

Dec 12th, 11:00 AM - 12:40 PM

Merging biology and technology to achieve selective bi-directional fish passage

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Presenter Information

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FISH PASS

GIIGOOK MAH-JOWAG



Merging biology and technology to achieve selective bi-directional passage

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GLFC & Sea Lamprey Control

GLFC is a 1955 treaty organization between Canada and the United States (www.glfc.int) charged with sea lamprey control and maintaining healthy sustainable fisheries in the Great Lakes



Sea Lamprey Biology

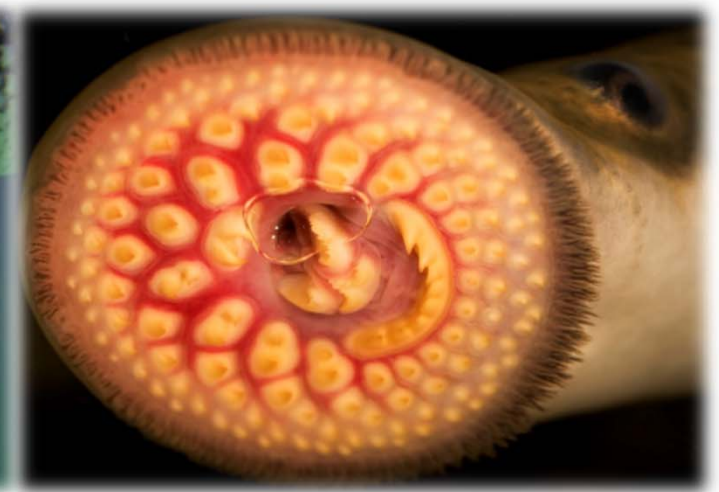
- Attach to prey fish and feed on blood and other bodily fluids
- A single sea lamprey is capable of killing 40 pounds of fish
- Migrates up rivers and streams to spawn and females can lay ~100,000 eggs

Sea Lamprey Control

- Barriers used to deny access to spawning grounds and lampricide used to kill larvae
- Efforts have reduced population by over 90% of historic peak

What is FishPass

An innovative project to **enhance fish passage and connectivity** between the Boardman River and Lake Michigan **while removing invasive or non-desirable fishes** through controlled sorting



What will FishPass Do?

- **Replace** deteriorating Union Street Dam with an improved barrier
- Optimize various sorting technologies and techniques **below a barrier** to maximize efficiency of passing desirable fishes and removing invasive fishes
- **Develop** into a living laboratory with education & outreach
- **Convert** to permanent selective fishway completing the Boardman River Restoration Project



