COLLABORATE. **CONNECT**. COMPLETE.

Applying Engineering Solutions to the Science of Protection and Enhancement of Aquatic Environments

Bill Holman, P.E.
Stanley Consultants

Project Development

PHASE	STAGE	TASKS	PURPOSE
I	Investigation	Site Visit/Inspection Discussion of Issues/Alternatives Estimate Conceptual Quantity/Cost Quantify Project Needs/Issues Concept Analysis/Design	Define Future Project Stages
II	Data Collection	Topographic and Structure Survey Soil Borings and Testing Design Parameter Analysis	Basis of Design
III	Final Design	Detailed Analysis/Design Develop Drawings Estimate Quantities/Cost Develop Construction Documents Refine Design	Construction

Scientists

- Define Problem
- Establish Objectives
- Characterize Species Behavior
- Provide Feedback

Engineers

- Define Design Parameters
- Evaluate Feasibility
- Layout Structure
- Detailed Design
- Develop Construction Documents

Key Factors of Successful Project

Project Constraints
- Meet Schedule
- Stay Within Budgets (Design/Construction)
- Site Conditions

Communication
- Submittals To Scientists and Facilities Managers
- Feedback Loop
- Project Buy-in

SUCCESS

Dynamic Scope
- Incorporate New Info
- Refine And Improve
- Find Optimal Solution

Aquatic Environment Enhancement

Wildlife Management
Pond/Basin Enhancements

Pool Level Control Enhancements

Fish Passage Enhancements

Chautauqua Levee Repairs

- Embankment Overtopping
- River Scour
- Large Fetch
- Significant Tree Growth

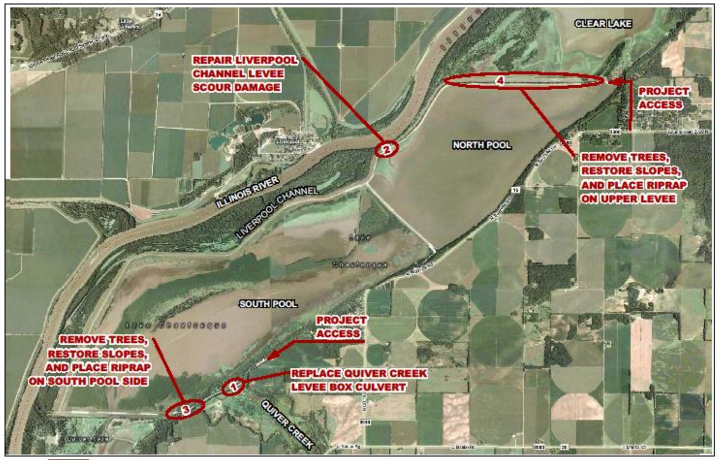

Figure 1
Project Map

Chautauqua Lake Perimeter Levee Repair
Chautauqua National Wildlife Refuge
Mason County, IL

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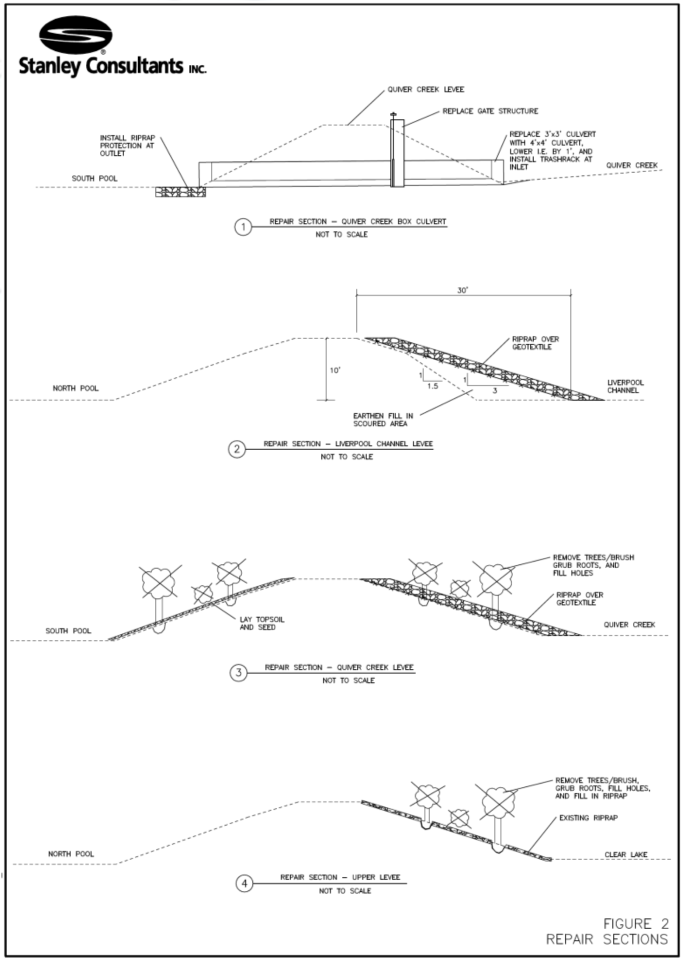
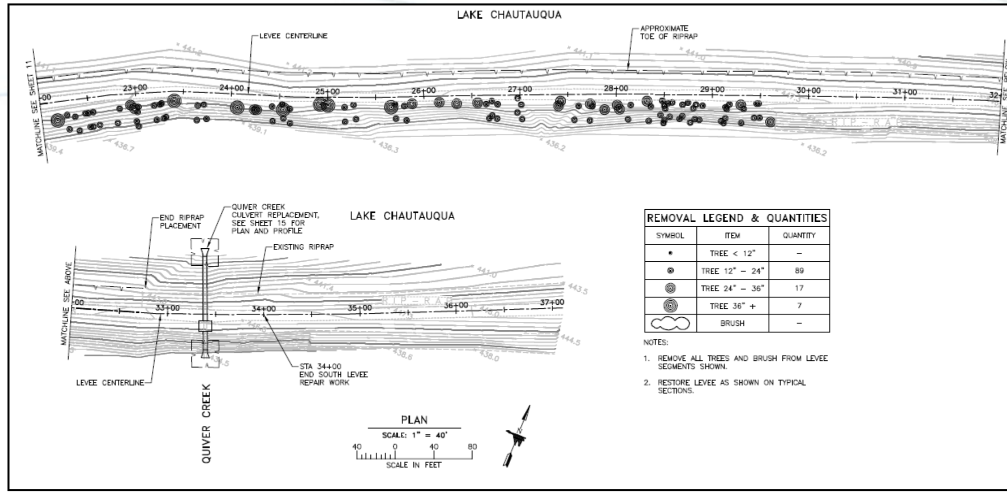
Chautauqua Levee Repairs





