

Jun 27th, 2:35 PM - 2:55 PM

## Session B2- Building a fishway for Lake Sturgeon: Successful testing of a prototype upstream fishway on the Menomine River in Northern Wisconsin

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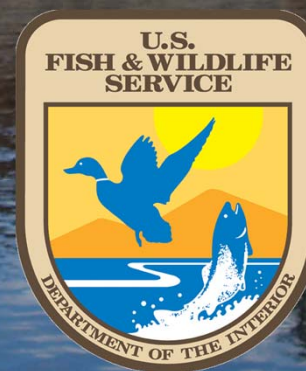
# Building a Fishway for Sturgeon

Successful Testing of a Prototype Upstream Fishway in  
Northern Wisconsin

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**U.S. Fish and Wildlife Service**  
**Green Bay, WI**

**National Fish Passage Conference**  
**University of Massachusetts**  
**June 27, 2011**

1000 51' 5011



# Project Partners

- Nick Utrup U.S. Fish & Wildlife Service
- Mike Donofrio Wisconsin Department of Natural Resources
- Jessica Mistak Michigan Department of Natural Resources
- Jim Fossum River Alliance of Wisconsin
- Todd Jastremski Michigan Hydro Relicensing Coalition
- WE Energies



# Project Location

Menominee River



# Status of Lake Sturgeon

- **State of Michigan**

- Threatened

- **State of Wisconsin**

- Species of Concern

- **U.S. Fish and Wildlife Service**

- Species of Special Concern



Photo courtesy of U.S. Fish and Wildlife Service

# Lake Sturgeon Decline

## Lake Michigan

- **Historical abundance**

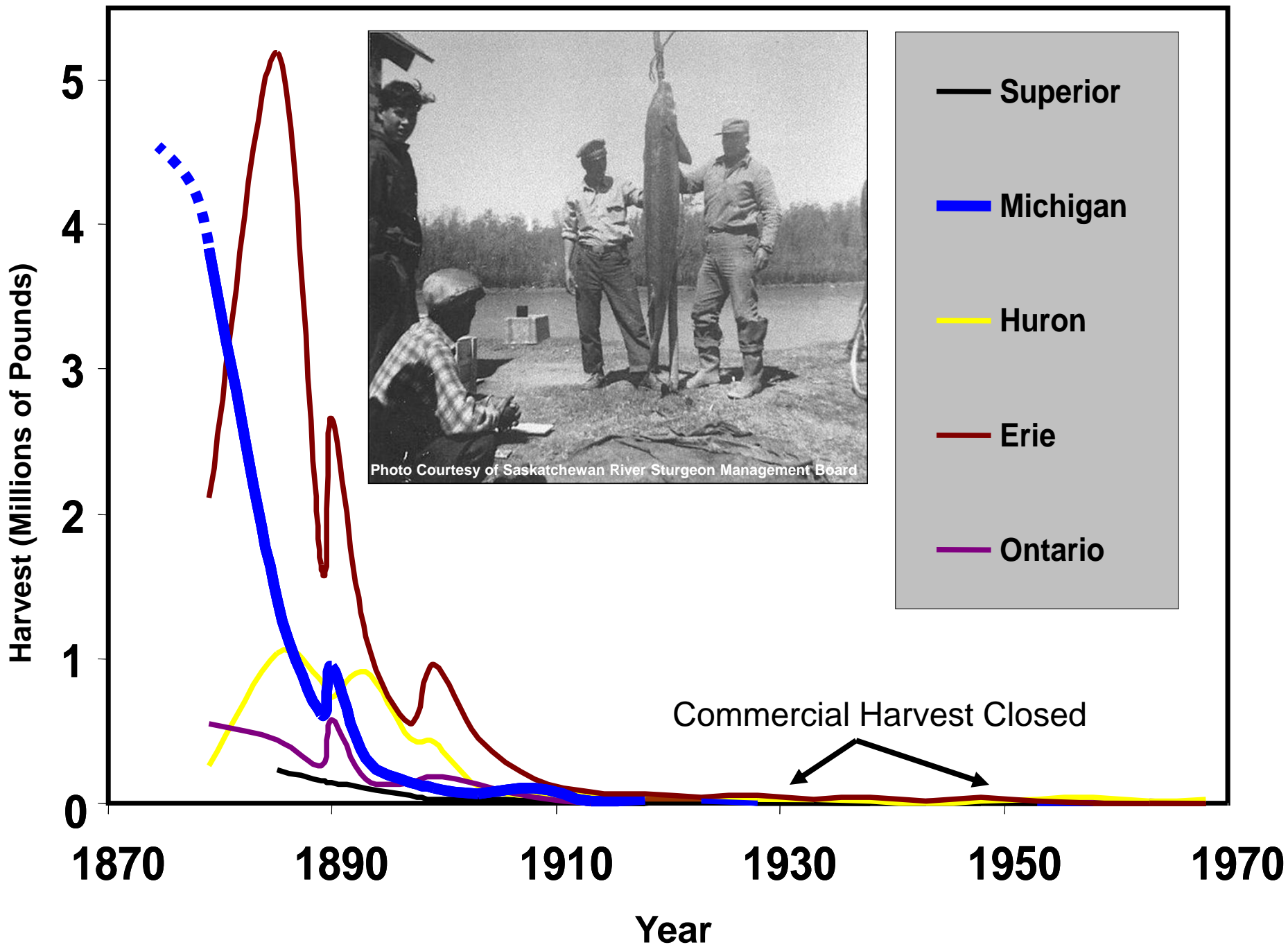
≈ 2 Million adults

- **Current abundance**

≈ 3,000 adults

- **< 0.002% of the historical abundance**





# Reason for the Decline

- **Commercial overharvest**

Combined with:

