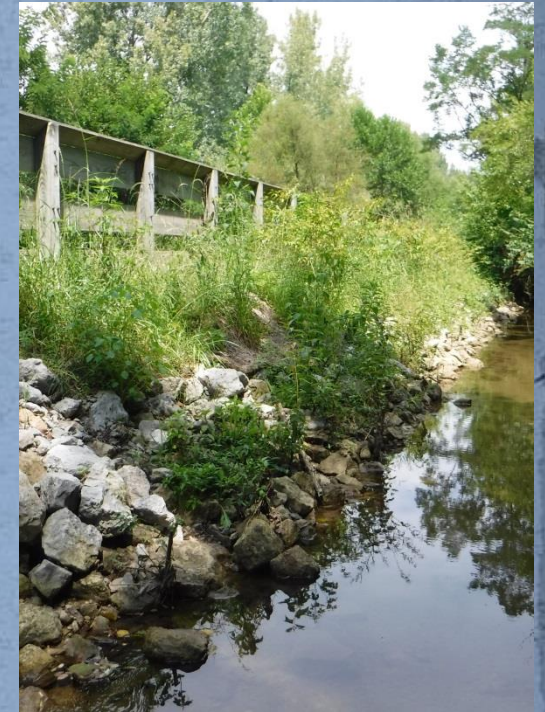


# Infrastructure Protection through Stream Restoration



OWEA Watershed Workshop

November 12, 2015

Jim Turner, PE, CFM





# Presentation Outline

- Infrastructure / stream conflicts
- Application of natural channel design techniques
- Case studies
  - Dry Fork Creek - Hamilton County, Ohio
  - Glady Run - Greene County, Ohio
- Project success factors
- Closing Thoughts





