Adikameg: Aging Populations & Creative New Restoration Strategies

Presented By:

Kris Dey

Hatchery Manager

Little Traverse Bay Bands of Odawa Indians
4100 Giigoohns Miikaan Ave.
Levering MI 49755

Freshwater Summit
Traverse City
October 30th 2024

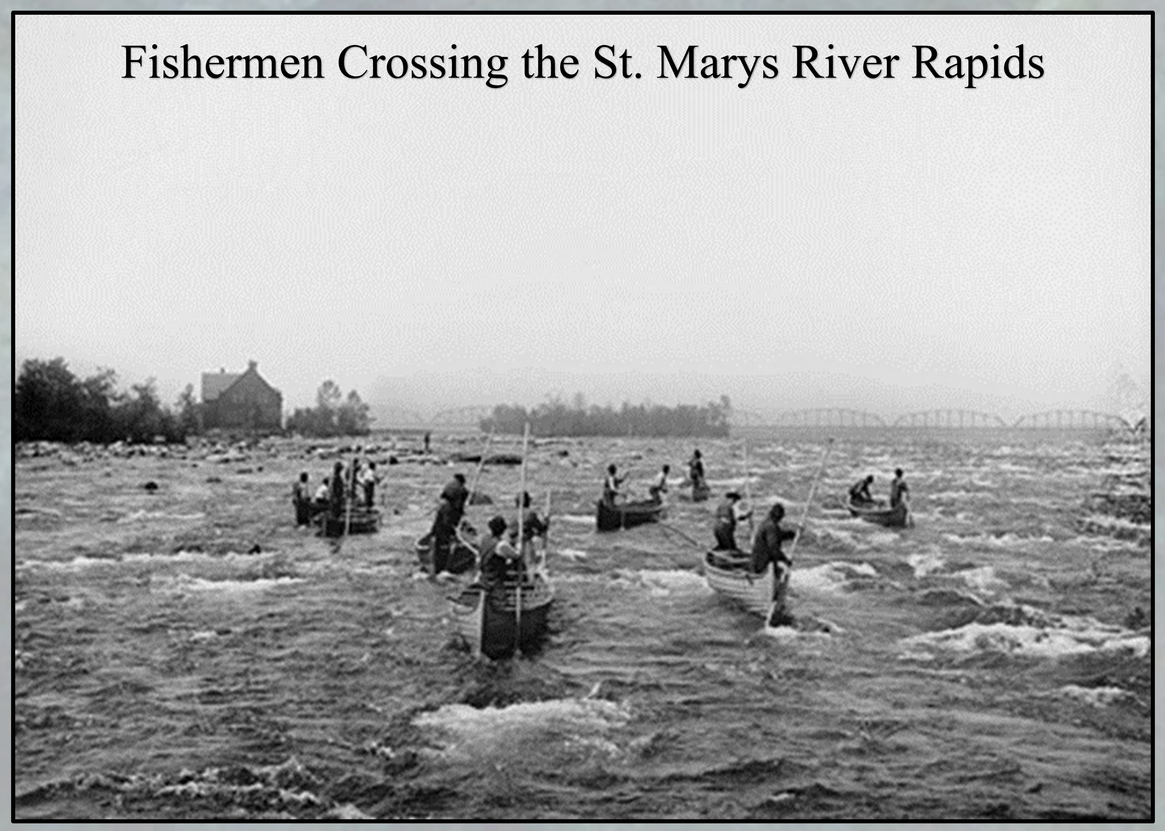
1836 Treaty Of Washington

Treaty of 1836; Article 13

Article Thirteenth:

The Indians stipulate for the right of hunting on the lands ceded, with th e other usual privileges of occupancy, until the land is required for settle ment. In testimony whereof, the said Henry R. Schoolcraft, commissioner on the part of the United States, and the chiefs and delegates of the Ottawa and Chippewa nation of Indians, have hereunto set their hands, at Washington the seat of Government, this twenty-eight day of March, in the year one thousand eight hundred and thirty-six.

Fishermen Crossing the St. Marys River Rapids



Reaffirmation!