- **Habitat loss**

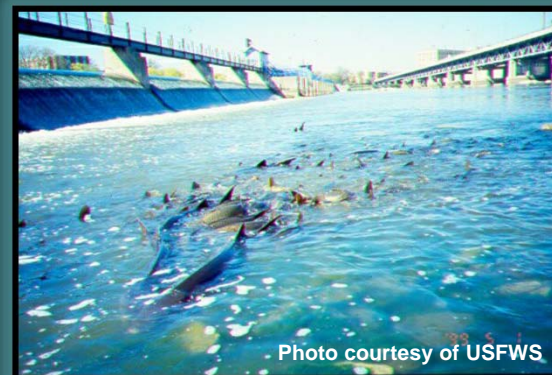
- Construction of Dams
- Destruction of spawning areas

- **Pollution effects**

- Further hindered reproductive success

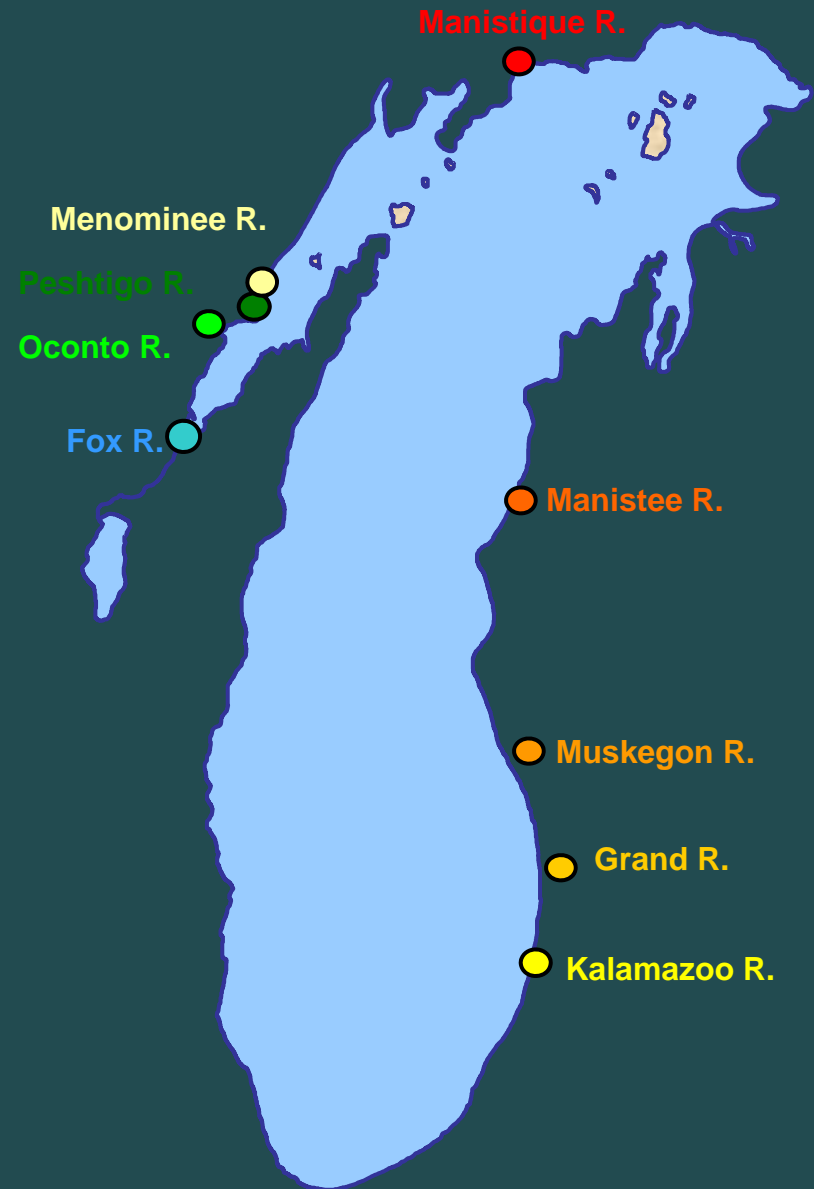
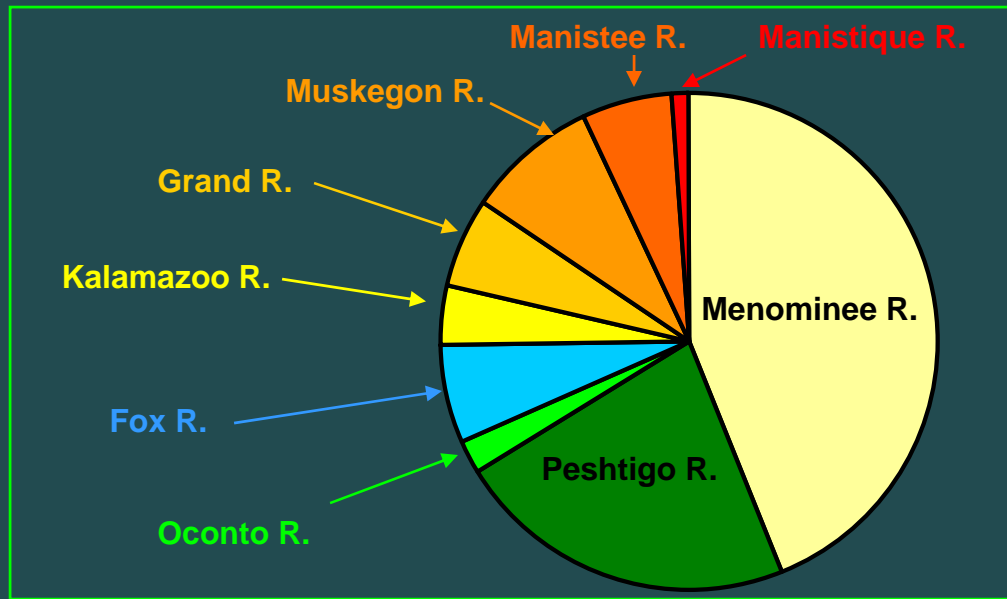
- **Protracted reproductive cycle**

