

# 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

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# Introduction

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

- Restore Cold Water Fishery
  - Brook & Brown
  - Steelhead
- Middle Branch River
- Muskegon River

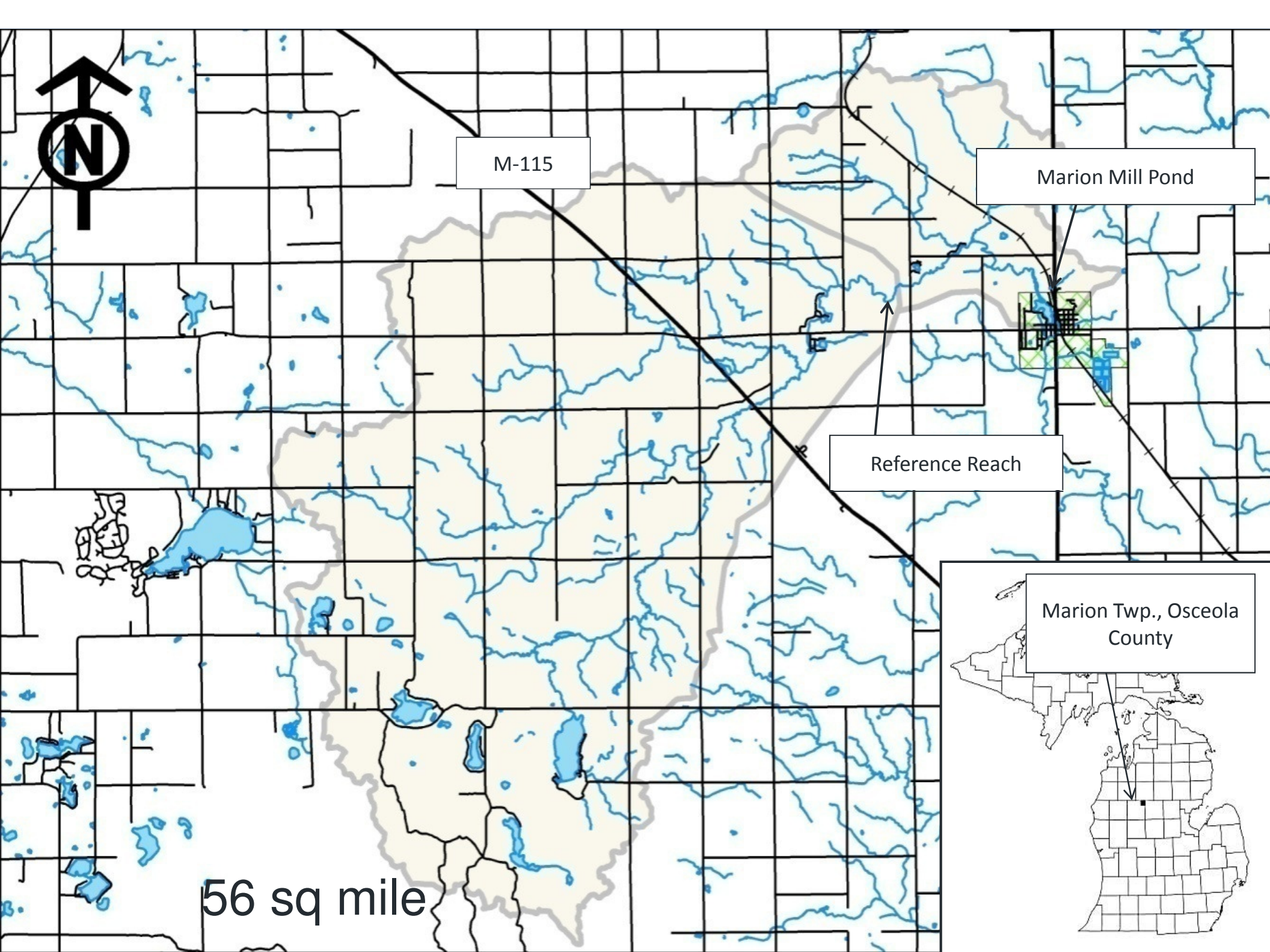


# Background

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M-115

Marion Mill Pond

Reference Reach

56 sq mile

Marion Twp., Osceola  
County

# 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



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# Marion Mill Pond

- Mile 16 (33 miles)
- Thermal Barrier
- Physical Barrier
- 26 acres
- 2 - 5 ' deep
- 3' Sediment
- BFGQ = 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

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# 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

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# 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