Former LTBB Chairman - Frank Ettawageshik

September 21st 1994, Public Law 103-324

Little Traverse Bay Bands' of Odawa Indians

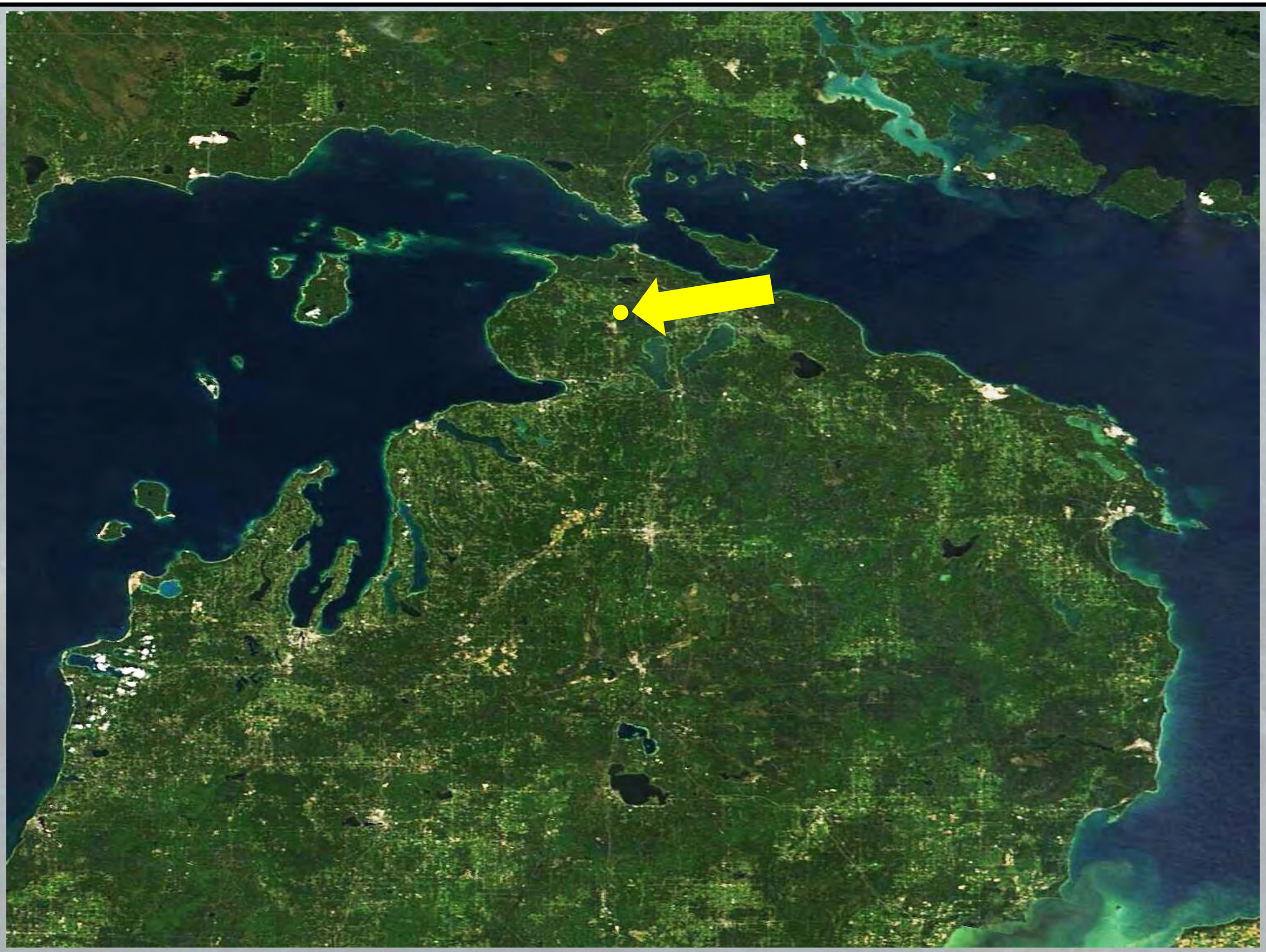
Main Government Center
Harbor Springs, MI