- Late maturation
- Spawning periodicity

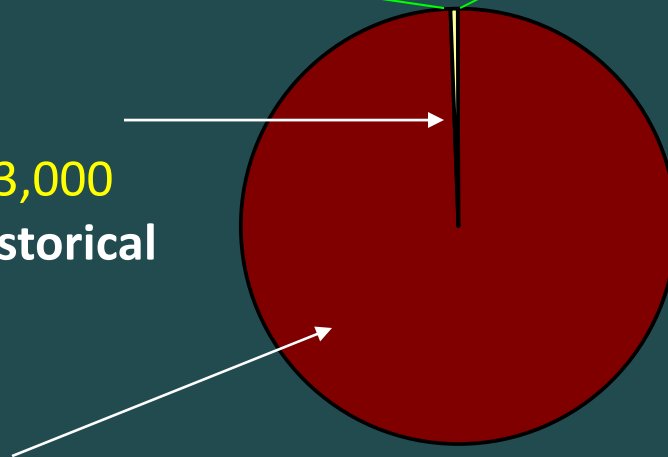




# Current Adult Abundance



Current Adult  
Abundance  $\approx 3,000$   
( $< 0.01\%$  of historical  
abundance)



Historical Adult Abundance  $\approx 1 - 2.4$  million

# Sturgeon Management Needs

## 1. Improved growth and recruitment

- Menominee River currently has an existing population of sturgeon that can contribute significantly to the Lake Michigan population
- Downstream passage and protection facilities are needed to allow Menominee River sturgeon to contribute to the lake population.

## 2. Access to quality spawning and juvenile rearing habitat

- Menominee River has available habitat upstream and between the dams within their historical spawning route.
- Upstream passage facilities are needed to allow access to this high quality habitat