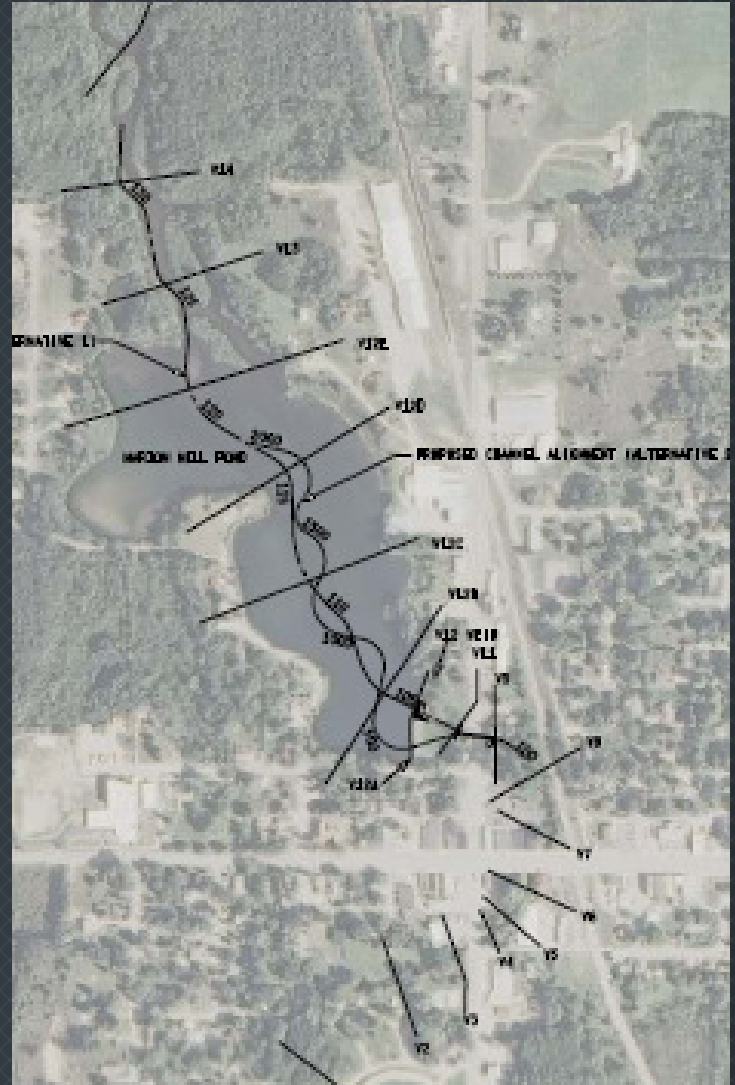
# Restoration

- 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

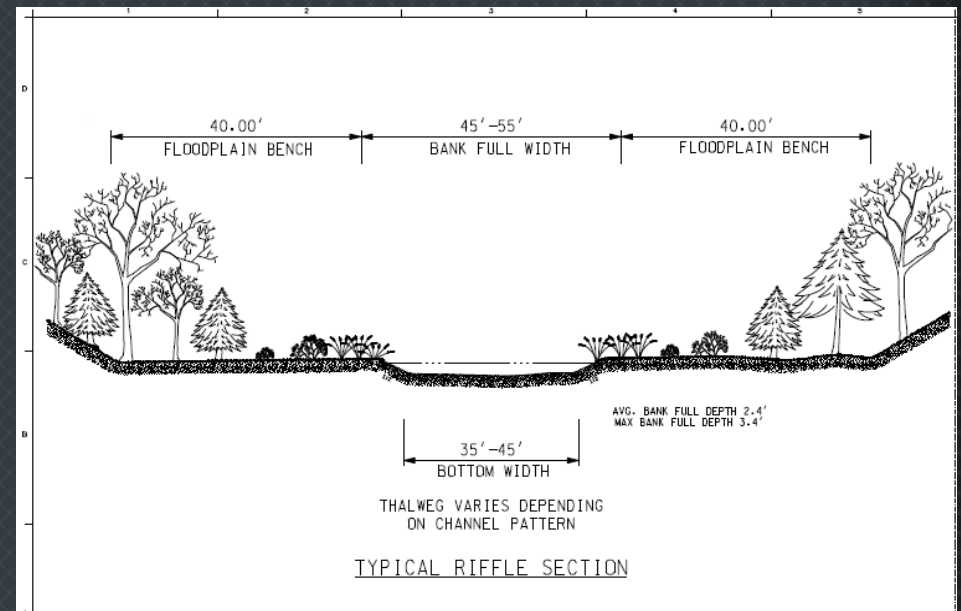
- Removal
  - More “relaxed”
  - Simpler design
  - Simpler construction
- Bypass
  - “Tighter” design
  - Sediment management
  - Complex construction