1836 Treaty of Washington D.C.

Former LTBB Chairman - Frank Ettawageshik

September 21st 1994, Public Law 103-324

LTBB Fisheries Enhancement Facility



LTBB Fisheries Enhancement Facility

Fisheries Enhancement Facility Construction

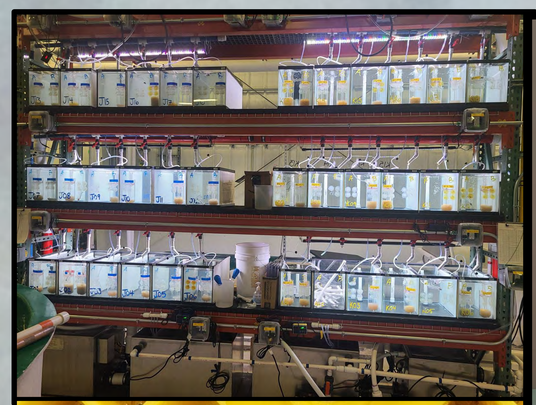
2013

LTBB Fisheries Enhancement Facility

LTBB Fisheries Enhancement Facility

LTBB FEF Objectives

Research



Restoration

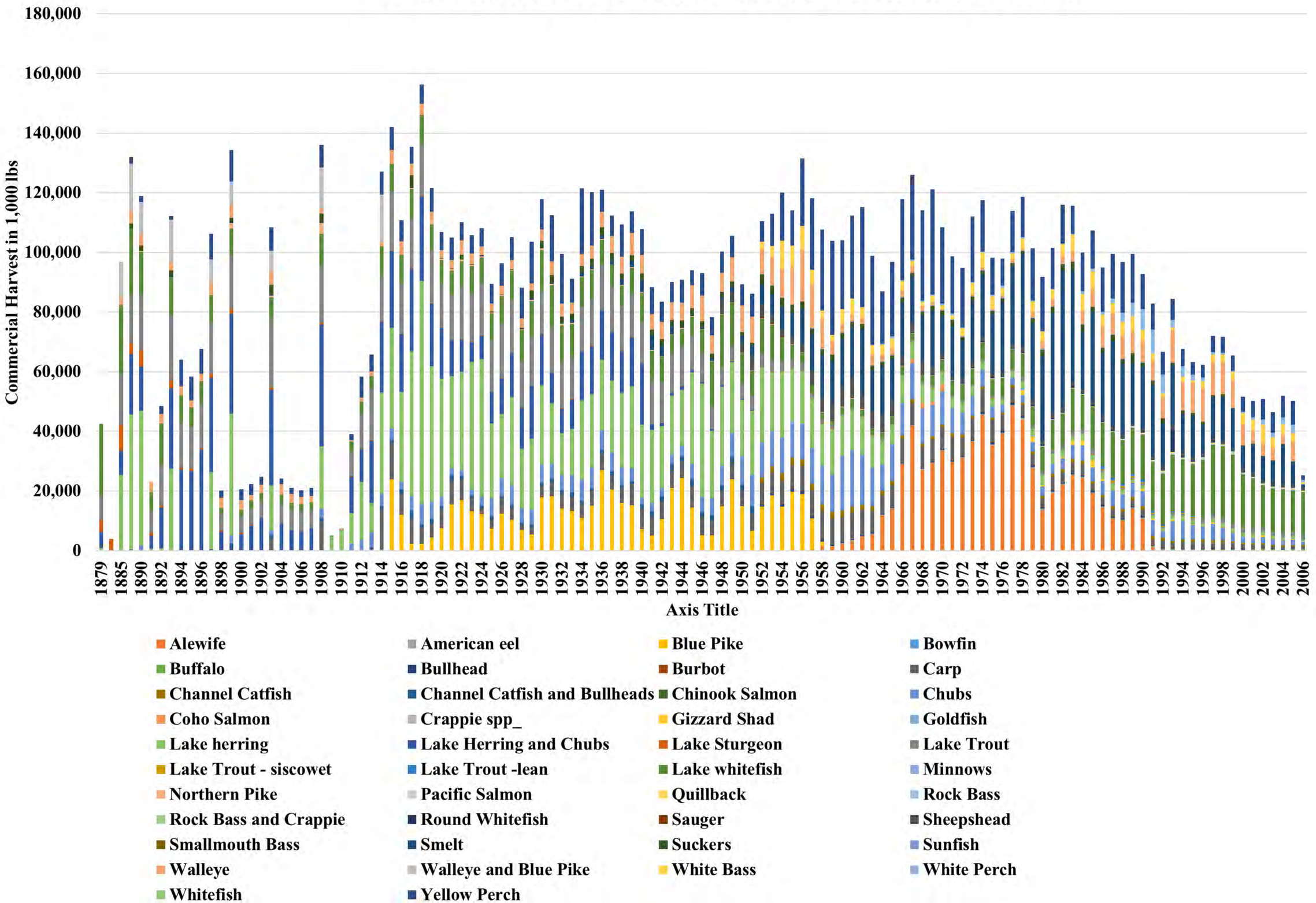
Education

Preservation

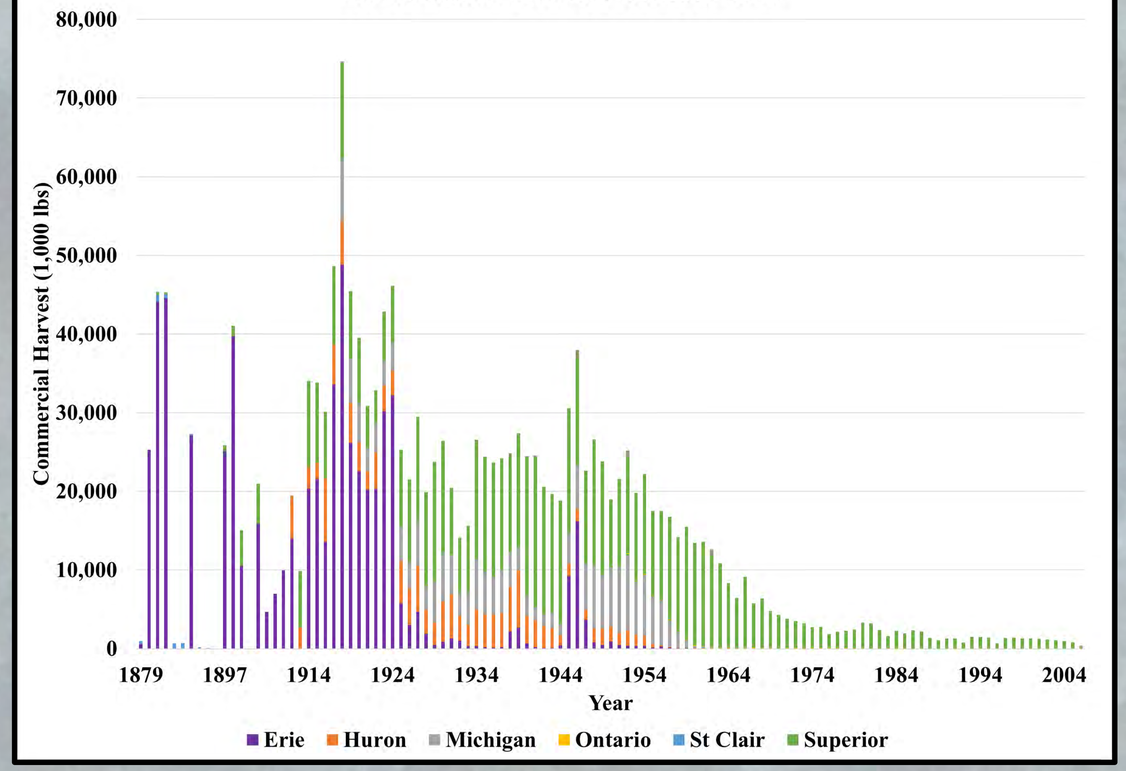
Adikameg (Lake Whitefish, *Coregonus clupeaformis*)

