ECOSYSTEM RESTORATION VIA PASSAGE OF LAKE STURGEON AT FIVE HYDROELECTRIC DAMS ON THE MENOMINEE RIVER

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FISH PASSAGE ENGINEER
PROJECT BACKGROUND

Lake Michigan Tributary Rivers with Known Sturgeon Spawning

- Menominee River: 45%
- Peshtigo River: 15%
- Mushegon River: 5%
- Fox River: 5%
- Oconto River: 5%
- All Other Rivers: 25%

Legend:
- Menominee River
- Peshtigo River
- Mushegon River
- Fox River
- Oconto River
- All Other Rivers
Menominee River
**Benefits of Sturgeon Passage on the Menominee River**

- **Currently Available Habitat**
  - 2.75 miles of river
  - Currently produces few fish

- **Passage at Menominee and Park Mill**
  - Would open 21 miles of river

- **Passage at Grand Rapids**
  - Would open 30 miles of river

- **Passage at White Rapids and Chalk Hill**
  - Would open 32 miles of river

*Slide courtesy of USFWS*
**Fish Passage Feasibility Study**

**Project Team**
- Engineers
- Fishery Biologists
- Regulatory Specialists
- Economists
- Ecologists
- Archaeologists

**Scope of Work**
- Identify Fish Passage Alternatives
- Review Engineering Feasibility
- Review Hydrology and Hydraulics
- Review Costs and Economics
- Review Habitat Benefits
- Review Historical and Cultural Impacts
- Review Real Estate Constraints
Fish Passage Feasibility Study

Alternatives Considered for Sturgeon Passage

- **Upstream Passage**
  - Fish Elevators
  - Nature-like Fishways
  - Vertical Slot Fishways

- **Downstream Passage**
  - Close Spaced Trash Racks
  - Angled Bar Racks
  - Exclusion Nets
  - Louver Structures
  - Induced Flow Devices

- **Dam Removal**
- **Trap and Transport**

- **Surface Bypass**
- **Submerged Orifice Bypass**
- **Transport Pipes**
- **Transport Flumes**
The Three Rules of Fish Passage Planning

- LOCATION, LOCATION, LOCATION
  - Fish Behavior
    - Guided By Flow
    - Guided By Natural Bathymetry or Man Made Structure
  - Site Layout Considerations
    - Bathymetry and Topography
    - Existing Structures
    - Existing Operations
  - Real Estate Considerations
FISH PASSAGE FEASIBILITY STUDY

Screening of Alternatives

- Effectiveness
  - Fish Passage Effectiveness
  - Effect on Hydro Project Operations

- Efficiency
  - Construction Cost
  - Operations and Maintenance Cost

- Acceptability
  - Flood Impacts
  - Environmental Constraints
  - Historical and Cultural Constraints
Selected Alternatives

- Fishway 1 – Menominee & Park Mill
  - Downstream Passage – Close Spaced Inclined Bar Racks and Surface Bypass

- Fishway 2 – Grand Rapids
  - Upstream Passage – Fish Lift in Tailrace
  - Downstream Passage – Existing Bar Racks and Surface Bypass

- Fishway 3 – White Rapids & Chalk Hill
  - Upstream Passage – Fish Lift in Tailrace
  - Downstream Passage – Close Spaced Bar Racks and Submerged Bypass
FOUR PHASE FISH PASSAGE AND PROTECTION PLAN

Phase I
Park Mill Dam
FLOW
Phase III
Menominee Dam
Phase II
Phase IV

Slide courtesy of USFWS
Photo courtesy of North American Hydro

Utility by Urban Hollenkamp - chief's eye aviation
Grand Rapids Dam (Fishway 2)

SITE CONDITIONS

Spillway and Tainter Gates

Power canal

Grand Rapids Dam; Powerhouse
WHITE RAPIDS & CHALK HILL DAMS (FISHWAY 3)

Approx 2.5 river miles apart

Chalk Hill Dam

White Rapids Dam

SITE CONDITIONS
Fishway 1  
Menominee – Park Mills

**Downstream Alternative:**  
Incline rack with surface bypass

**Available Habitat:**

- **Excellent**  
  spawning habitat: 59 acres,  
  juvenile habitat: 1,742 acres
- **Good**  
  spawning habitat: 706 acres,  
  juvenile habitat: 0 acres
- **Fair**  
  spawning habitat: 0 acres,  
  juvenile habitat: 0 acres

**Number of lake sturgeon above Park Mills:**

<table>
<thead>
<tr>
<th>Total length (cm)</th>
<th>2011</th>
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<tr>
<td>&lt;91</td>
<td>1,362</td>
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<td>&gt;91</td>
<td>713</td>
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<td>&gt;107</td>
<td>483</td>
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<td>&gt;127</td>
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**Number of lake sturgeon below Menominee:**

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Spawning

Rearing

Staging

Spawning

Habitat Above and Below Menominee Dam
Fishway 2  
Grand Rapids

Upstream Alternative:  
Fish Lift

Downstream Alternative:  
Existing Trash Racks and Surface Bypass

Available Habitat:

- **Excellent**  
  spawning habitat: 100 acres,  
  juvenile habitat: 1,593 acres
- **Good**  
  spawning habitat: 784 acres,  
  juvenile habitat: 166 acres
- **Fair**  
  spawning habitat: 0 acres,  
  juvenile habitat: 0 acres

Number of lake sturgeon above Grand Rapids:

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<td>1,782</td>
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<td>(470-717)</td>
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Spawning

Staging

Rearing

Habitat Above Grand Rapids Dam
Fishway 3
White Rapids – Chalk Hill

**Upstream Alternative:**
Fish Lift

**Downstream Alternatives:**
New Close Spaced Trash Racks and Submerged Orifice Bypass

**Available Habitat:**
- **Excellent**
  - spawning habitat: 78 acres,
  - juvenile habitat: 1,592 acres
- **Good**
  - spawning habitat: 664 acres,
  - juvenile habitat: 842 acres
- **Fair**
  - spawning habitat: 98 acres,
  - juvenile habitat: 0 acres

**Number of lake sturgeon above White Rapids:**

<table>
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<tr>
<td>&gt;165</td>
<td>2</td>
<td>0</td>
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Spawning  Staging  Juvenile

Habitat Above White Rapids Dam
Spawning
Staging
Juvenile
Habitat Above Chalk Hill Dam
QUESTIONS

Menominee River Fish Passage Partnership Video

http://www.youtube.com/watch?v=FvNrJG4G8O4