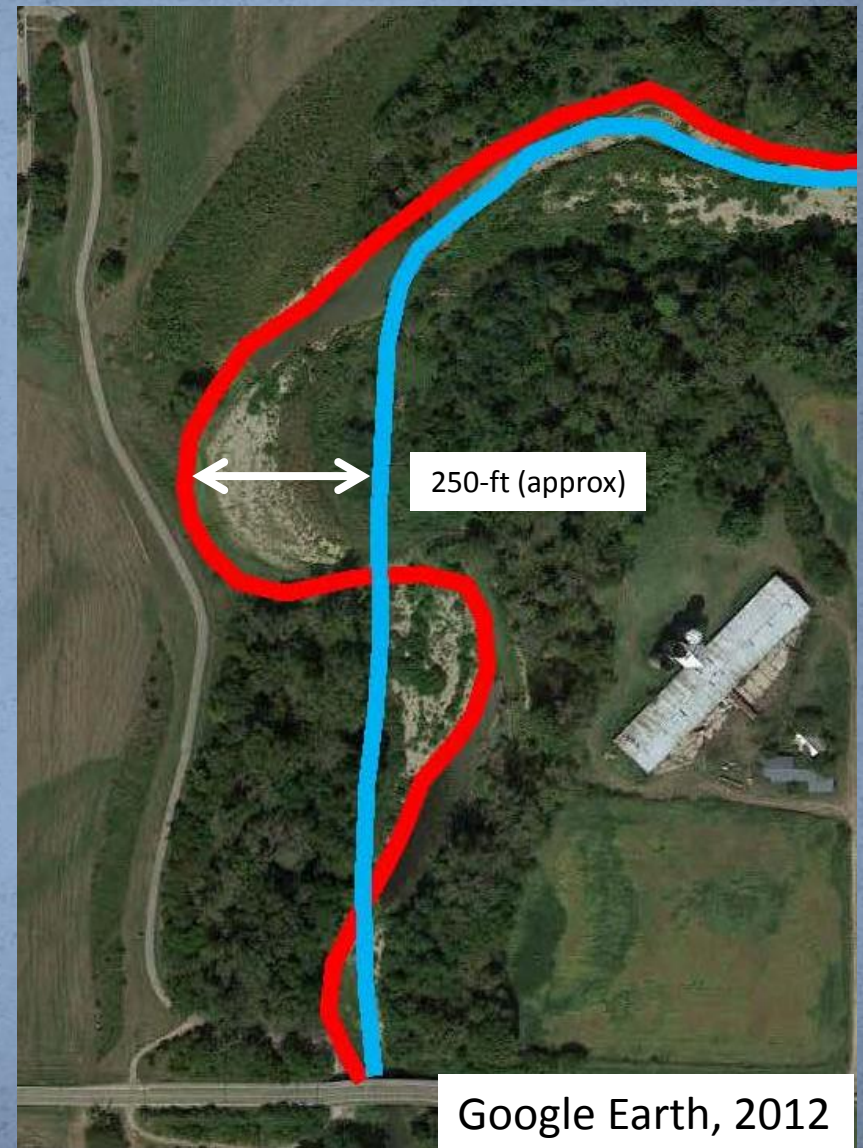
# Infrastructure / Stream Conflicts

- Streams are dynamic systems that are subject to horizontal and vertical adjustments
- The rate of adjustment may be accelerated in disturbed streams (floodplain filling, hydrologic changes, channel straightening, etc.)
