Dam Removal to Support Great Lakes Fisheries Restoration

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Project Overview

- Background
- Restoration Design
  - Conceptual
  - Feasibility
  - Cost Estimation
  - Construction Staging and Sequencing
  - Real Estate
- Final Design and Implementation
Introduction

W.R.D.A Section 206 - Aquatic Ecosystem Restoration

• Restore Cold Water Fishery
  • Brook & Brown
  • Steelhead
• Middle Branch River
• Muskegon River
Background
Marion Dam

- 1878
- 60’ Concrete spillway
  - 8 feet head
- 250’ Earthen embankment
  - 8 – 11 feet high, 14 feet wide
- Fish ladder
- Downstream basin
Marion Mill Pond and Dam
Marion Mill Pond

- Mile 16 (33 miles)
- Thermal Barrier
- Physical Barrier
- 26 acres
- 2 - 5 ′ deep
- 3′ Sediment
- BFQ = 190 cfs
- 100 Year = 1,500 cfs
Project Information

- **MDEQ**
  - Fish surveys, Water quality, Hydrology
- **USACE**
  - Geomorphic Survey, H&H, Sediment Transport
- **Baird/URS**
  - Dam Removal
  - Stream Restoration
Project Challenges

- Constricted space for alignment
- Floodplain constrictions
  - Dam
  - Highway bridge
- Local resistance
- Impounded sediments
- Construction access and staging
Restoration Design

Dam Inspection

Fish Passage Feasibility

• No Action
• Dam Removal
• Dam Bypass
What is “Feasibility Design”

Given site constraints, it CAN work...

- Fish passage
- Property rights
- Economics
- H&H
- Regulatory
- Construction, engineering, etc, etc.
No Action

Required by NEPA

• Status quo
  • Dam remains
  • Continues to degrade
  • Continues to block fish passage
  • Open Wetland/Pond habitat
Restoration

- Natural channel design (~2,800’)
  - Allow channel to “rediscover” its original path (bathymetry, sediment probes, etc)
- Riparian restoration
- Fish passage & habitat
  - Option A - Dam Removal
  - Option B - Dam Bypass
Alternatives

- Removal
  - More “relaxed”
  - Simpler design
  - Simpler construction

- Bypass
  - “Tighter” design
  - Sediment management
  - Complex construction
Common Features

• Restoration in Pond
• Similar morphology
• Riparian plantings
• Bank treatments
• Riparian wetlands
General landscape types

- Riparian
- Floodplain mixed forest and herbacoues
- Floodplain wetlands
- Mesic uplands
Channel

- Riffle/pool structure
- Riparian treatments
- Bank protection
- Channel metrics
Dam Removal
Dam Removal

- Notched removal
- Staged drawdown
- Sediment dewatering
- Sediment management
Dam Removal

- Sediment basins
- Trap coarse
- Fines pass
- Ongoing during drawdown
Dam Bypass
Dam Bypass

- Tighter meandering
- Dam retained
- Constrained by roads
- “Hard” control features
Dam Bypass

- Bypass at dam challenging
- Opportunity for excellent habitat
- Grade control
- Draw down
Dam Bypass

J-Hook Weir
• Steer thalweg
• Guide meander
• Grade control
• Plunge pool
• Energy dissipation
Dam Bypass

Stone Weir/Ramp

• Critical riffles
• Grade control
• Steer thalweg
• Energy dissipation
Dam Bypass

Bank Protection
- Rootwad revetments
- Maintain meander
- Steep outside banks
- Habitat
- Protect road
- Energy dissipation
## Removal vs. Bypass

### Removal
- Locally Favored
- Opens Floodplain
- Dam Removal ($$$)
- Simpler Channel
- More Open Space
- Sediment Basin
- Original channel
- $640k

### Bypass
- Alternative
- Floodplain Obstructed
- Preserves Dam
- Greater Variability ($$$)
- Facilitates Access
- No Sediment Basin
- Original channel?
- $820k
What’s Next?

Final Design / Implementation

• Stakeholder Process
• Recommended alternative
• Final design
  • Engineering, Ecological, Cost
• NEPA/Regulatory
• Funding
Questions
Baird