run Tributary – West Branch

Jesse McLaughlin
West Chester University of Pennsylvania

Greg Smith
West Chester University of Pennsylvania

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By Jesse McLaughlin and Greg Smith

Goals and Objectives

- Excavate and shape stream banks to a 3:1 ratio
- Restore stream quality and prevent nutrient loading and bank erosion via a Riparian buffer
- Seed and Mat the stream to aid in Riparian growth and prevent bank erosion
- Remove invasive species from the right side of the stream where vegetation is already present(keep natives in place)

Goals and Objectives

- Install boulder clusters in the form of J-hooks at meandering sites and Cross-vanes where necessary
- Monitor Restoration efforts by measuring sediment load (turbidity), counting invertebrate species, and by using a probe to measure different aspects of water chemistry (DO, Temperature, etc.)

Why we choose our site?

- The location of the pond at the beginning of our site is already a natural way that the stream is protected and has reduced nutrient uptake from its location.
- Being a smaller, 1st order stream, more accelerated and noticeable results are expected from restoration of this site.
- Site lacks adequate riparian vegetation

Site characteristics

- Approximately 222 meters long
- Average of 1.3 meters wide
- Pond located at top of site
- Limited trees and shrubs on east side
- Entirely grass on west side
- 4 major bends in stream
- Steep banks, with some undercut banks
- Tom Ciccarone’s property

Site to be restored

Major bends

Acquiring permits and funds

- County permits
- Conservation district approval
- Apply for USDA conservation reserve enhancement program for Tom Ciccarone's sake.

Water divergence

- Working in the dry is law in Chester county
- Water will be diverged using a pump from the upstream portion of site to the downstream portion of site.
- This will also simplify in stream restoration
- Costs included in “additional fees”

Excavation

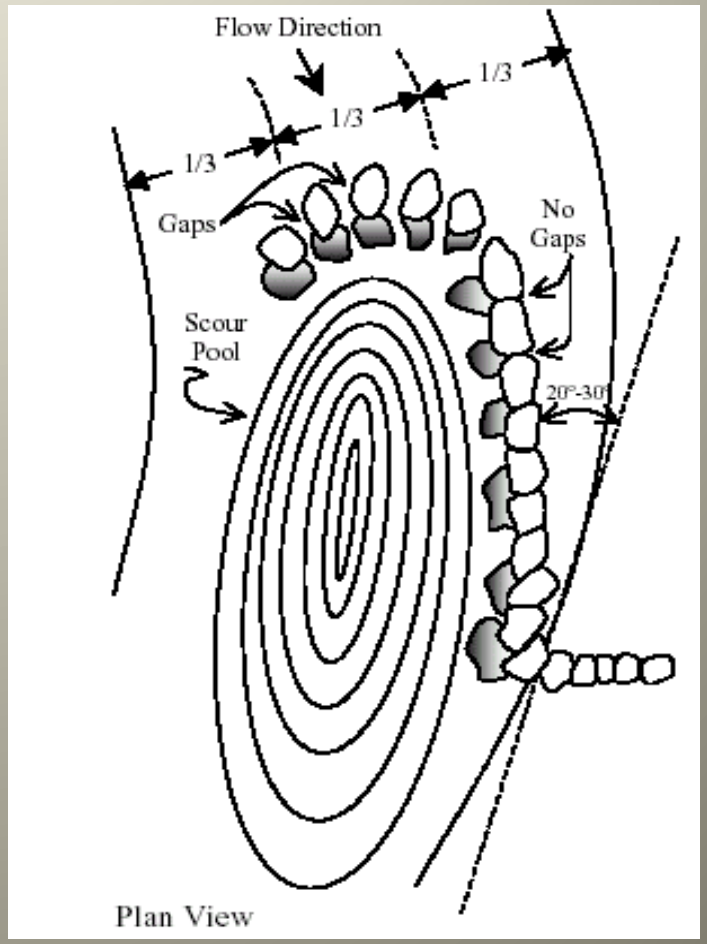
- Initial fee for delivery of equipment and materials: $3500
- Additional fees: $1500
- Stream currently about 1.3 meters wide
- Increase to a width of 2 meters
- Widening excavation of 117 m^3 of soil
- Cost: $1200