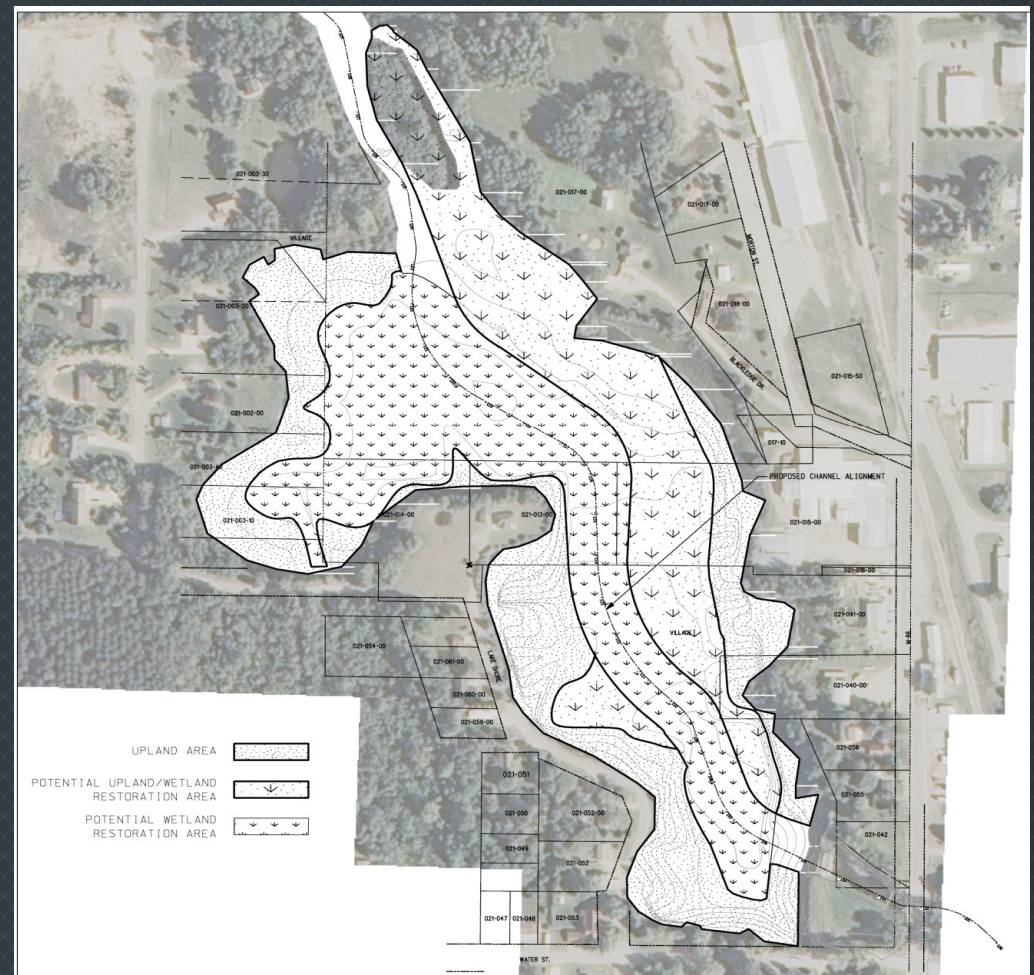
# Common Features

- Restoration in Pond
- Similar morphology
- Riparian plantings
- Bank treatments
- Riparian wetlands



# General landscape types

- Riparian
- Floodplain mixed forest and herbaceous
- Floodplain wetlands
- Mesic uplands