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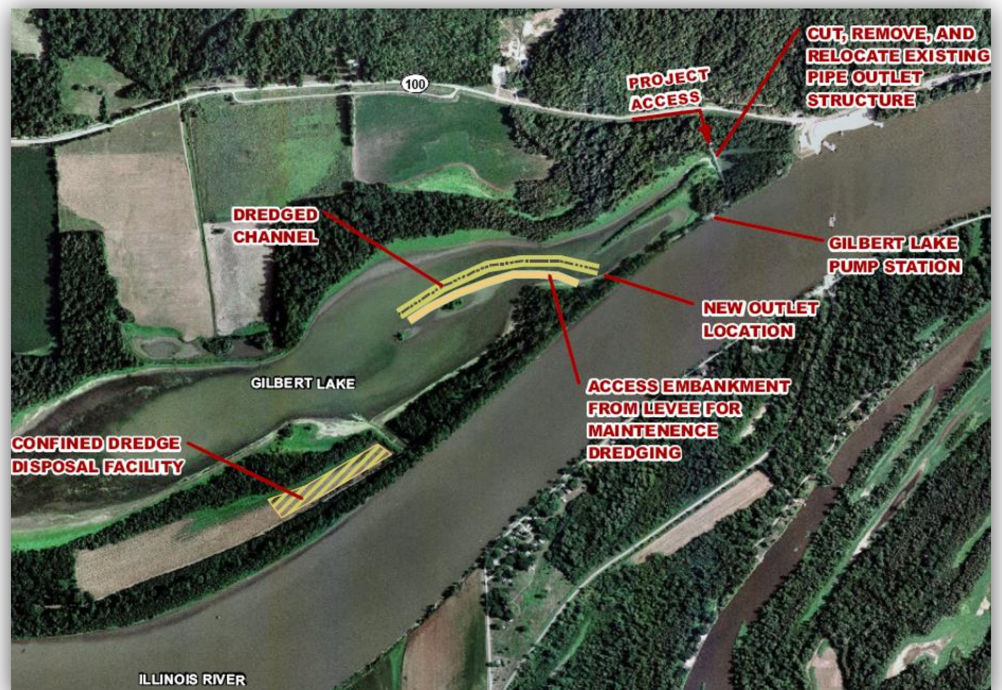
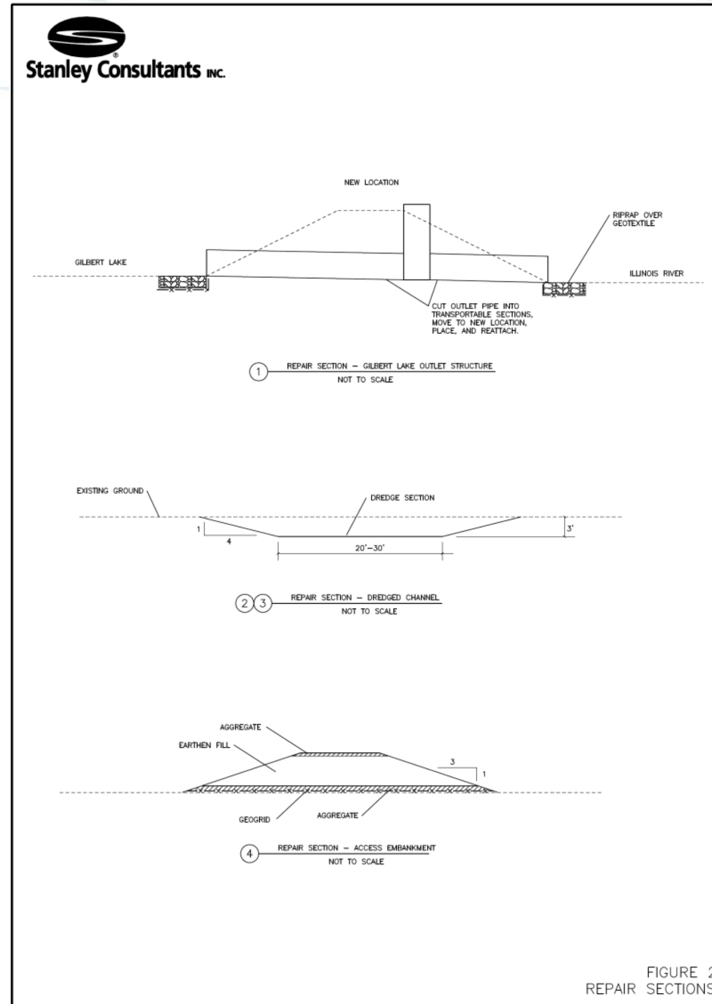
DEPARTMENT OF THE INTERIOR