- At-risk infrastructure includes utility lines, transportation assets, and recreational assets (bike paths, shelters, etc.)





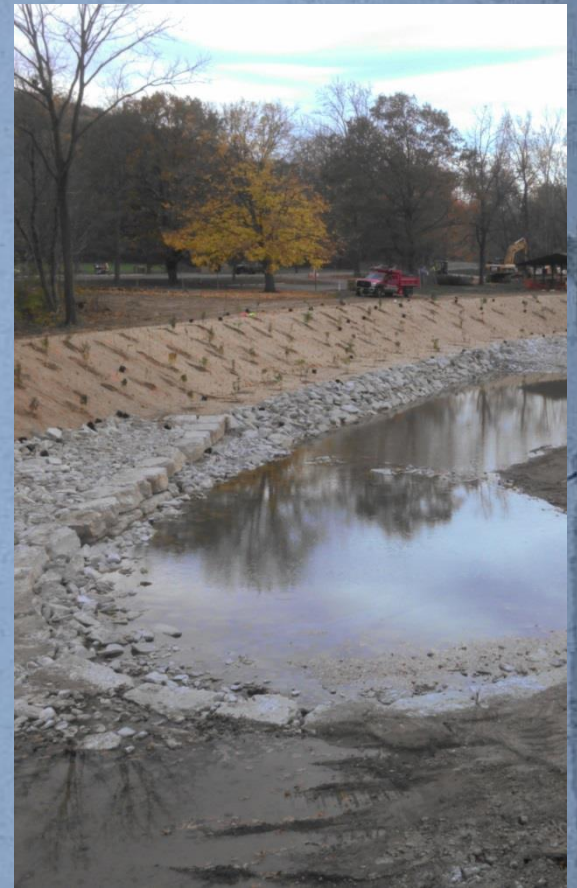
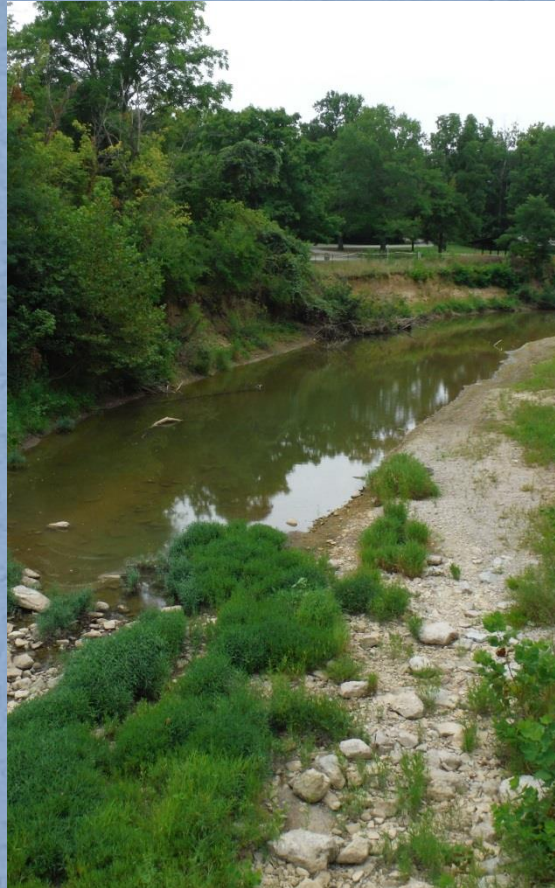
# Streams Are Dynamic!!!