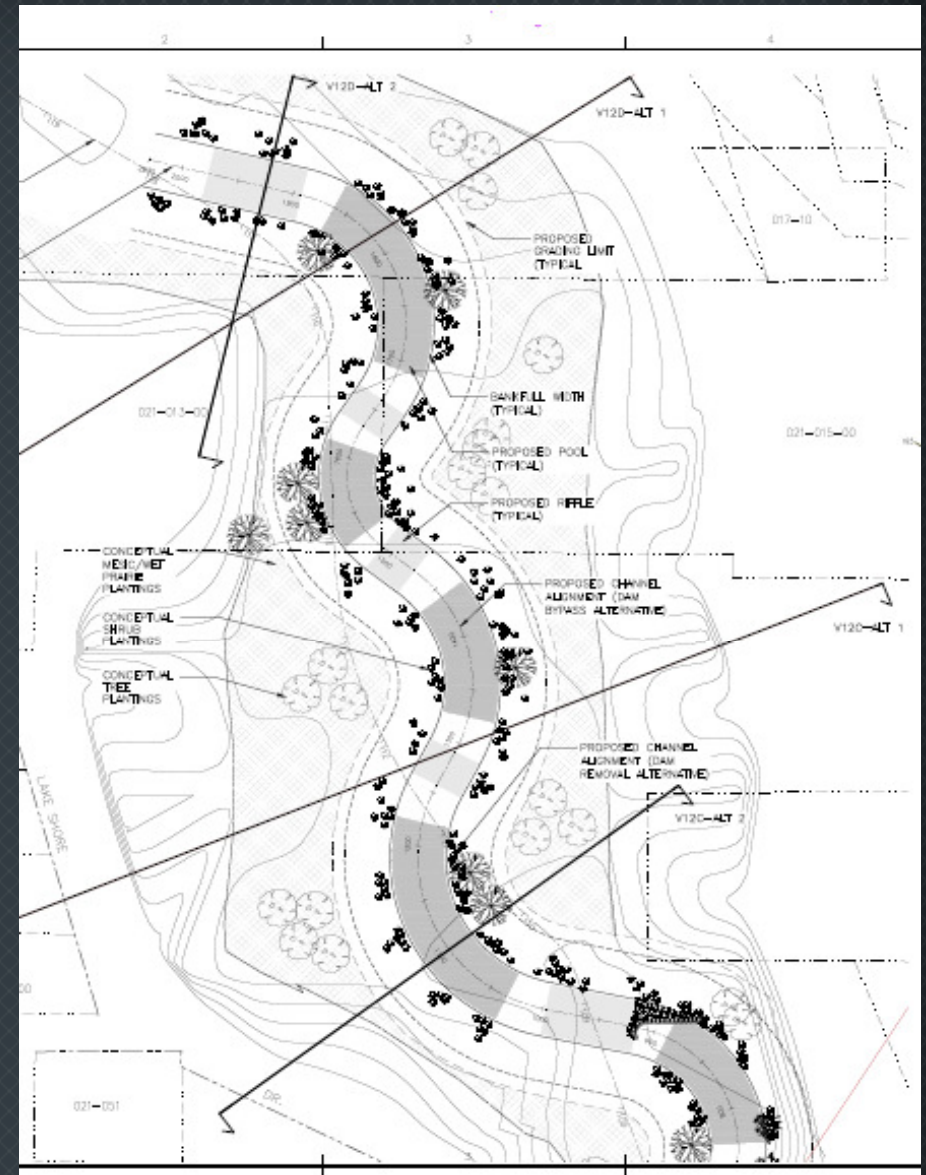
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# Channel

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



# Dam Removal

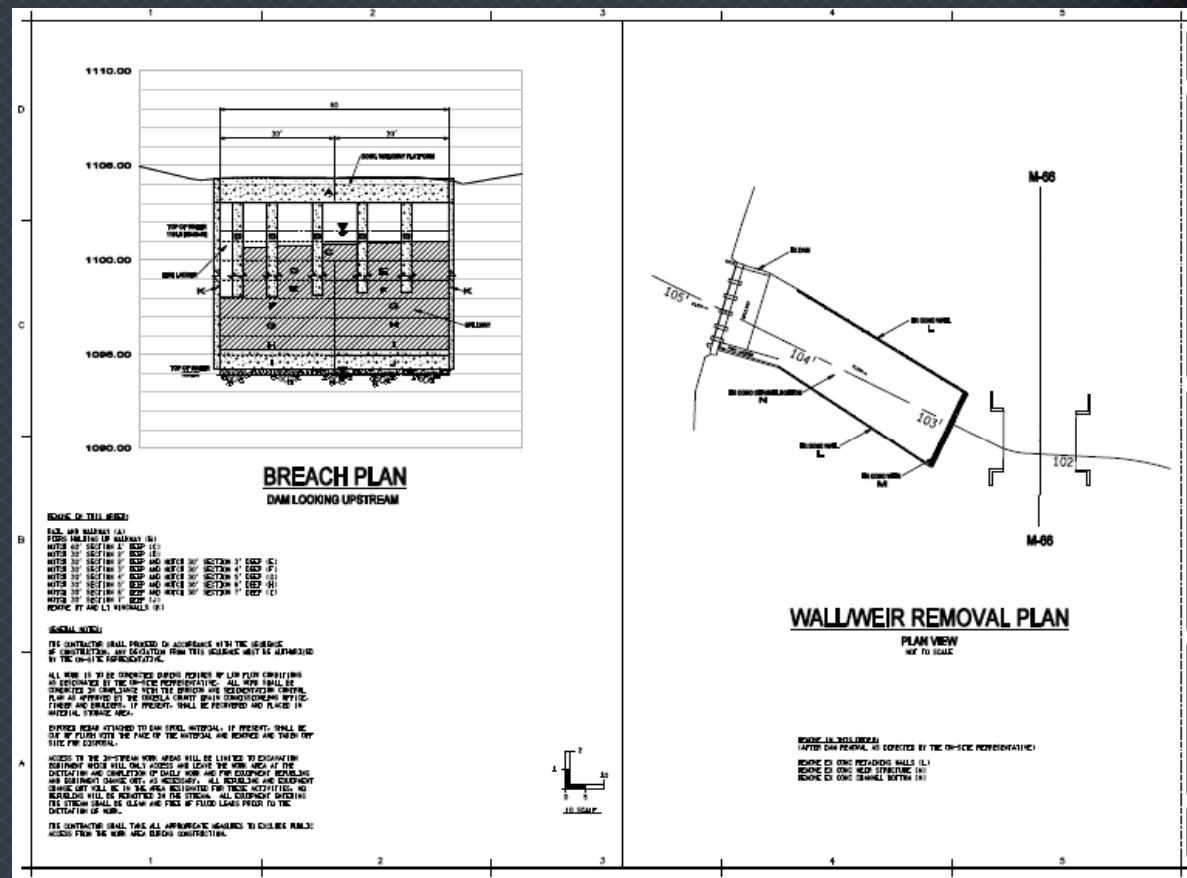
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# Dam Removal