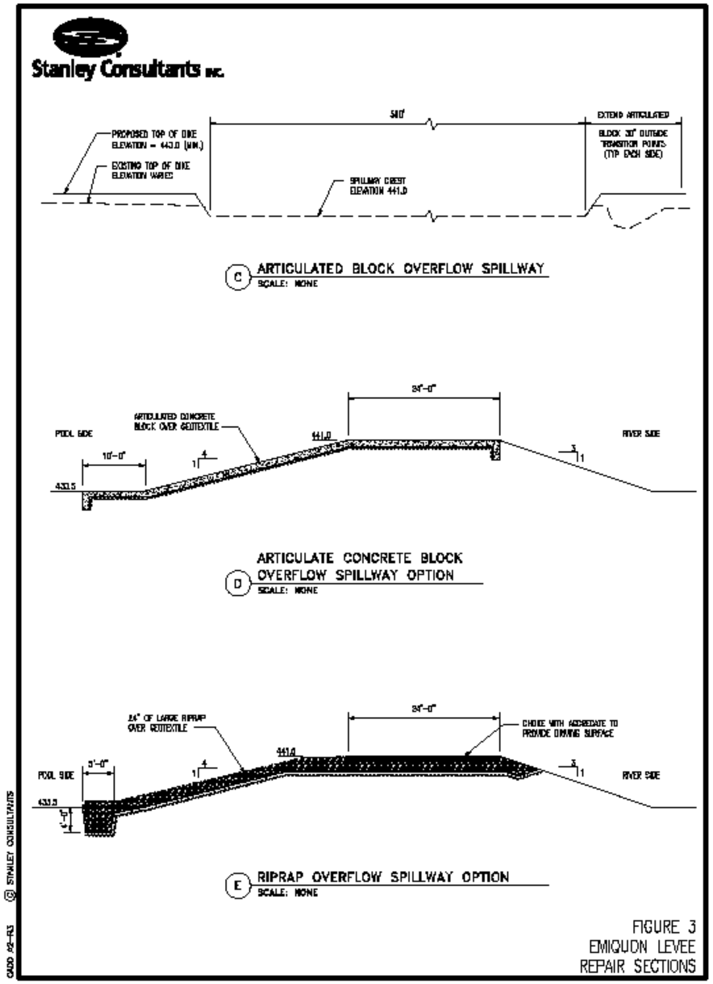
Gilbert Lake Outlet

- Not Able To Empty Lake
- Siltation Concern
- Limited $'s





Emiquon Embankment Improvements



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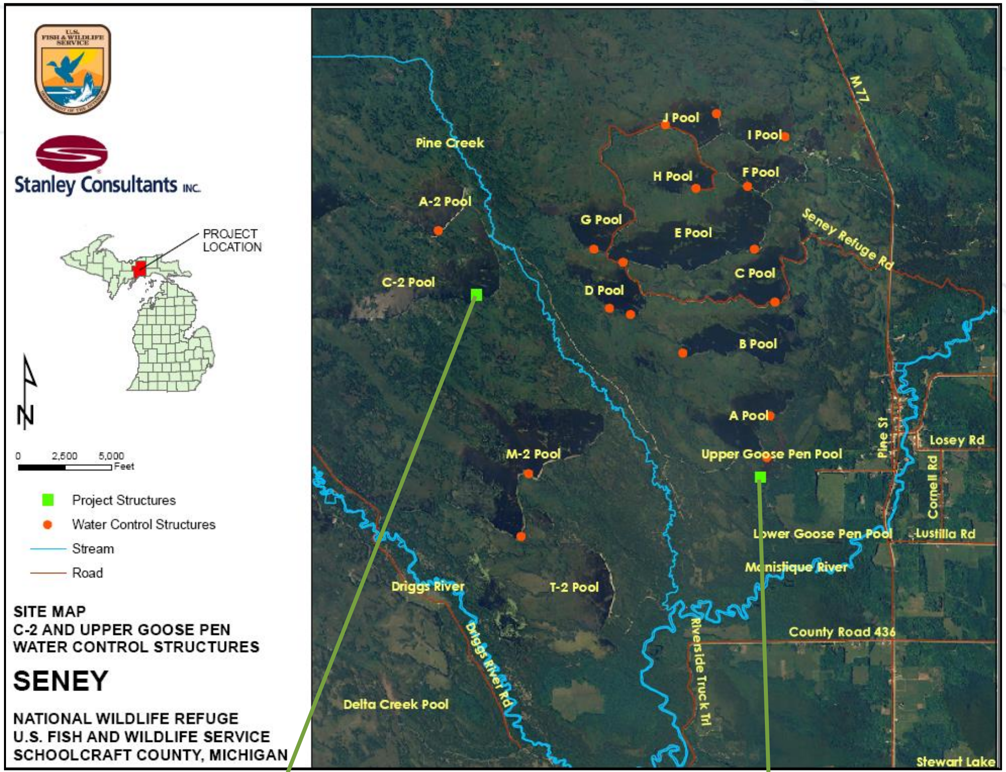
Seney Wildlife Refuge

- Seney Wildlife Refuge
  - Series of Connected Pools
  - Nesting/Migrating Bird Habitat
- Upper Goose Pen
  - Tainter Gate Control Structure
  - 70+ Years Old
  - Frequent Adjustments
  - Costly Maintenance
- C-2 Pool
  - Stoplog Controlled Culvert
  - 70+ Years Old
  - Insufficient Capacity



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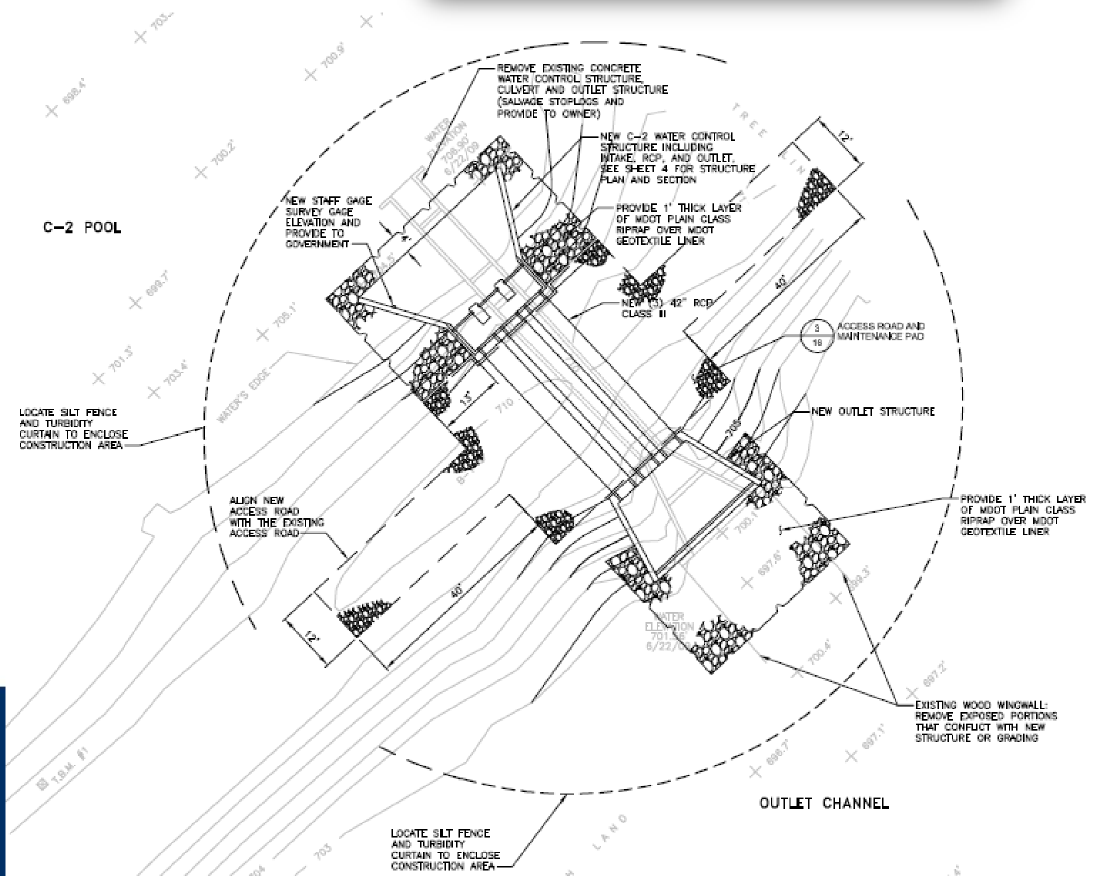
Seney C-2