# Benefits of Sturgeon Passage



## ■ Currently Available

- 2.75 miles of river
- 238 acres of sturgeon habitat
- Produces few fish

## ■ Passage at lower two dams

- Will open 21 miles of river
- 1,668 acres of sturgeon habitat

## ■ Passage throughout historical range

- Would open 87 miles
- 4,797 acres

# Can We Pass Sturgeon?

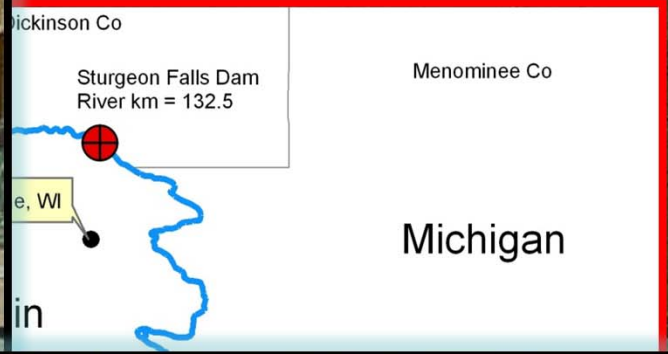
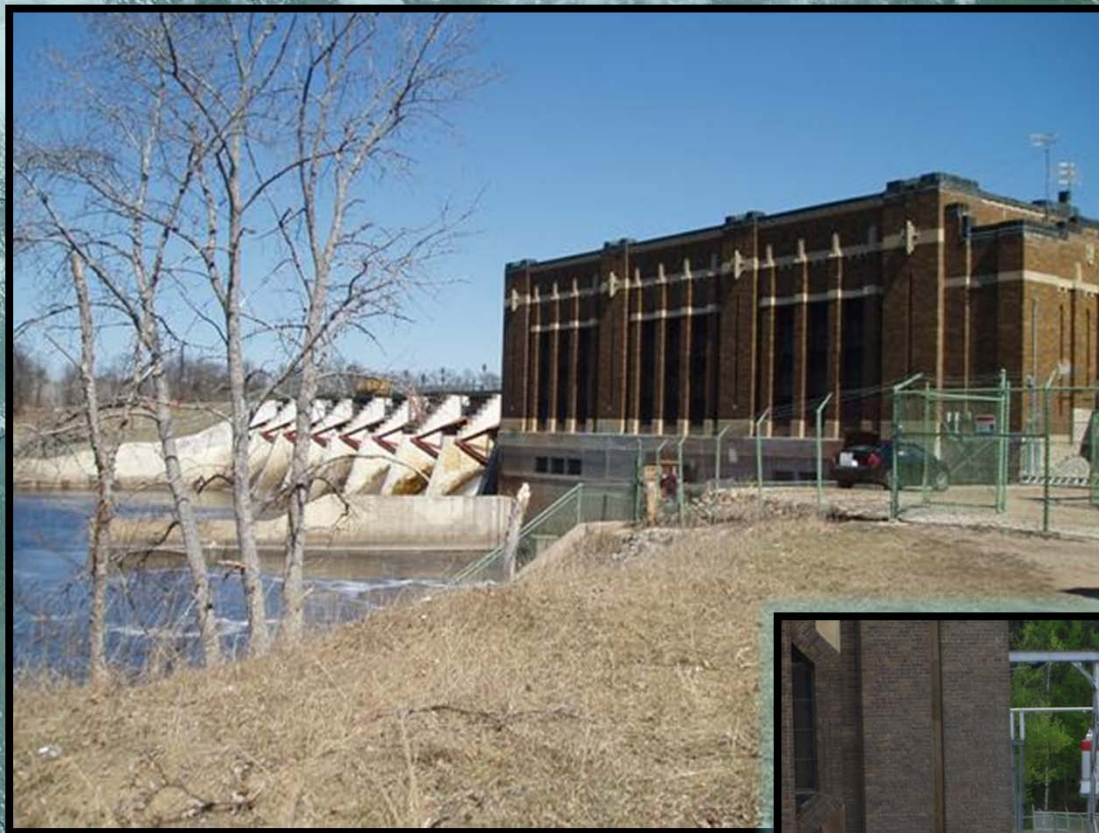
- **Passage facilities typically developed for “athletic” fish such as salmon.**
- **Can we effectively attract and pass “non-athletic” fish like sturgeon?**