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



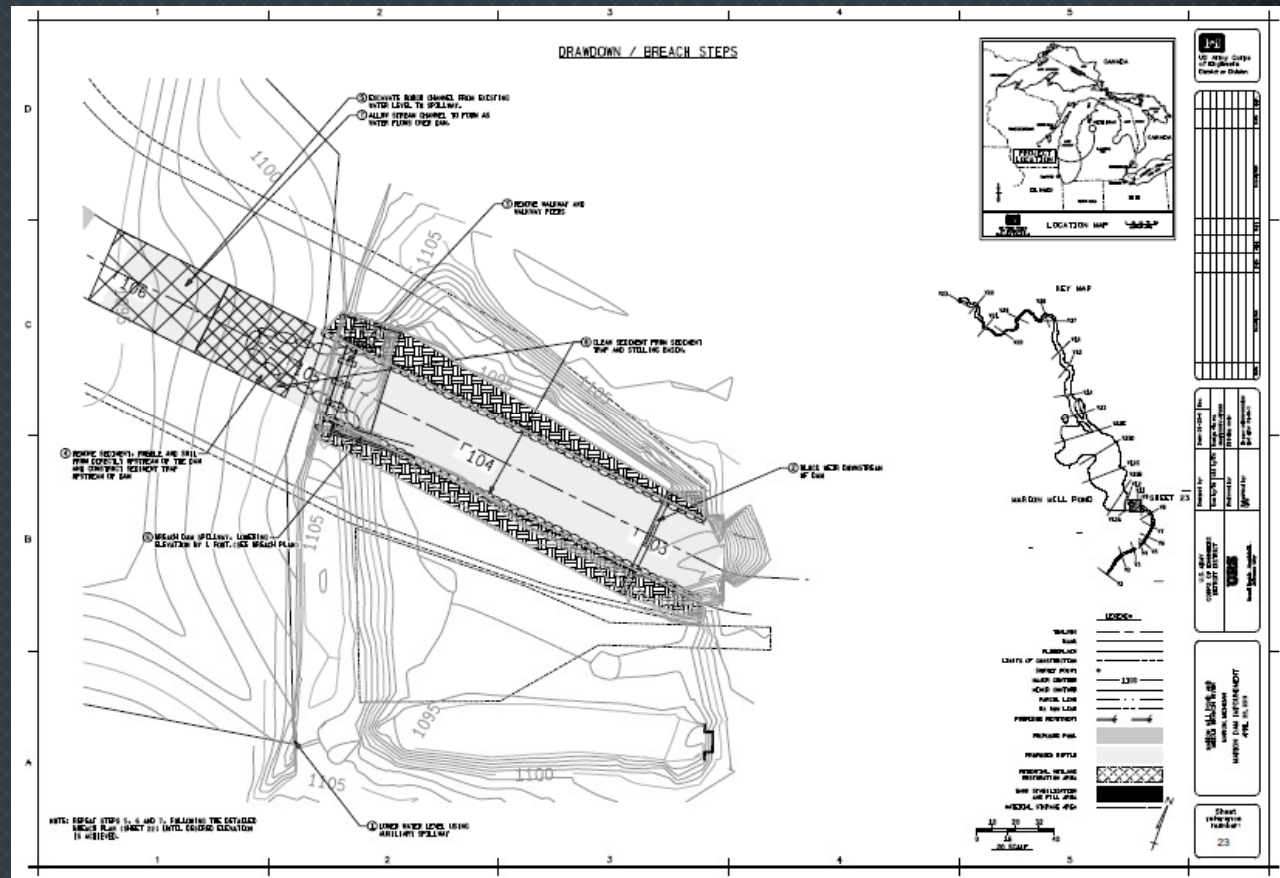
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# Dam Removal