Boardman (Ottaway) River



Union Street Dam



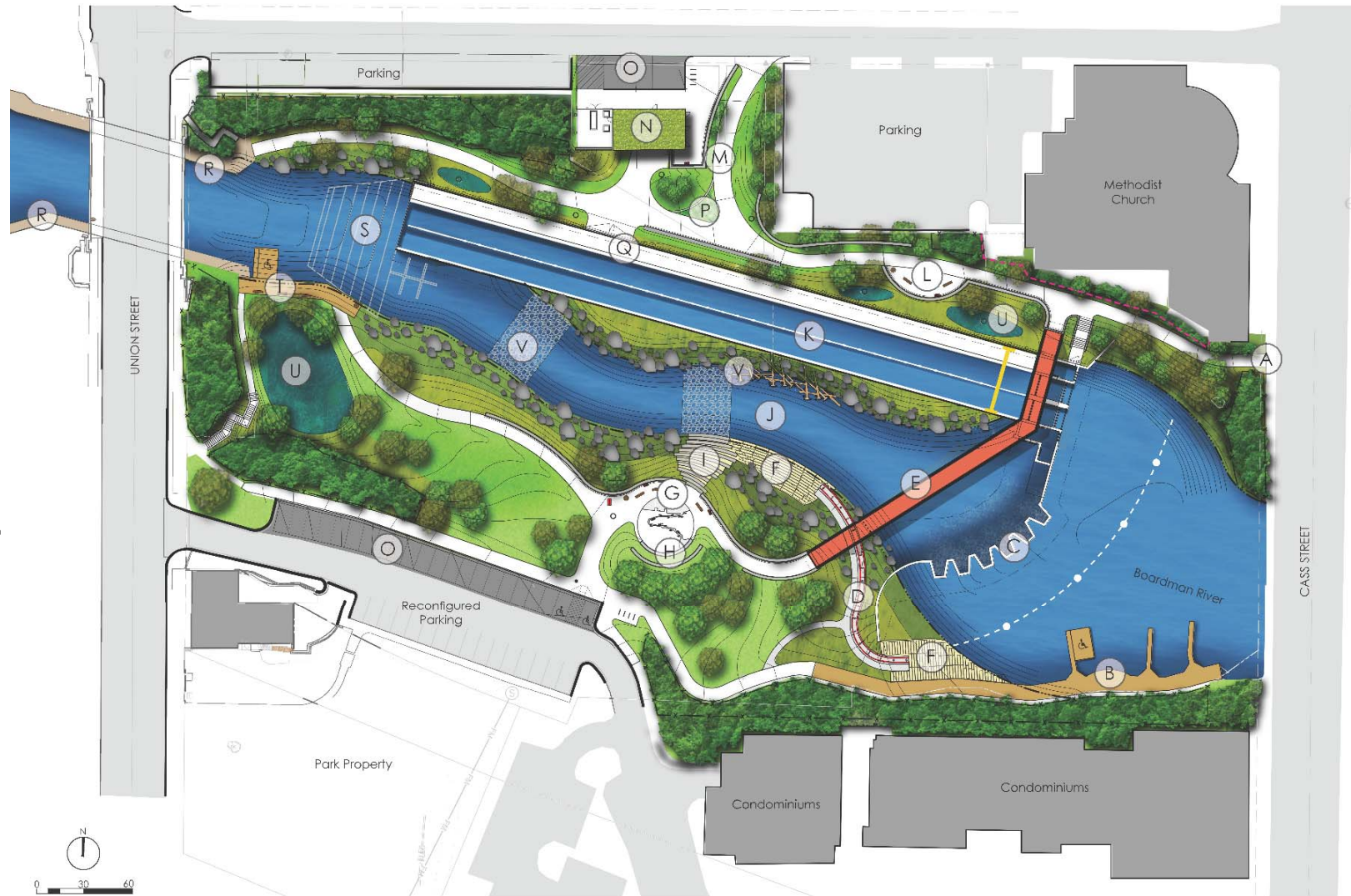
65% Design Layout

LEGEND

-  Lawn
-  Meadow
-  Riprap & Live Stakes
-  Stormwater Seeding
-  Concrete Plank Paver Boat Launch
-  Fish Habitat Logs
-  Existing Fence

PLAN KEY

-  A New Pedestrian Connection to Cass Street
-  B Rehabilitated Boardwalk & Accessible Kayak Launch
-  C Labyrinth Weir
-  D Kayak Portage Rail
-  E Pedestrian Bridge
-  F Kayak Shore Access
-  G Interpretive Overlook 1
-  H Outdoor Classroom & Amphitheater
-  I Fishing Area - Stone Stepped Hillside
-  J Bypass Channel w/ Boulder Armoring & Native Vegetation
-  K Fish Sorting Channel
-  L Interpretive Overlook 2
-  M Service Drive/Pedestrian Walk on City Easement
-  N FishPass Research Building/ Public Restrooms
-  O Pervious Pavers
-  P TurfStone Vehicular Access
-  Q Research Access Way & Security Fence
-  R Future Boardwalk (BY OTHERS)
-  S Tailwater Entrance Pad
-  T Boardwalk Overlook Accessible Kayak Launch
-  U Rain Garden To Manage Building/Parking Runoff
-  V Stream Habitat & Stream Riffles