# Prototype Fishway Study Upstream Fish Entrance Channel



Photo courtesy of USFWS

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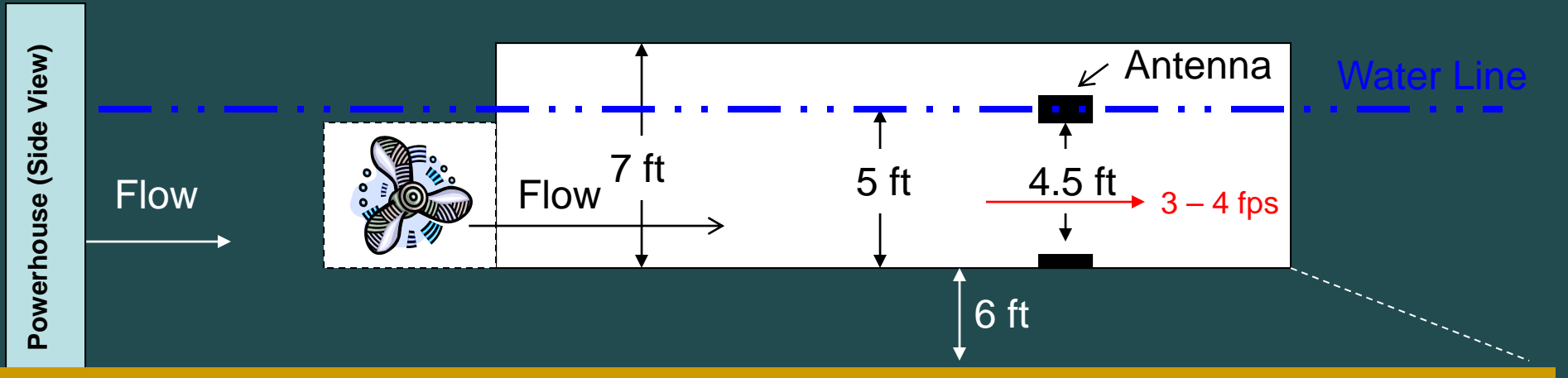
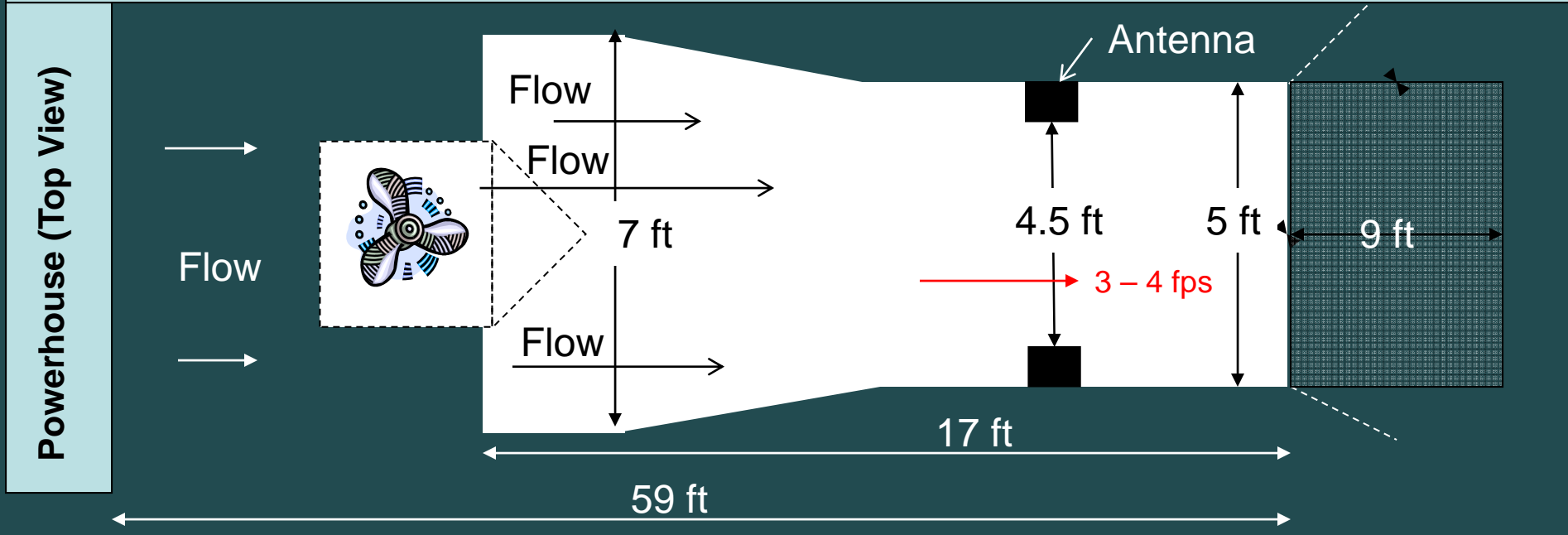


# Prototype Fish Entrance Channel

- **Designed by FWS fishway engineers**
  - Simulates an actual fishway entrance
- **Constructed at We Energies expense**
  - Placed downstream of the powerhouse

# 2009 Entrance Channel Parameters

Concrete Retaining Wall (Top View)





# PIT Tag System

- Submerged pass-through PIT tag antenna
- Multiplexing transceiver
  - Continuous data recording (April – October)

Photo courtesy of USFWS



# Video System

- **Underwater cameras with infrared LED lights**
- **Record continuous video data during the spring spawning season**
  - April 15 – May 31
- **Video divided into 1-hour segments**
  - Segments randomized
    - 30 random daytime and 30 night segments (N=60)
  - Fish identified and counted
    - Fish behavior and orientation also evaluated



# 2009 Study Layout

Concrete Retaining Wall (Top View)

Powerhouse (Top View)