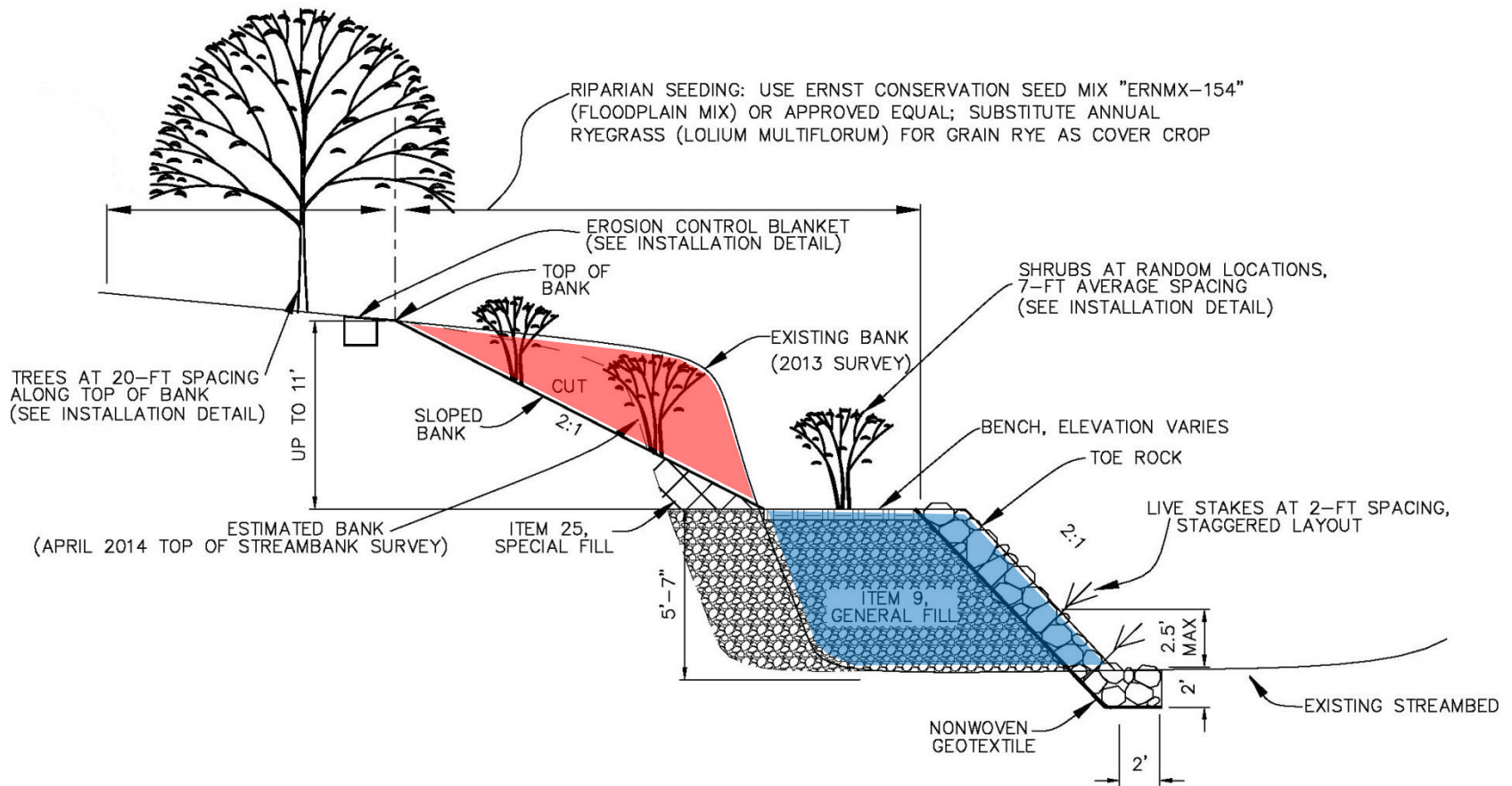
# Natural Channel Design Techniques

- Reconfigured channel cross-sections (reduced bank slopes, bankfull benches)
- Grade control structures (boulders or logs)
- Permanent and temporary stabilization (toe rock, vegetation, erosion control blanket)