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



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# Dam Bypass

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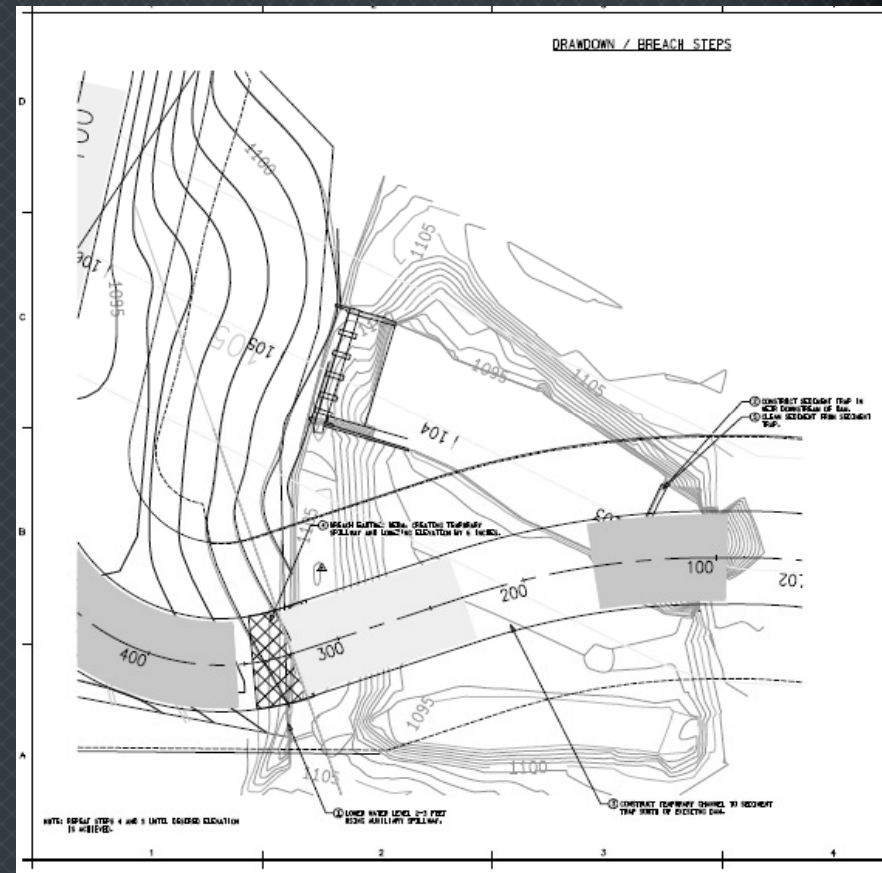