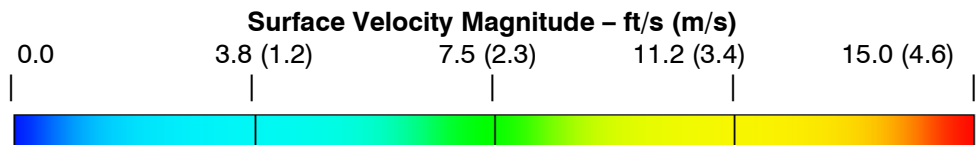
Flow-3D Simulations – Water surface velocities at base flow

AECOM
October 25, 2018



Notes:

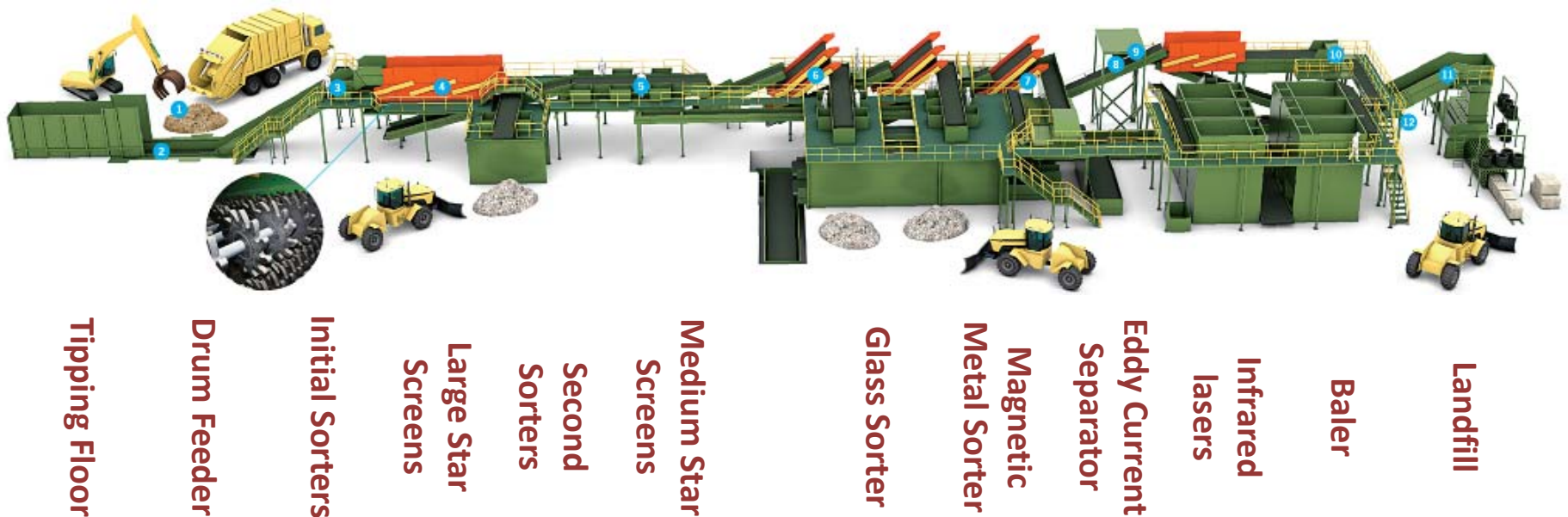
1. Low Lake Michigan Water Level EL 576.0
2. Base Flow Scenario (250 cfs)
3. Dual Leaf Gate set 1 foot below backwater elevation
4. Downstream Tilt Gates fully opened
5. LES Turbulence Model