Turbine Bay 1

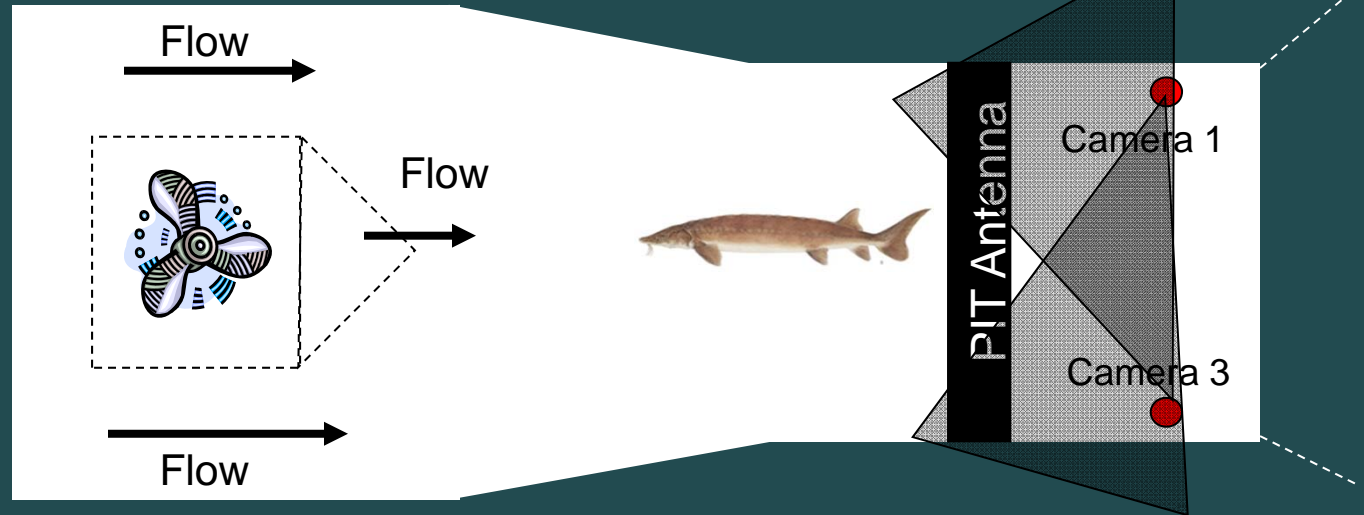
Flow  
→

Flow  
→

Turbine Bay 2

Flow  
→

Flow  
→



# 2009 PIT Tag Results

- **Study period: April 15 – October 7**
- **Antenna system recorded:**
  - 86 different sturgeon
  - Each sturgeon was detected an average of 4 times
  - Sturgeon passed through antenna field quickly ( $\approx$  3 seconds)
- **During spawning season (April 15 – June 2)**
  - 21 different sturgeon
  - Average length 44.9 inches
- **During the remainder of the year (June 3 – October 7)**
  - 75 different sturgeon
  - Average length 37.8 inches
- **Approximately 20% of the tagged sturgeon were detected by the pass-through PIT tag antenna**

# 2009 Video Results

- **Study period:** April 15 – May 31
- **Random Video Review:**
  - 26 lake sturgeon passed through the structure
    - 14 during the day and 12 during the night
    - Average time in camera view ( $\approx$  3.5 seconds)
    - Only 3 sturgeon had PIT tags
  - 318 smallmouth bass passed through the structure
    - All during the day
  - 130 suckers, 7 carp, and 1 crappie passed through the structure
  - No fish were observed in 22 of the 60 video segments (37%)

# 2010 Study

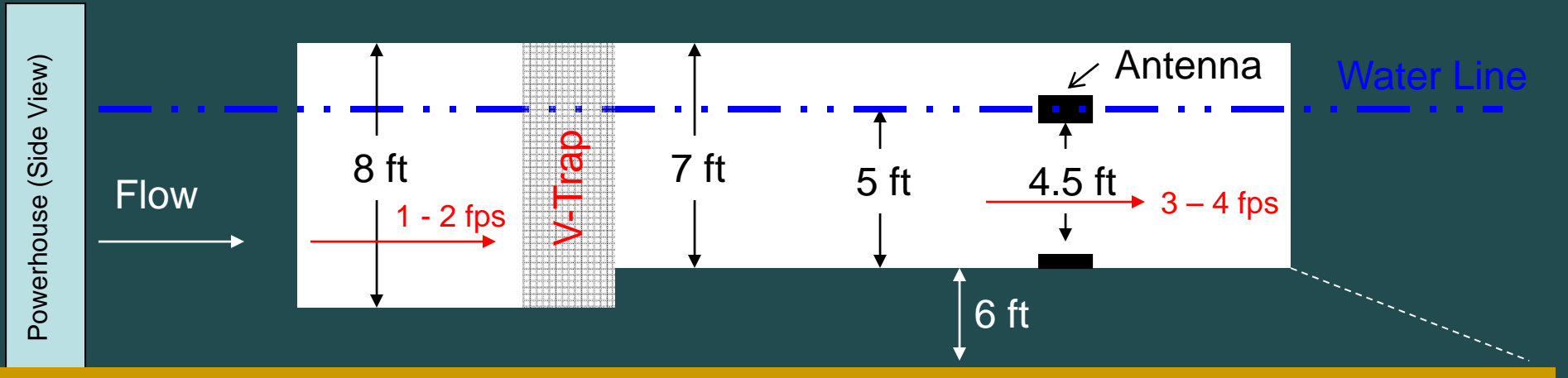
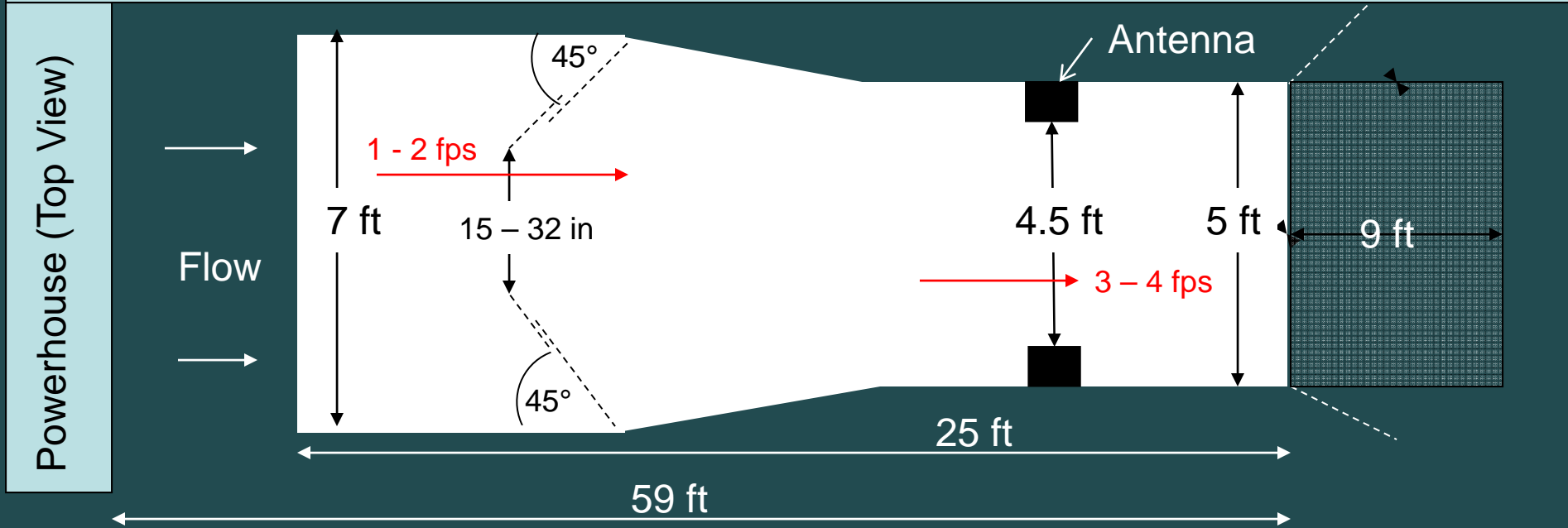
- **Installed an adjustable V-trap gate**
  - Test opening widths of 18, 24, and 30 inches