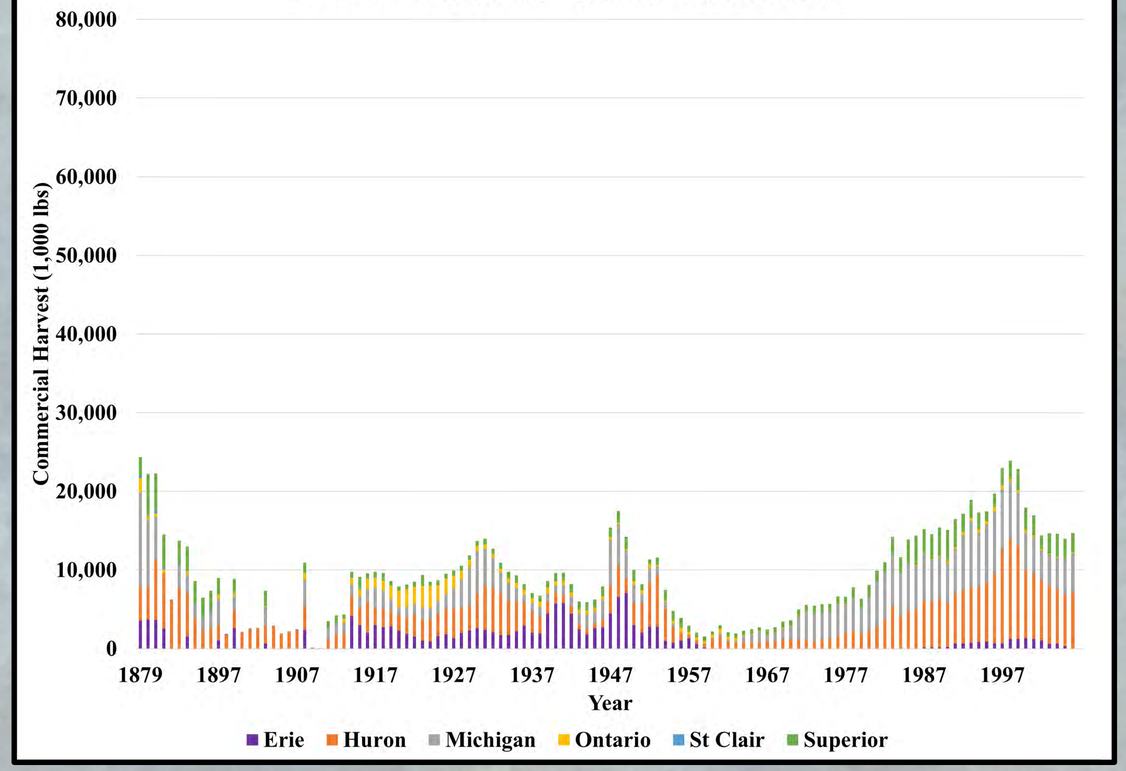
LTBB Fisheries Enhancement Facility

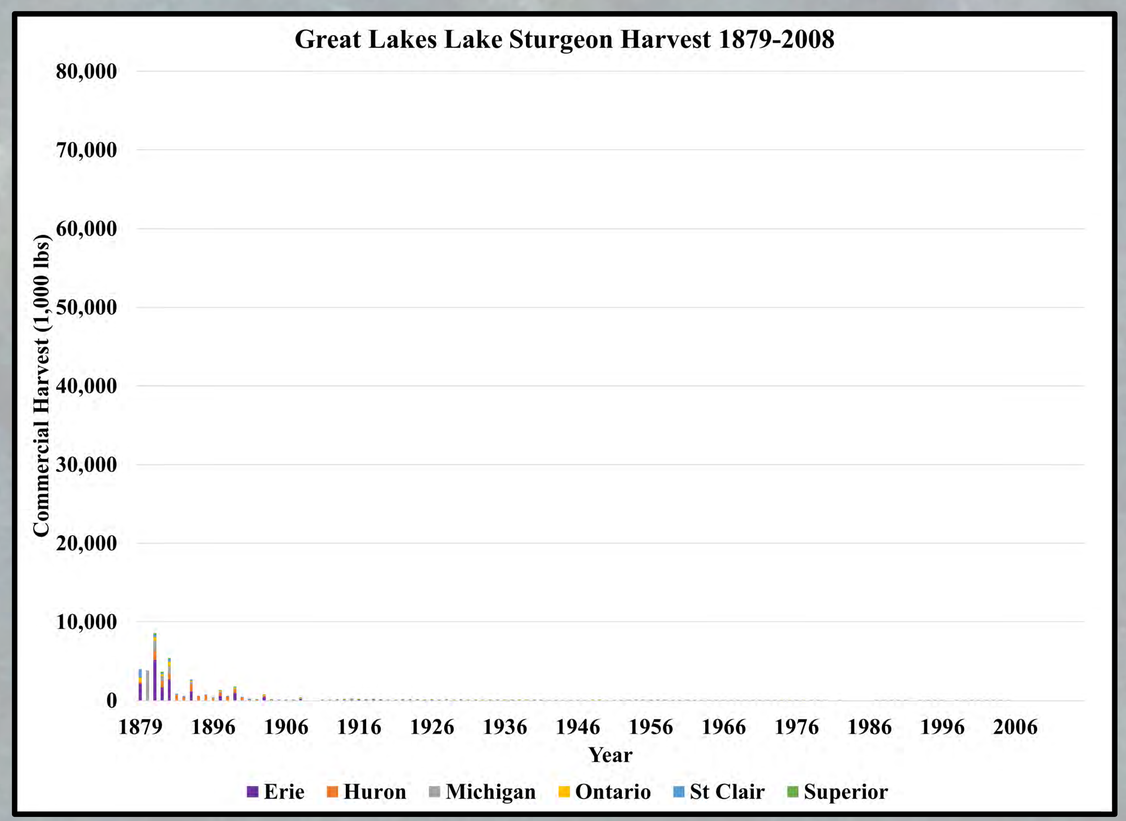