Eco-engineering approach

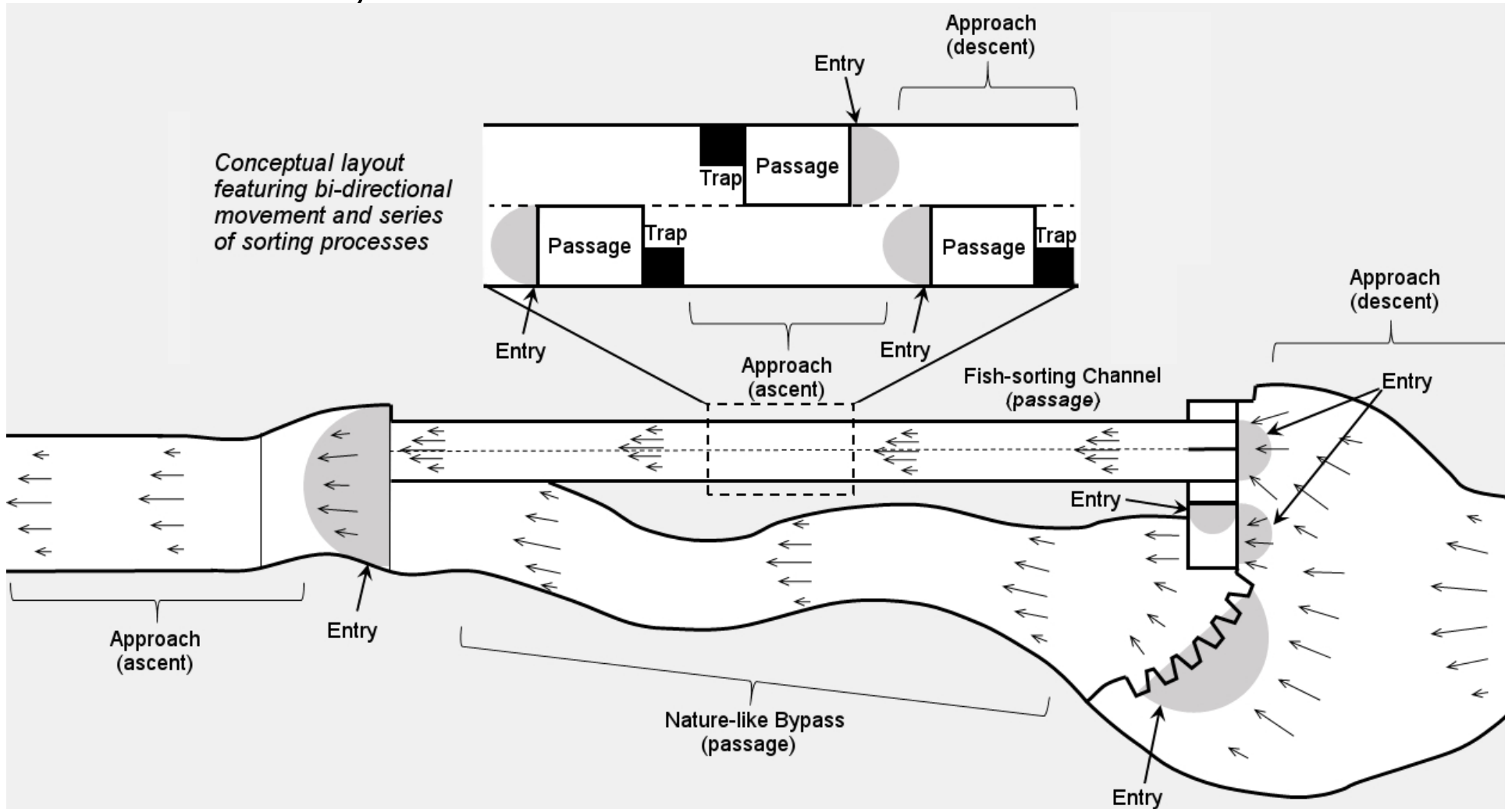
Selective passage = How to sort an assortment of things

- Evolution of single-stream recycling (SSR) centered around **automation** and **attribute-driven sorting**
- SSR can **inform development** and **expectations** for selective fish passage



Eco-engineering approach

- Applied to fish passage framework:
 1. Approach
 2. Entry
 3. Internal Passage
 4. Fate