- Communication
  - Used Existing Structure Preferred By Refuge Staff As Model For Proposed
  - Specified Aluminum Grating For Easier Access and Operation
- Dynamic Scope
  - Coordinated Survey Of Pools To Establish Common Datum For More Accurate Evaluation And Future Management
  - Used Results To Analyze Capacity Of Pool Structures And Spillways To Verify C-2 Structure Was Hydraulically Sufficient



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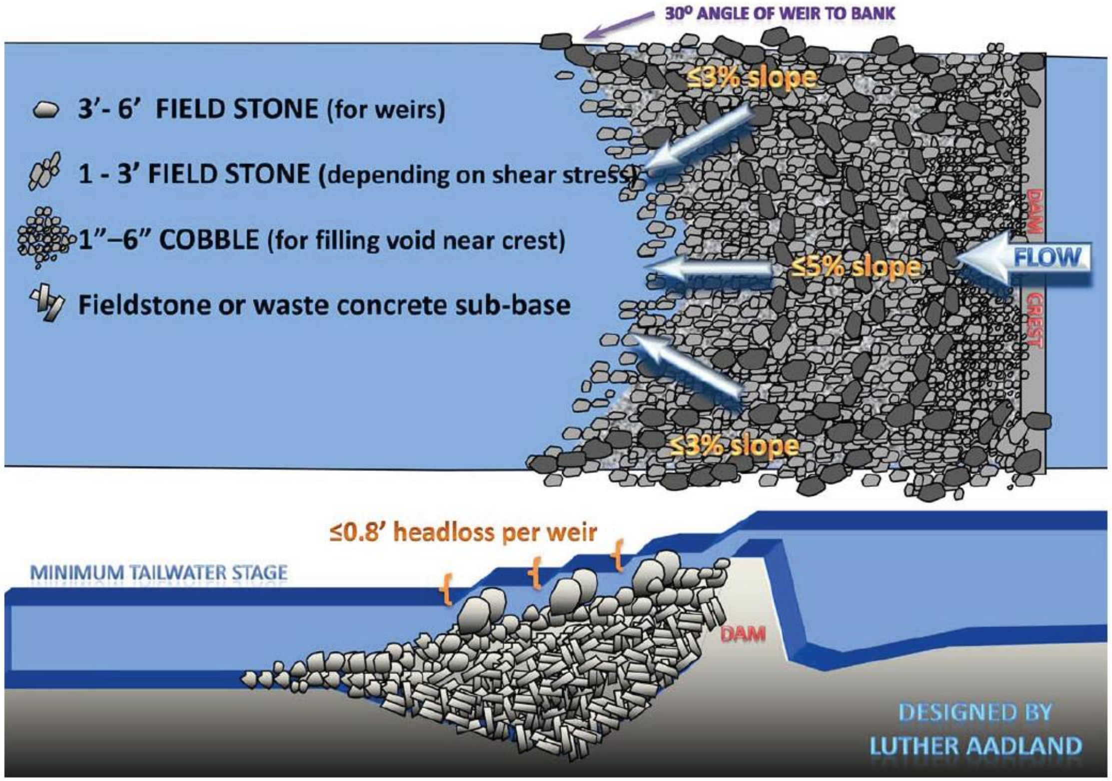
Seney Upper Goose Pen

- Constraints/Scope
  - Provide Hydraulic Capacity And Supply Flow To Lower Goose Pen
  - Remote Location
  - Dam Failure Hazard Mitigation
- Communication
  - Existing Structure Required Frequent Adjusting
  - Developed Modified Labyrinth Weir Layout
  - Constant Water Level With Ability To Lower Seasonally

