

Camp Creek: Tackling Erosion and Improving Water Quality in a Recreational Playground Mitchellville, Iowa



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Outline

- Project Background and Goals
- Modeling Results
- Design
- Construction and Final Results



Location Map







Watershed Map





Project Background

- 185 acre park
- Camp Creek bisects the park from north to south
- Approximately 200,000
 visitors annually





Need for Project

- Severe bank erosion evident
- 2011 Master Plan outlined several needs
 - Better internal park access via a new stream crossing
 - Recreational and visual enhancement
- 2013 Polk County Conservation Board (PCCB) hires HR Green to address concerns





Project Scope and Goals

- Creek Assessment determine cause of erosion, bed stability, etc.
- Hydrologic and Hydraulic Modeling determine peak flows, velocities, and shear stresses to aid in creek crossing and bank mitigation design
- Develop conceptual plan for bank erosion
- Define road crossing options
- Once Concept is selected, complete final design and submit permits



Creek Assessment – April 2013

- Creek bed seemed stable due to NRCS designed riffle structures
- Previous efforts to stabilize banks not working
- Bank erosion throughout park









Hydrology

- A HEC-HMS model was created using HEC-GeoHMS
- 2-, 5-, 10-, 25-, 50-, and 100-year peak flows were determined
- Checked flows against StreamStats –much lower
- County staff were consulted
- Higher HEC-HMS flows used as they more closely matched staff accounts of HWLs





Hydraulics



- HEC-RAS model covered reach from NE 46th Ave to almost NE Devotie Dr
- Two peak flows U/S and D/S of pond tributary
- Existing and multiple proposed conditions modeled to determine created head of crossing options



Results

- Existing Creek crossing floods in very small storms (~100 cfs)
- 100-year water surface elevations showed flooding of much of the park, confirmed by County Staff
- Large bridge needed to pass the 100-year storm without significant backwater effects
- High shear stresses and velocities in various locations





Creek Crossing Options

- PCCB Budget did not cover high cost of large bridge, other solutions?
- Low water crossing a possibility, but must:
 - Carry 40 tons or more
 - Be dry in smaller storms
 - Handle overtopping without significant scour
- Several RCB and Precast concrete arch solutions were analyzed



Creek Crossing Recommendation

- Twin 12'x7' RCB
- Carries roughly 2-year storm
- Doesn't cause backwater effects for large storms
- 40-ton load capacity





Creek Crossing Recommendation Cont.

- Mitigate impacts of road overtopping using:
 - Low points in road on either side of culvert
 - Inverted curb at downstream end of road
 - TRM within flooding limits
- Recess RCB into creek bottom for fish passage





Bank Stabilization Recommendations

- Three prong approach
 - Divert thalweg away from outer banks
 - Hard armor where needed
 - Bioengineering: coir fabrics and native vegetation
- Leave banks alone where possible to prevent vegetation loss
- Grade banks to a stable slope: 3:1



Divert Thalweg – J-Hook Bends





J-hook Bend





Hard Armor





Hard Armor and Recreation

- Rough-hewn limestone steps to serve dual purpose:
 - Allow easy creek access at defined points to protect native vegetation
 - Protect banks with high shear stresses





Bioengineering Approach

- Two layers of Coir Fabric:
 - Inner layer nonwoven burlap to hold soil and seed in place
 - Outer layer High strength woven mat with 0.5" x 0.5" openings
- Customized native seed mix selected by PCC





Bioengineering Cross-Section





Conceptual Plan



Project Goals

-Stabilize banks using a bioengineered approach -Minimize impacts -Improve health of creek -Provide access to creek for park users -Provide vehicular access to pond area

Recommended Improvements

-600 LF of toe protection -750 LF of limestone protected banks -1100 LF of additional bioengineered banks -3 stone-lined access points in addition to limestone campground area -Road crossing w/culvert





PROPOSED IMPROVEMENTS - OVERALL PLAN

Construction and Beyond



Placing the Culvert









The New Road







Final Product





J-Hook Bends







Limestone Steps









Bank Stabilization





Plantings





Then and Now







Last Summer







Last Summer





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Questions?