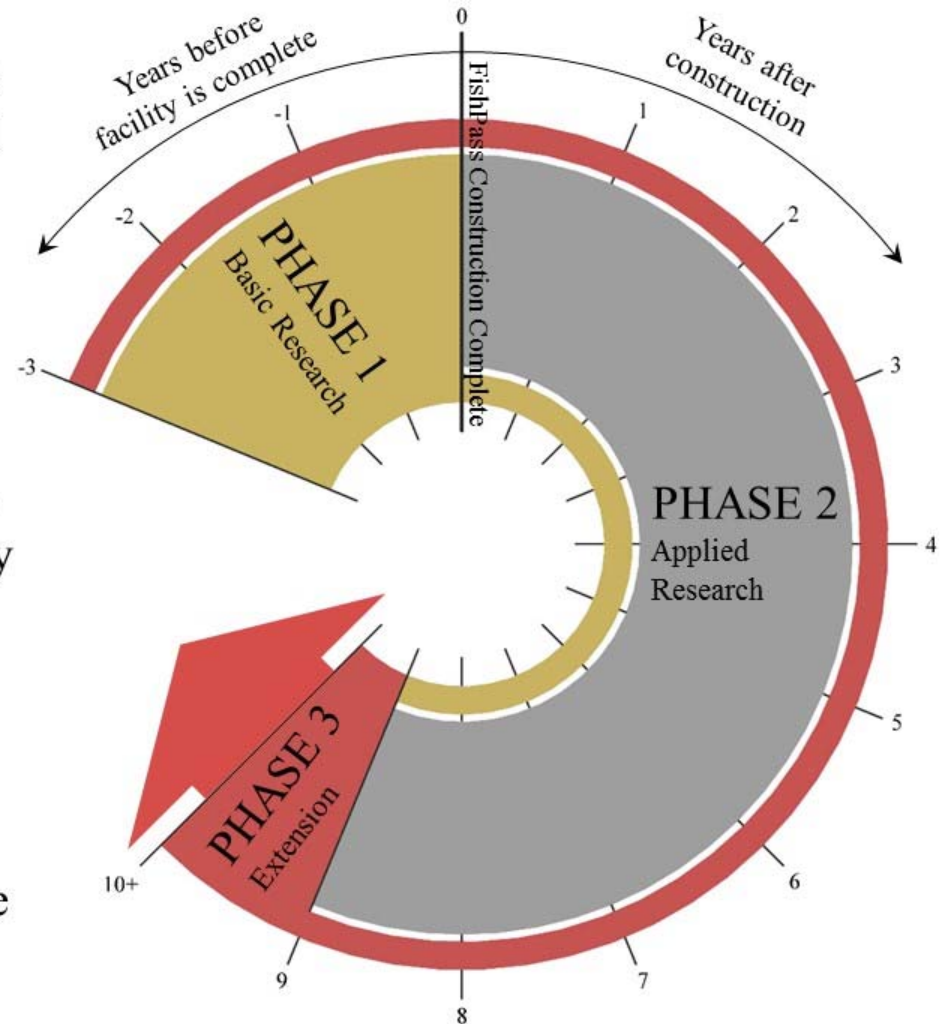


Research Plan

Phase 1: What are the sortable attributes of fish at FishPass and how can they be used to promote passage of desirable fish and block and/or remove undesirable fish in the Boardman River?

Phase 2: How can technologies and techniques that exploit or overcome sortable attributes be improved or used synergistically to direct, sort, assess, and manage (pass or remove) fish moving in a river?

Phase 3: How can selective fish passage improve watershed connectivity and improve fishery management?