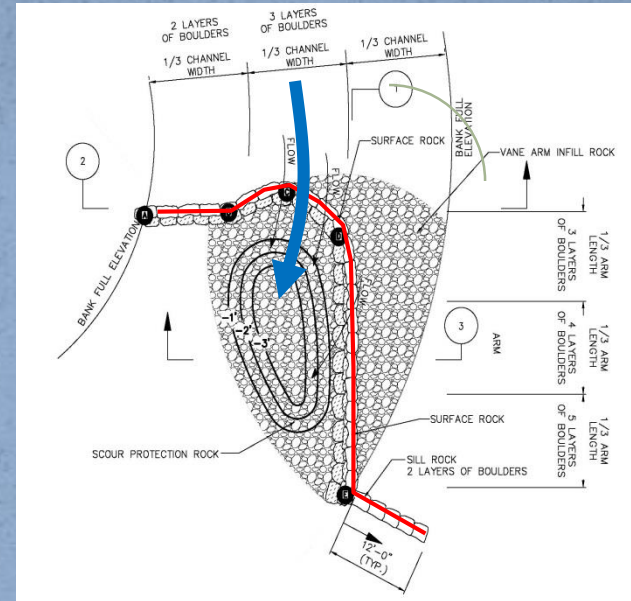


# Reconfigured Cross-Section



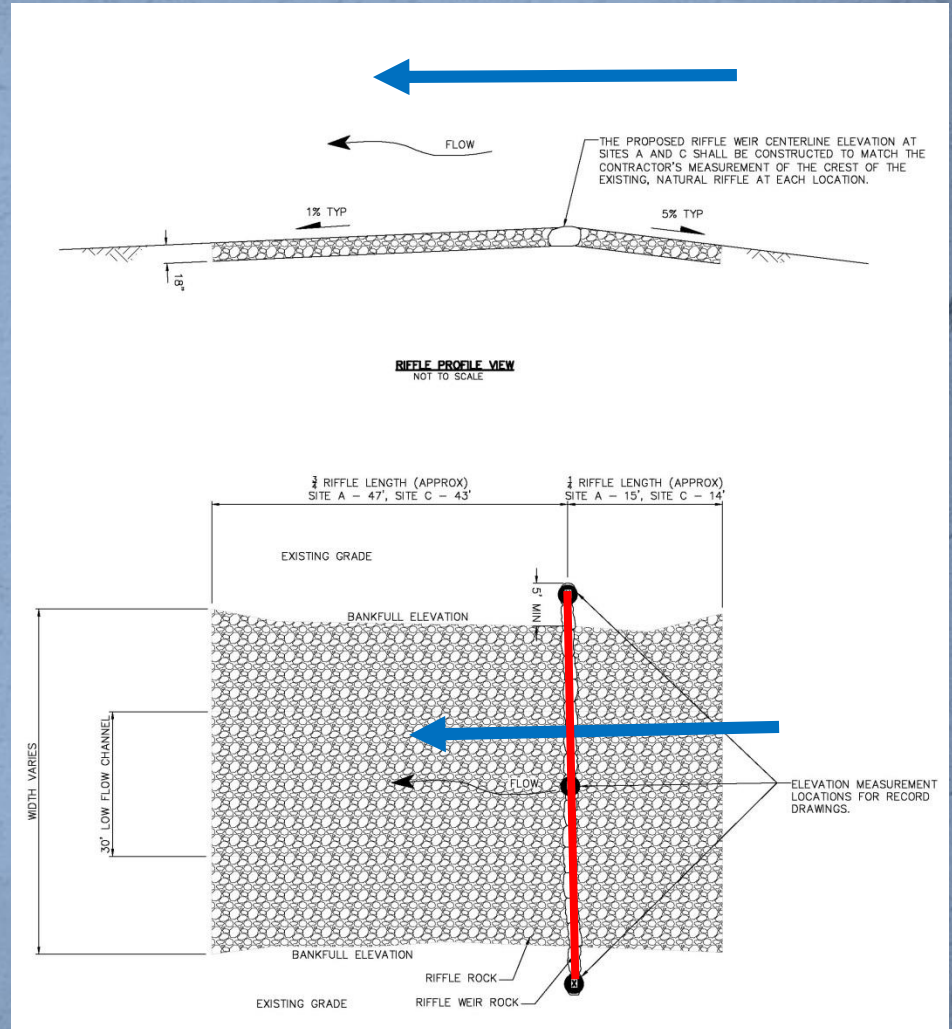


# Grade Control Structure, J-Hook



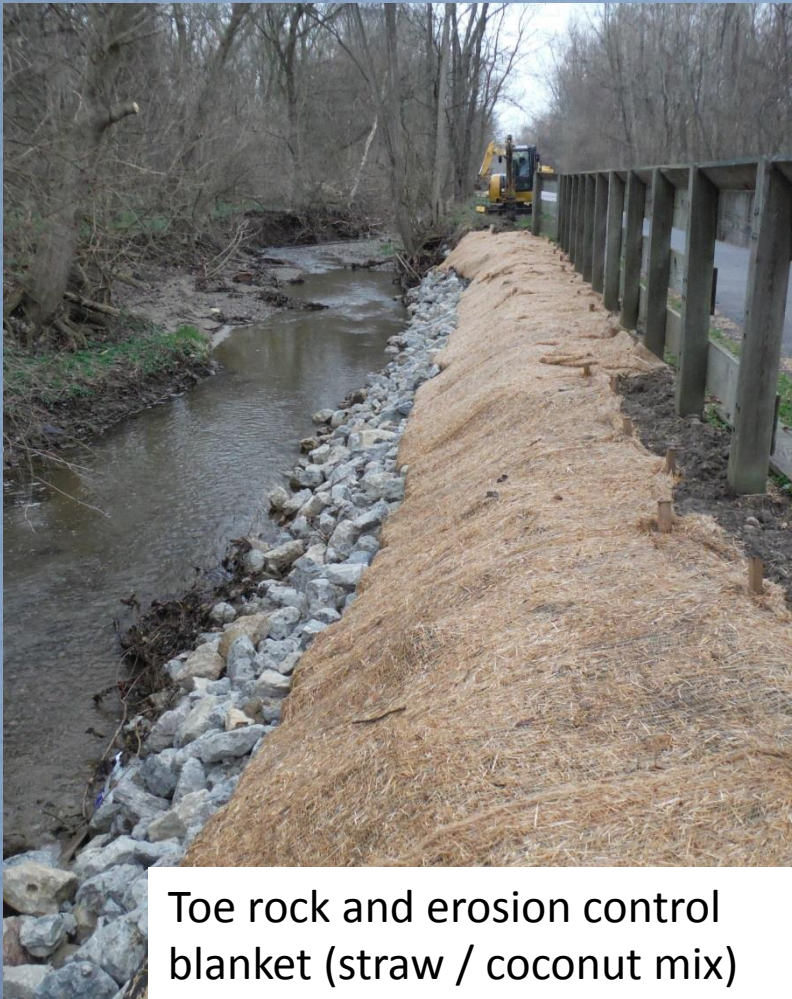


# Grade Control Structure, Constructed Riffle





# Permanent and Temporary Stabilization





# Case Study – Dry Fork Creek

- Project Owner: Great Parks of Hamilton County
- Project Goal: Restore and stabilize rapidly eroding streambanks that were causing property loss and creating risk for adjacent park infrastructure (shelterhouse, bike path)
- Funding Source: Clean Ohio Fund - Ohio Public Works Commission
- Stream Characteristics: alluvial soils, watershed area of 77 mi<sup>2</sup>
- Principal Design Elements:
  - 3,300 cys of excavation
  - 1,600 cubic yards of toe rock
  - J-Hook structures (5 total)
  - Constructed Riffles
  - Native plantings (seeding, shrubs, trees, live stakes)
- Total restoration length: approximately 1,400-ft
- Construction Cost: \$597,800 (Evans Landscaping, 6 bids received)
- Construction Schedule: July to December, 2014





Site A - Pre-Construction, 8/16/2014





Site A - Construction, 10/5/2014





Site A - Restoration, 10/27/2014





Site A - Post-Construction, 9/23/2015





Site C, Bridge - Pre-Construction, 9/1/2014





Site C, Bridge - Construction, 9/5/2014





Site C, Bridge - Restoration, 9/28/2014





Site C, Bridge – Post-Construction, 9/23/2015





Site C, Bend – Pre-Construction, 8/16/2014





Site C, Bend – Construction, 11/2/2014





Site C, Bend – Restoration, 11/30/2014





Site C, Bend – Post-Construction, 9/23/2015



# Case Study – Glady Run

- Project Owner: Greene County Parks and Trails
- Project Goal: Stabilize and restore rapidly eroding stream banks and protect a heavily used bike path
- Funding Source: Ohio EPA Section 319 Nonpoint Source Grant