“Nature-Like” Fishways

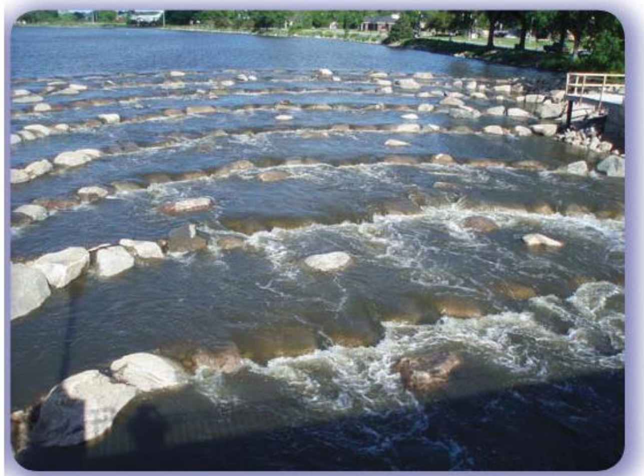


Source: Aadland, *Reconnecting Rivers*, MnDNR, 2010

Before

Upstream view of dam from right bank

After



Upstream view of completed ramp

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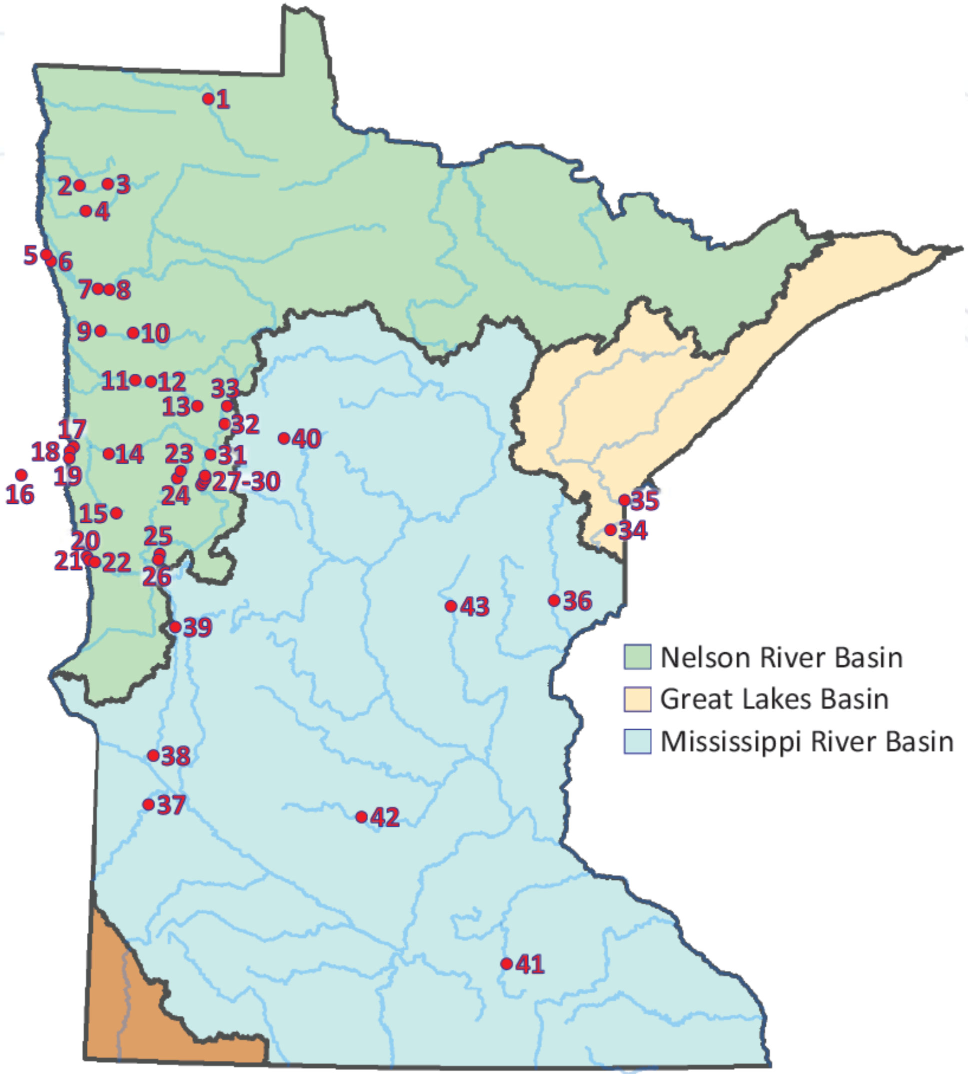
Successful MN Projects

- Key Features
  - Height: 10 Feet Or Less
  - Length: Less Than 200 Feet
  - Flow: Continuous
  - Entrance: Close To Spillway
- Partial List of Species
  - Black Crappie
  - B. Darter
  - Bluntnose Minnow
  - Ch. Catfish
  - Creek Chub
  - Frshwtr Drum
  - G. Redhorse
  - J. Darter
  - SM Bass
  - Shiner
  - Walleye
  - White Bass
  - White Sucker
  - Yellow Bass



Source: Aadland, *Reconnecting Rivers*, MnDNR, 2010

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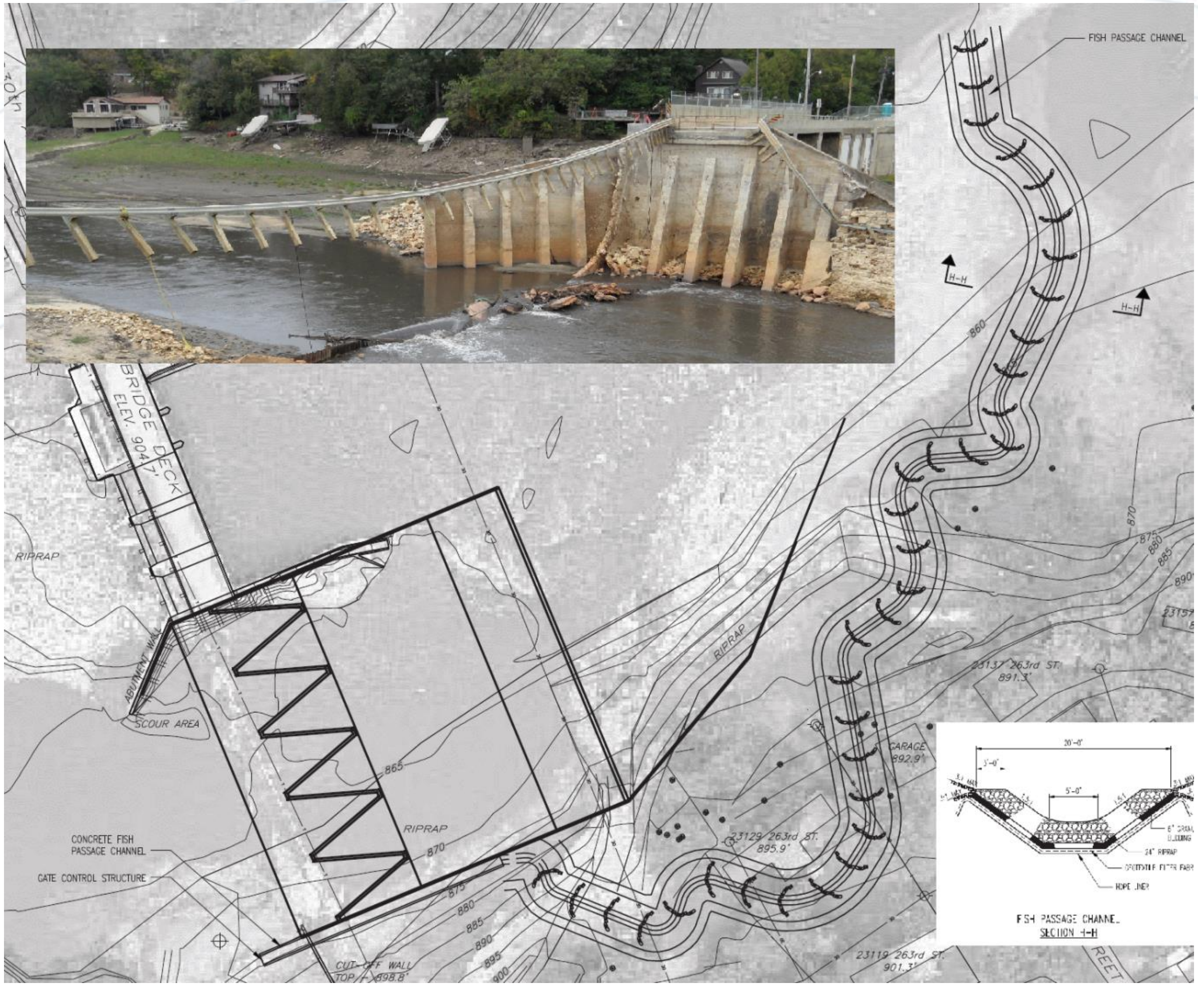
Lake Delhi Dam