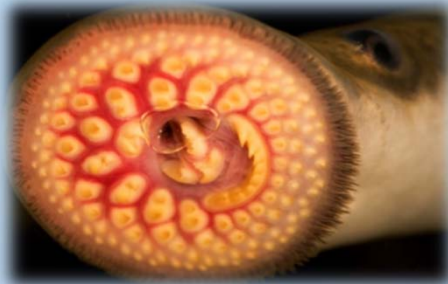


- Currently 8 research projects in Phase 1 funded at \$772, 877
- 3 more research proposals in Phase 1 submitted and under review

Potential technologies

LIFE HISTORY

- Seasonal or daily sorting



MORPHOLOGY

- Video shape recognition
- Elevators
- Screens
- Ladders
- Water velocity barriers



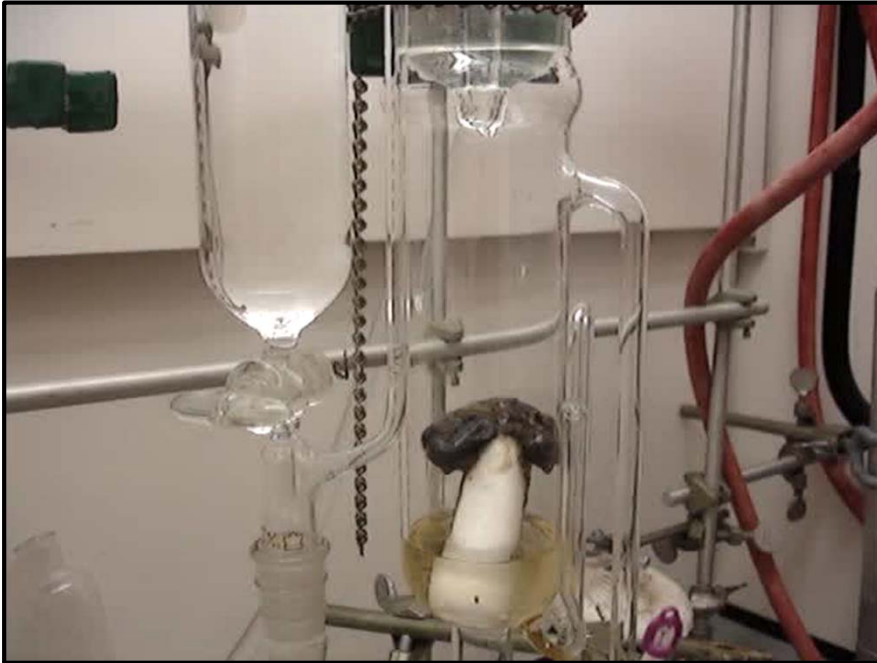
BEHAVIOR

- Eel-ladder style traps
- Funnel
- Pheromones
- Alarm cues
- CO₂
- Sound deterrents
- Hydraulic challenges



Fish passage solutions typically rely on a single technology targeting a single species (or group of like species). FishPass will integrate several technologies and techniques to optimally pass all desirable and block undesirable species.

Alarm cues



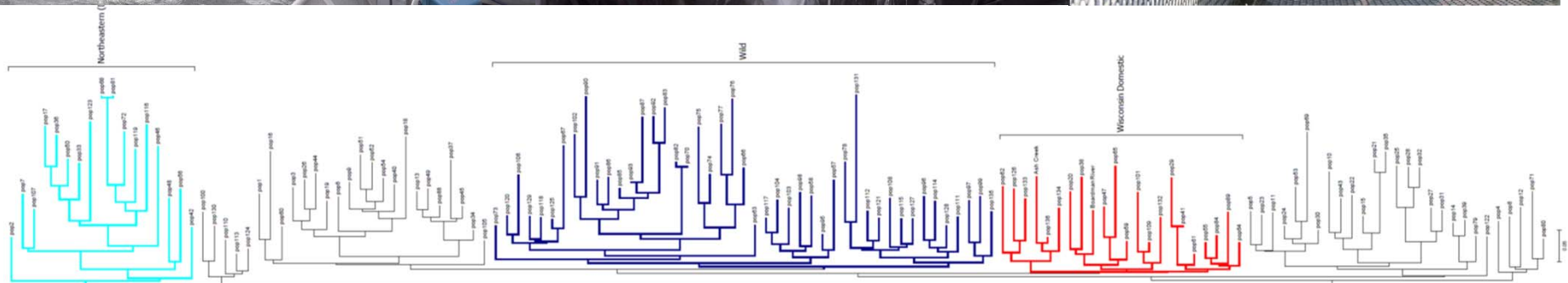
Wagner Lab: Bottling Fear



Assessment Plan

Current monitoring program focused on establishing baseline data prior to construction:

1. Long-term monitoring
2. Sea lamprey assessment
3. Movement studies
4. Genetic studies and eDNA sampling
5. Contaminant transfer



Project Feasibility

The project has a high likelihood of success built on **strong partnerships and support** and **expert judgement**

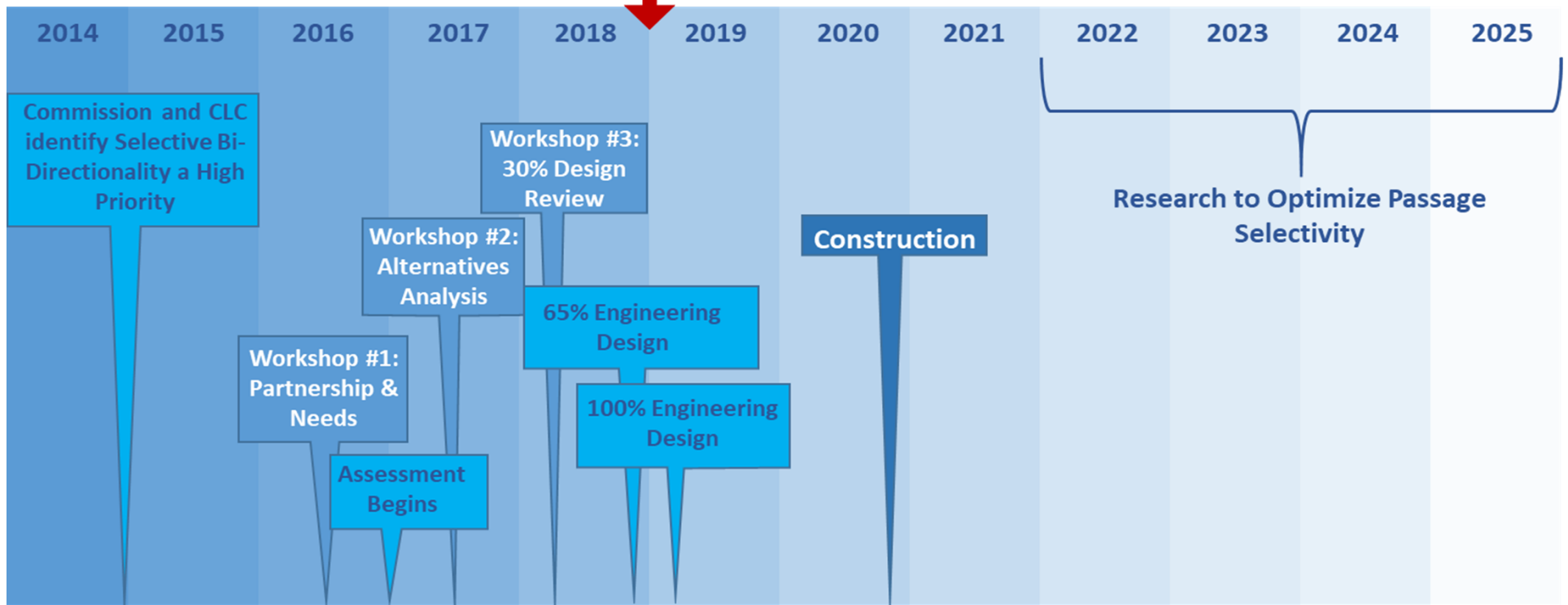
Partnerships and Support



Expert Judgement

- Project plans and designs developed through 3 planning workshops
- 50 experts in fish passage, behavior, engineering, hydrology
- Local, national, and international participation

Project Timeline



Contact us

- Andrew Muir, Science Director (amuir@glfc.org)
- Dan Zielinski, Computational Engineer (dzielinski@usgs.gov)

<http://www.glfc.org/fishpass.php>