- **Installed 2 additional underwater cameras**
  - 2 in the current position and 2 more upstream of the new V-trap

# 2010 Entrance Channel Parameters

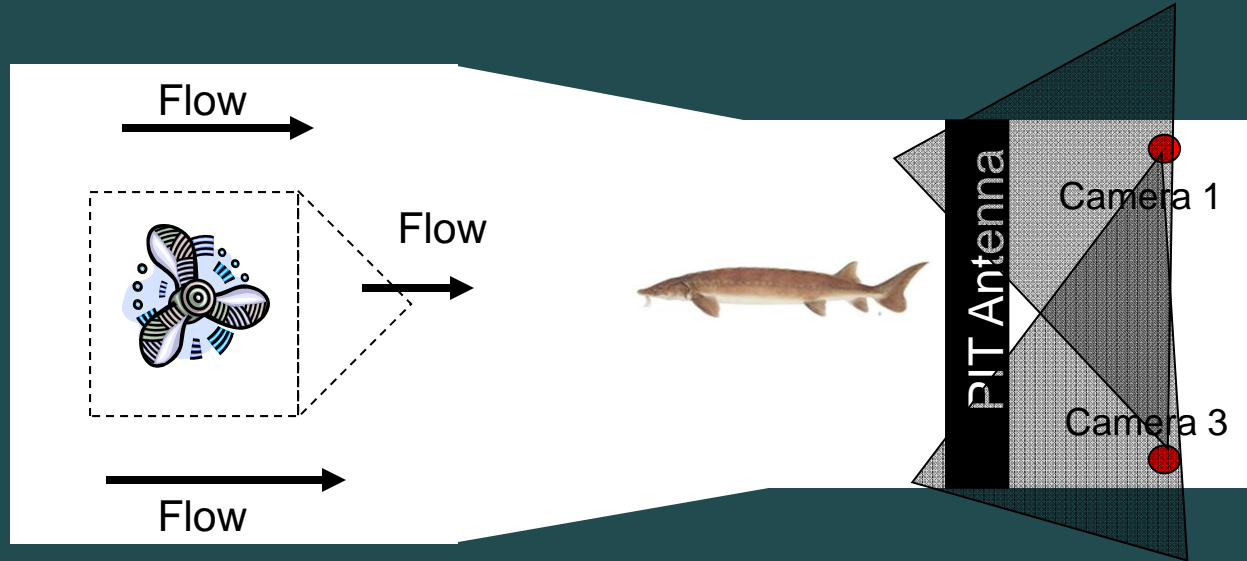
Concrete Retaining Wall (Top View)