# Dam Bypass

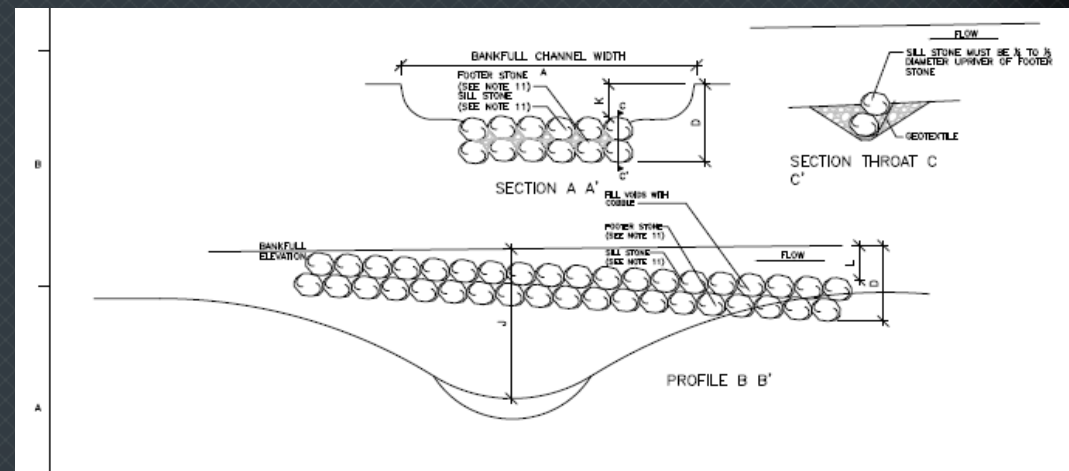
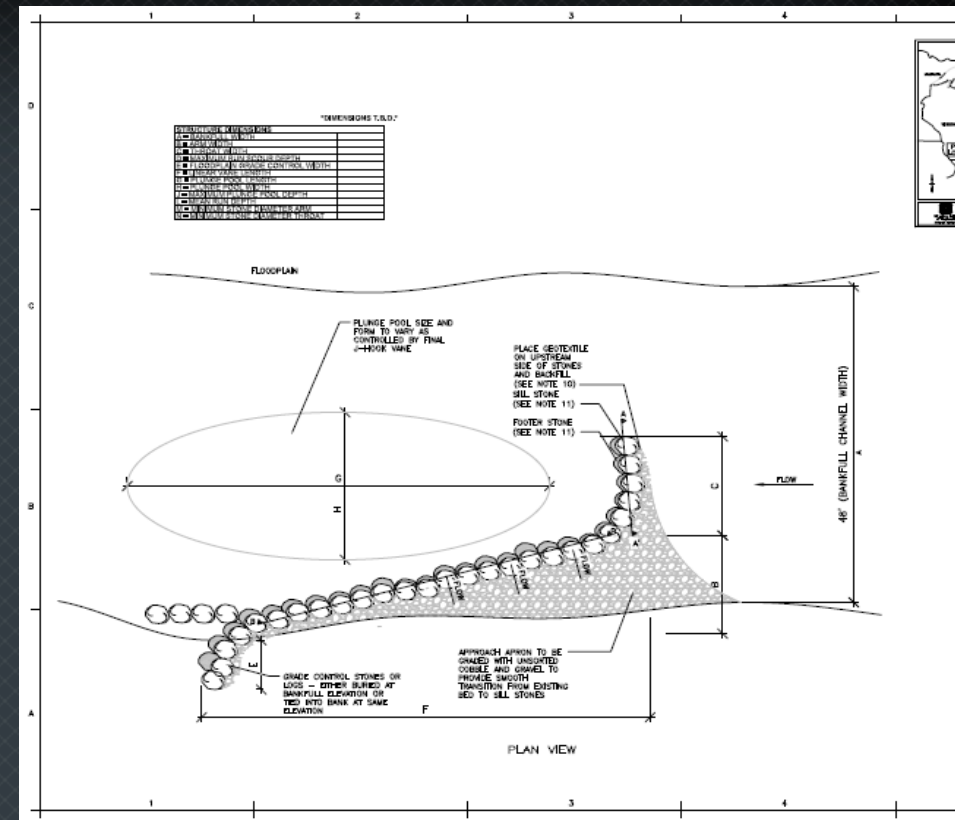
- Bypass at dam challenging
- Opportunity for excellent habitat
- Grade control
- Draw down



# Dam Bypass

## J-Hook Weir

- Steer thalweg
- Guide meander
- Grade control
- Plunge pool
- Energy dissipation



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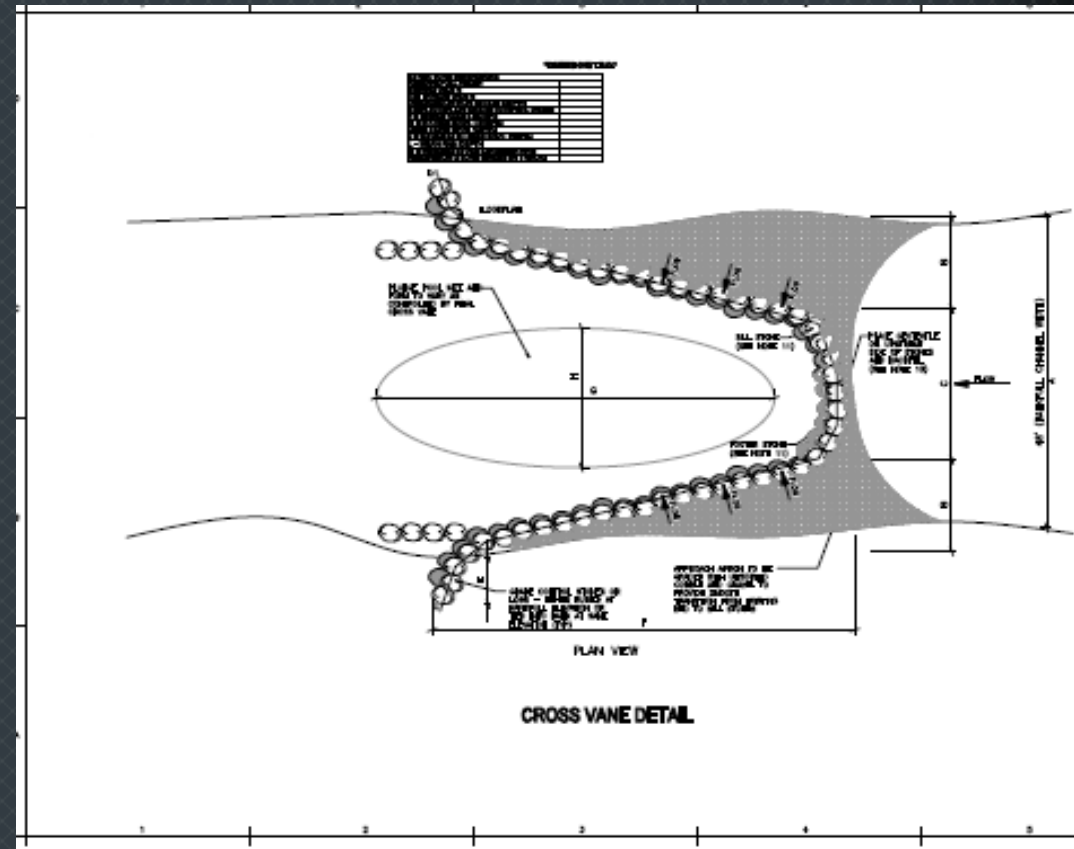
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# Dam Bypass