- Stream Characteristics: cohesive soils, historically straightened channel, watershed area of 3.5 mi<sup>2</sup>
- Principal Design Elements:
  - 600 cubic yards of toe rock
  - Native plantings (seed, shrubs, trees, live stakes)
  - Protection of adjacent bike path and timber fence
- Total Project Length: Approximately 2,900-ft
- Construction Cost: \$139,933 (Water Quality Systems, Inc.)
- Construction Schedule: February to June, 2015





Area Alt-3 – Pre-Construction, 2/4/2015





Area Alt-3 – Construction, 3/19/2015





Area Alt-3 – restoration, 4/28/2015





Area Alt-3 – post-construction, 8/14/2015





Area F – pre-construction, 2/4/2015





Area F – construction, 4/6/2015





Area F – restoration, 4/28/2015





Area F – post-construction, 8/14/2015



# Project Success Factors

- Conservative designs (rock / boulder sizing, J-hook geometry, etc.)
- Clearly defined quantities (J-hook structure rock, toe rock, etc.)
- J-hook design elevations at multiple points for each structure, based on pre-construction field survey
- Construction scheduling to account for optimal streamflow conditions (Dry Fork Creek)
- Contract provisions that addressed the protection and repair of adjacent infrastructure (Glady Run)



Dry Fork Creek, Site A - 1/3/2015 Flood



Glady Run, bike path overlay



# Closing Thoughts

- Natural channel design-based stream restoration can be an effective means of infrastructure protection
- Natural channel design approaches are encouraged by permitting agencies (Corps, Ohio EPA, etc.)
- Natural channel design projects can be attractive candidates for grant funding





# Questions?



Jim Turner, PE, CFM

(Purdue University – 1992)

Coldwater Consulting, LLC

[jaturner@coldwaterconsultants.com](mailto:jaturner@coldwaterconsultants.com)

(740) 936-5368