# Study Layout Comparison

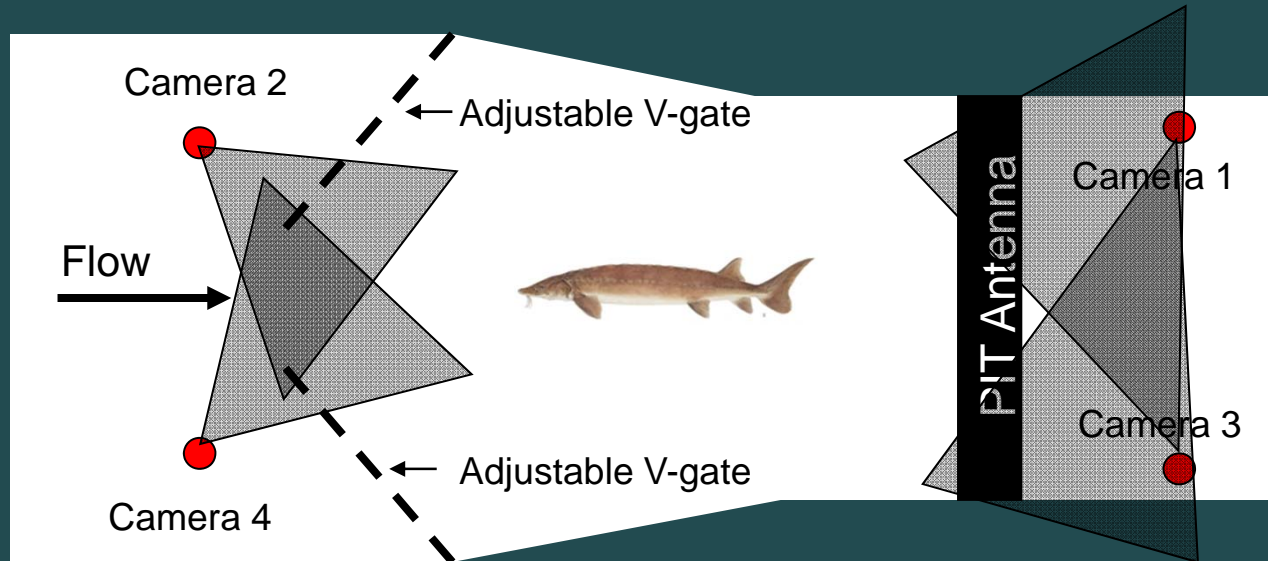
Powerhouse (Top View)

2009



Powerhouse (Top View)

2010





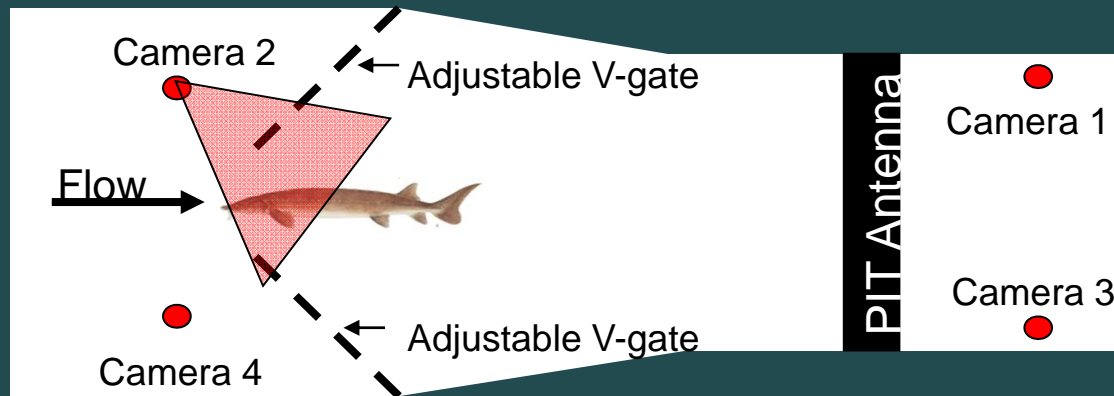
# 2010 PIT Tag Results

- **Study period: April 1 – October 18**
- **Antenna system recorded:**
  - 112 different sturgeon
  - Each sturgeon was detected an average of 5 times
  - Sturgeon passed through antenna field quickly ( $\approx$  3 seconds)
- **During spawning season (April 1 – May 31)**
  - 41 different sturgeon
  - Average length 41.2 inches
- **During the remainder of the sample period (June 1 – October 18)**
  - 72 different sturgeon
  - Average length 31.7 inches
- **Approximately 24% of the tagged sturgeon were detected by the pass-through PIT tag antenna**

# 2010 Video Results

- **Study period:** April 15 – May 15
- **Random Video Review:**
  - 10 lake sturgeon passed through the structure
    - 5 during the day and 5 during the night
    - Average time in camera view (1 - 3 seconds)
    - None of these sturgeon had PIT tags
  - 290 smallmouth bass passed through the structure
    - Mostly during the day
  - 4 suckers and 1 walleye passed through the structure
  - No fish were observed in 25 of the 60 video samples (42%)

# Example Video Clip



Camera 2



# 2011 Preliminary Data

- **Study period:** April 15 – June 3
- **Antenna system recorded:**
  - 21 different sturgeon
- **Video data for the Spring spawn is currently being reviewed**
- **Will review PIT tag and video data for the Autumn migration (September 1 – October 31)**

# Summary

- **Wild sturgeon can be attracted into an artificial structure**
  - This effectively simulates the hardest part of fish passage
- **Nearly 20% of the tagged sturgeon population were detected by the pass-through PIT tag antenna**
- **Sturgeon moved through antenna and past cameras quickly ( $\approx 3$  seconds) and multiple times**
- **Larger sturgeon were detected during the spring spawning period**
  - On average 10 inches larger than during the post spawn period
- **Video data from 2010 and 2011 suggests sturgeon will move through a narrow V-trap opening**
  - Important concept for trap and lift facilities

# Questions?