Source: Stanley Consultants, 2012

- Key Features
  - Height: 40 Feet
  - Length: 800 Feet
  - Flow: Seasonal
  - Entrance: 700 Feet
  - Species: Similar

Work Plan

Answer Questions

1) Will The Desired (Target) Species Find The Bypass Entrance?
2) If So, Will The Fish Enter The Structure?
3) If So, Will They Pass Through The Structure?
4) If So, Will Their Passage Increase Species Diversity Or Abundance?

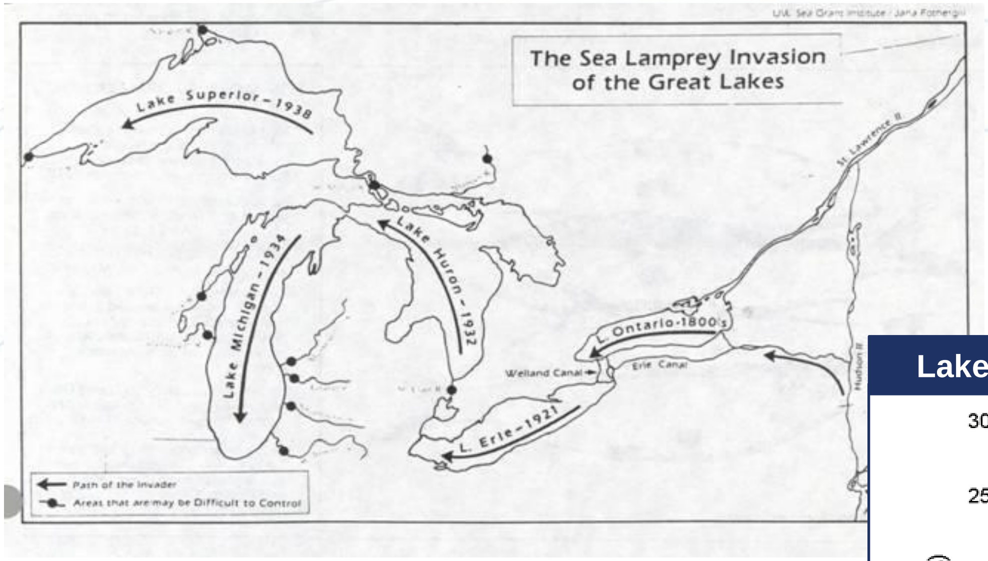
Project Phases

1) Evaluate River System
2) Construct Entrance
3) Construct Channel

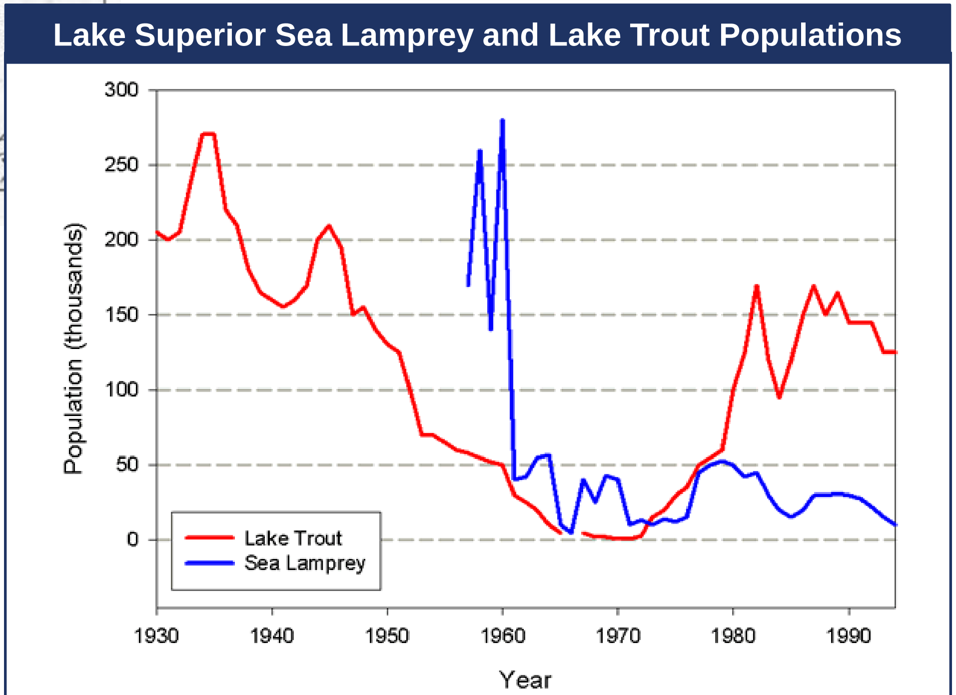
Team

- Iowa DNR
- University of Iowa
- Lake Delhi District
- U.S.F.W.S.
- U.S. Army C.O.E.
- Delaware County

Sea Lamprey: Great Lakes Invader



- 1930s – Sea Lamprey Reach The Upper Great Lakes
- 1950s – Collapse Of Lake Trout Population
- 1960s – Effective Sea Lamprey Control Measures Instituted