Excavation

- Grading of the steep stream banks to a 3:1 ratio
- Grading on both sides of stream where possible without removing native trees
- Excavation of 441 m^3 of soil
- Cost: $8200

In stream additions

- Addition of J-hooks in curves at the top and bottom of site
- cost: $3000 each
- $6000 total
- Will use logs or root wads if available on site



J-hook locations

In stream additions

- Addition of 4 Artificial riffles
- Essentially a pile of medium sized rocks strung across stream, almost always submerged.
- Not intended for erosion resistance, but rather for macro-invertebrate habitat creation
- Cost: $800 each
- $3200 total

Artificial riffle locations

Morphological restoration Budget

- Delivery- $3500
- Additional fees- $1500
- Widening- $1200
- Bank grading- $8200
- J-hooks- $6000
- Artificial riffles- $3200
- Total- $23600

Seeding

- After the banks are graded to the proper 3:1 ratio and the stream is widened to 2 meters, seeding will be performed on the banks.
  - Aids in Riparian Growth
  - Protects against erosion
- Use Mid-Atlantic 178 seed
  - Area to cover = 1.2 acres
  - Cost = $650 (@$537 per acre)

Coconut Fiber Matting

- After seed has been spread soft armor will be put in place
  - Use Coconut fiber matting to protect seed from washing away while also protecting against stream erosion
    - Keeps our newly graded banks in-tact
    - Soft armor allows for stream to reconnect with its floodplain

Coconut Fiber Matting

- BioD – Mat 90 woven coir mat (rolanka.com)
  - Will cover entire 222 m stretch
  - And 4 m wide on each side
  - Mat Dimensions – 3.3 ft. x 83 ft.
  - Need 64 rolls (32 each side)
  - Cost = $8,640 (@ $135 per roll)

Riparian Vegetation

- The main goals behind our riparian buffer will be to
  - Intercept nutrients (especially phosphorus)
  - Increase bank stability
  - Reduce water temperature
  - Increase sinuosity (only 4 bends currently)

Riparian Vegetation

- Our buffer will mostly run on the west side of the stream.
  - east side already has vegetation
    - Remove invasive species
    - Maintain native species
    - Add native species
- Will run outwards 11m to give a substantial buffer capable of making a difference to stream quality.

Riparian Vegetation

Riparian Vegetation

- Order trees and shrubs from
  - Environmental Concern Inc. (wetland.org)
- Trees
  - 6 silver maple = $60
  - 6 red maple = $84
  - 12 willow = $174 (6 black willow, 6 willow oak)
  - 6 river birch = $108
  - 6 Alder = $72
- Total = $498

Riparian Vegetation

- Bushes
  - 2 dozen Buttonbush = $240
  - 4 dozen Red Osier = $480
  - 2 dozen Dogwood = $240
- Total = $960
- Total trees and bushes = $1458

Riparian vegetation budget

- Seeding = $650
- Coconut Matting = $8640
- Trees and Bushes = $1458
- Labor will primarily be volunteers efforts
- Total= $10748

Monitoring of Stream Restoration

- Number of years to monitor?
  - 15 years
    - First 2 yrs, visit 6x per year
    - Next 5 yrs, visit 4x per year
    - Next 8 yrs, visit 2x per year
- Sites to be monitored?
  - 3 sections - The beginning, middle, and end of the stream
    - Being 220m long, every 75 m will suffice as a way of breaking the stream up into 3 monitoring sites

Monitoring Riparian Vegetation

- To monitor the riparian growth, each time the stream is visited it will receive a new habitat score.
  - This score will be taken over the full 15 year and will be compared to a healthy stream as a control to interpret the results that the site restoration is having on the stream and its watershed.

Monitoring Invertebrates

- Sampling of riffles, runs, and pools using D-frame nets
- Getting genus and individual counts
- Applying the 6 metrics to acquire IBI results
- Results will tells us whether aquatic life use is impaired or not

Monitoring Water Chemistry

- In order to check the stream diagnostics such as DO, and temperature, a probe will be used on each visit to record the changes in the stream quality.
- Water chemistry (hardness & alkalinity) will also be performed upon these visitations.
  - Account for changes in season

Monitoring budget

- 48 visits over 15 years
- $400 per visit
- Total= $19200

Total budget

- Morphological= $23600
- Riparian vegetation= $10748
- Monitoring= $19200
- Total= $53548