## Stone Weir/Ramp

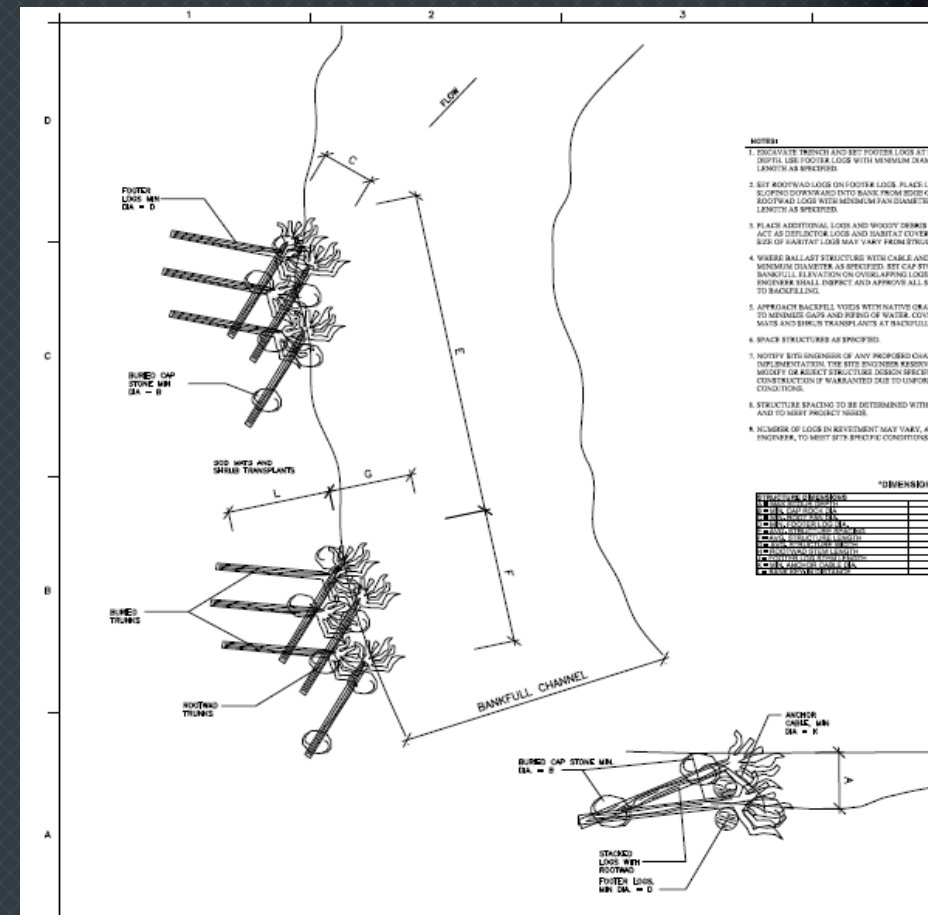
- Critical riffles
- Grade control
- Steer thalweg
- Energy dissipation



# Dam Bypass

## Bank Protection

- Rootwad revetments
- Maintain meander
- Steep outside banks
- Habitat
- Protect road
- Energy dissipation



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# 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

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