Source: USGS

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Methods of Control

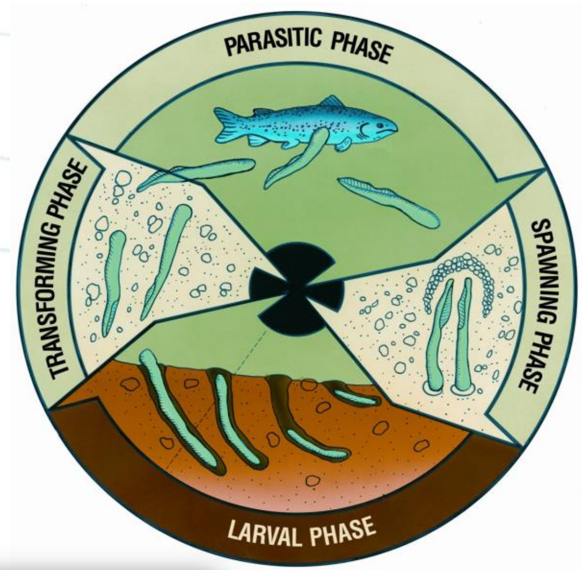
Chemical

Mechanical

Electrical

Physical

Sea Lamprey



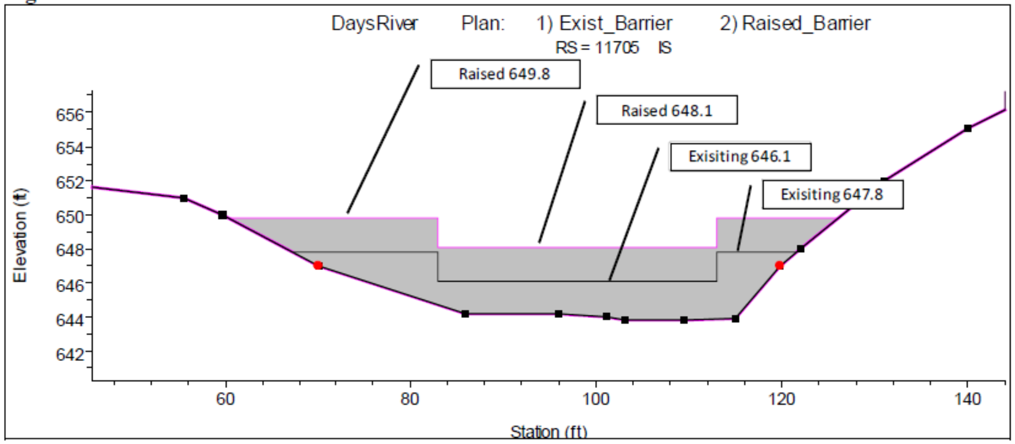
- Tendencies
  - Live In Great Lakes
  - Ascend Gravelly Streams And Rivers To Spawn In Spring
  - Stream Flows Are Typically Highest In Spring
- Capabilities
  - Low Swimming Speed But Can Attach To Rocks/Objects
  - Cannot Ascend Vertical Drops Greater Than 18”

Sea Lamprey Barriers

Days River

- Existing Barrier In U.P. Of MI Constructed In Mid-80s
- No Longer Effective
- Project Findings:
  - 2’ Raise Could Improve Effectiveness By 87%
  - Removing ATV Trail Lowers Tailwater
  - Minimal Upstream Flooding Impacts

Figure 3 – Barrier Raise Schematic



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Sea Lamprey Barriers

Ontonagon River

- Most Productive Sea Lamprey Stream
- Use Abandoned Bridge
- Use Skewed Weir to Control Velocity
- Project Findings:
  - Highly Variable Flow Regime
  - Spring Water Levels Could Be Up To 10’ Higher Than Shown In Photo
  - Use Sheet Pile Weir
  - Construction Difficult (i.e. $$) But Possible In Two Stages
  - Difficult To Control Velocity During Normal Spring Flows

Sea Lamprey Barriers

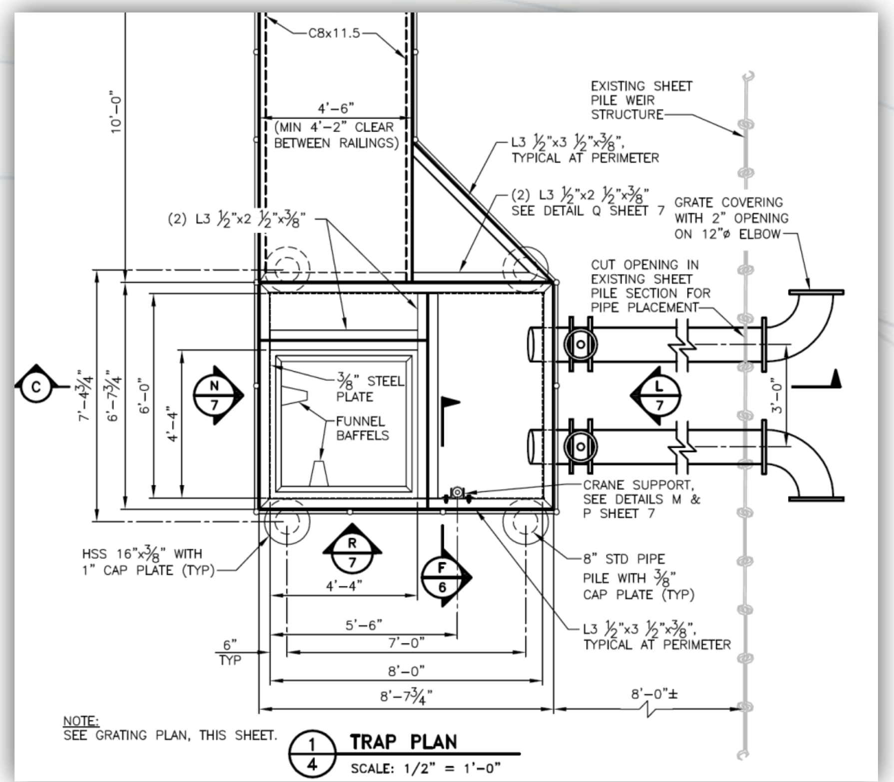
Manistique River Barrier

- Existing Dam
- Significant Concrete Deterioration
- Void And Crevice Filled Bedrock
- Flood Impacts
- Environmental Concerns

Sea Lamprey Traps

Manistee River

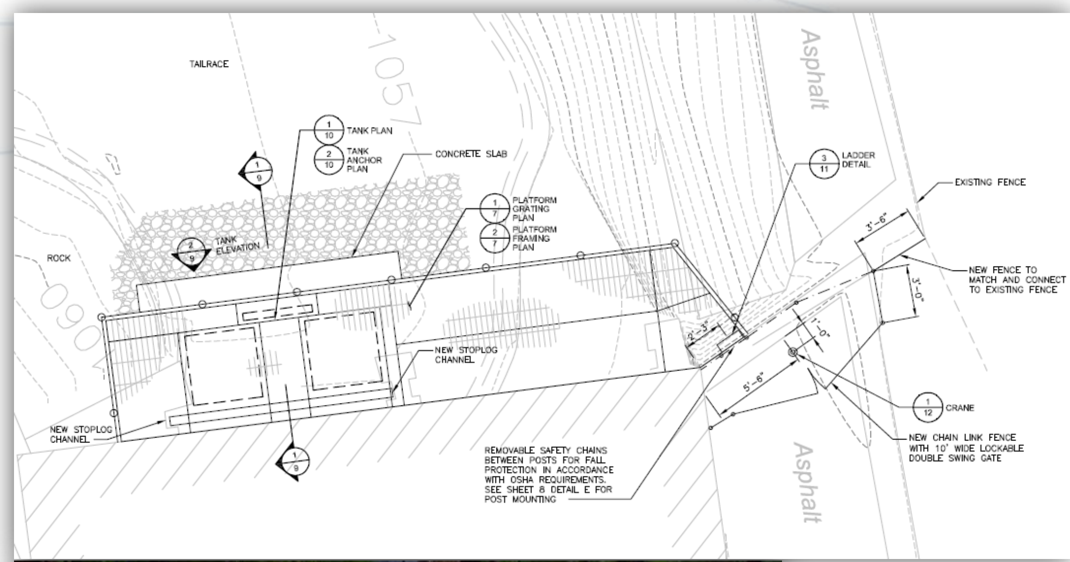
- Existing Dam Provides Barrier
- Design Trap Box To Be Removable
- Valved Pipes (2) To Provide Flows
- Removable Grated Panels And Crane For Trap Lifting
- Switch From Deep Pipe Pile To Hybrid Shallow Pile/Slab Foundation
- 2010 Construction



Sea Lamprey Traps

Cattaraugus Creek

- Existing Dam Provides Barrier
- Historic Structure
- No Attachment To Powerhouse
- Remove Turbine Runner
- Remove 14’ Of Sediment In Forebay
- Concrete Slab Foundation
- Stoplog Adjustable Openings
- Provide Two Cranes For Lifting Trap Up To Parking Area
- Construction 2011



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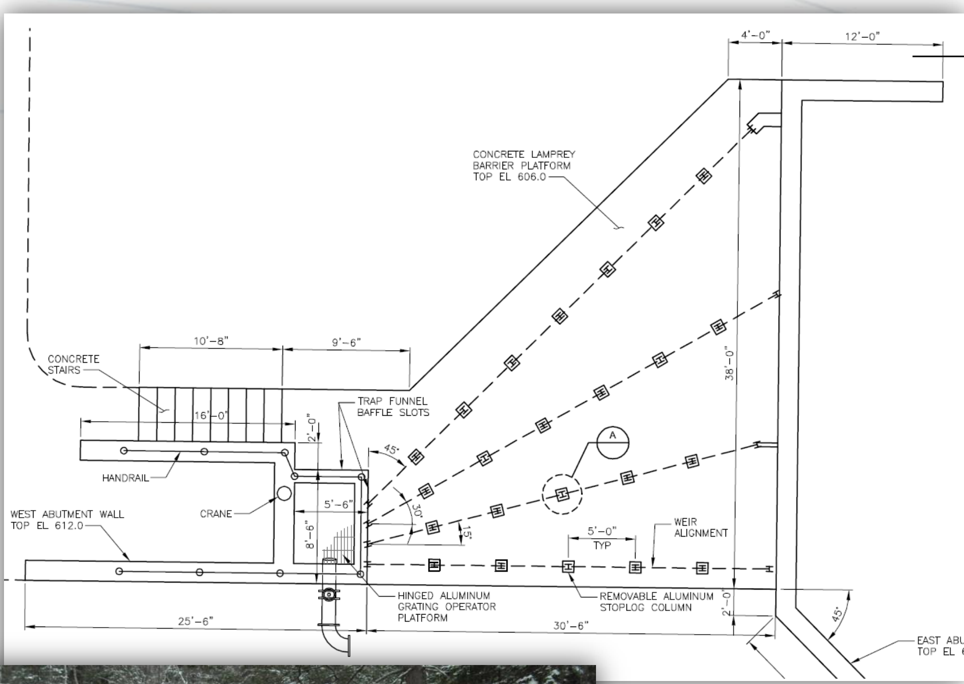
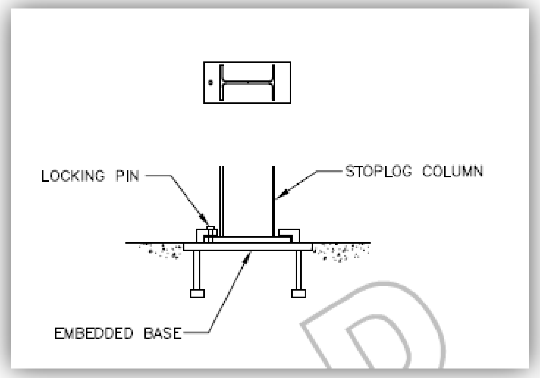
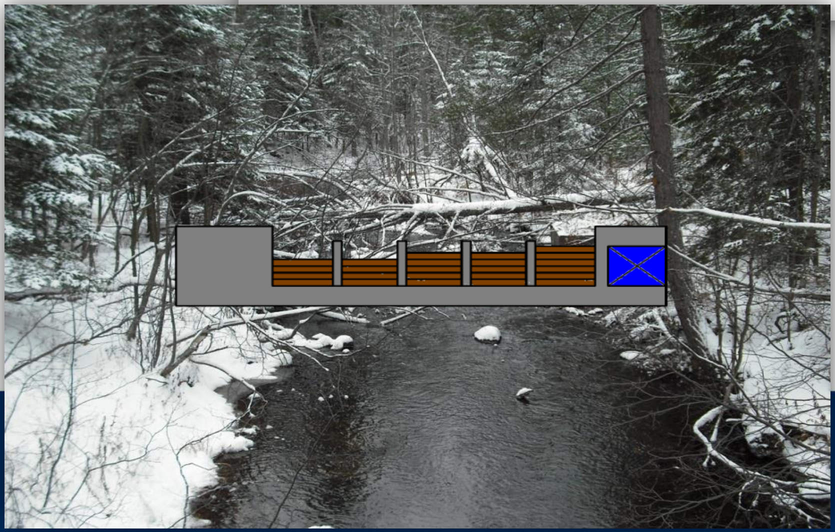
Sea Lamprey Trap Testing Facility

Harlow Creek

- Proposed Facility On Small Creek In U.P. MI
- Adjustable Angle And Weir Heights
- Removable Posts With Stoplogs
- Test Variations To Improve Trapping Effectiveness







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The University of Iowa

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Questions?