Great Lake Commercial Harvest 1879-2006

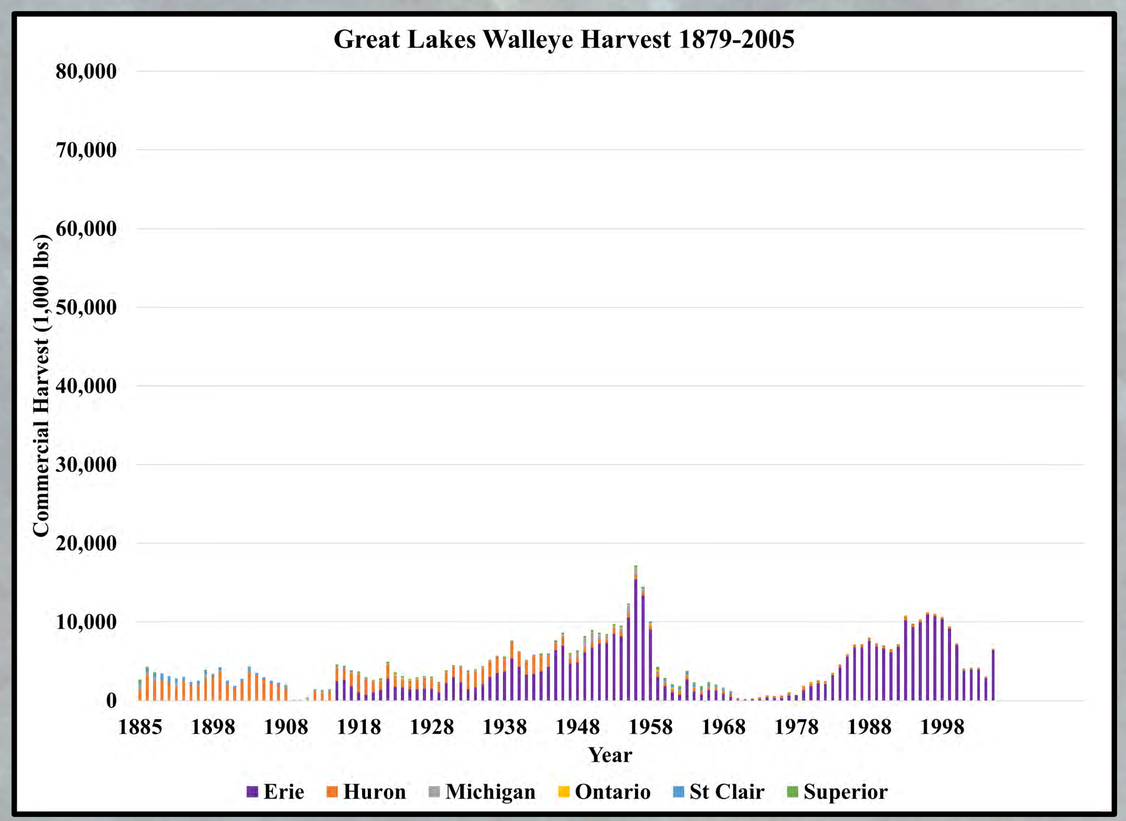


Great Lakes Commercial Harvest 1879-2008

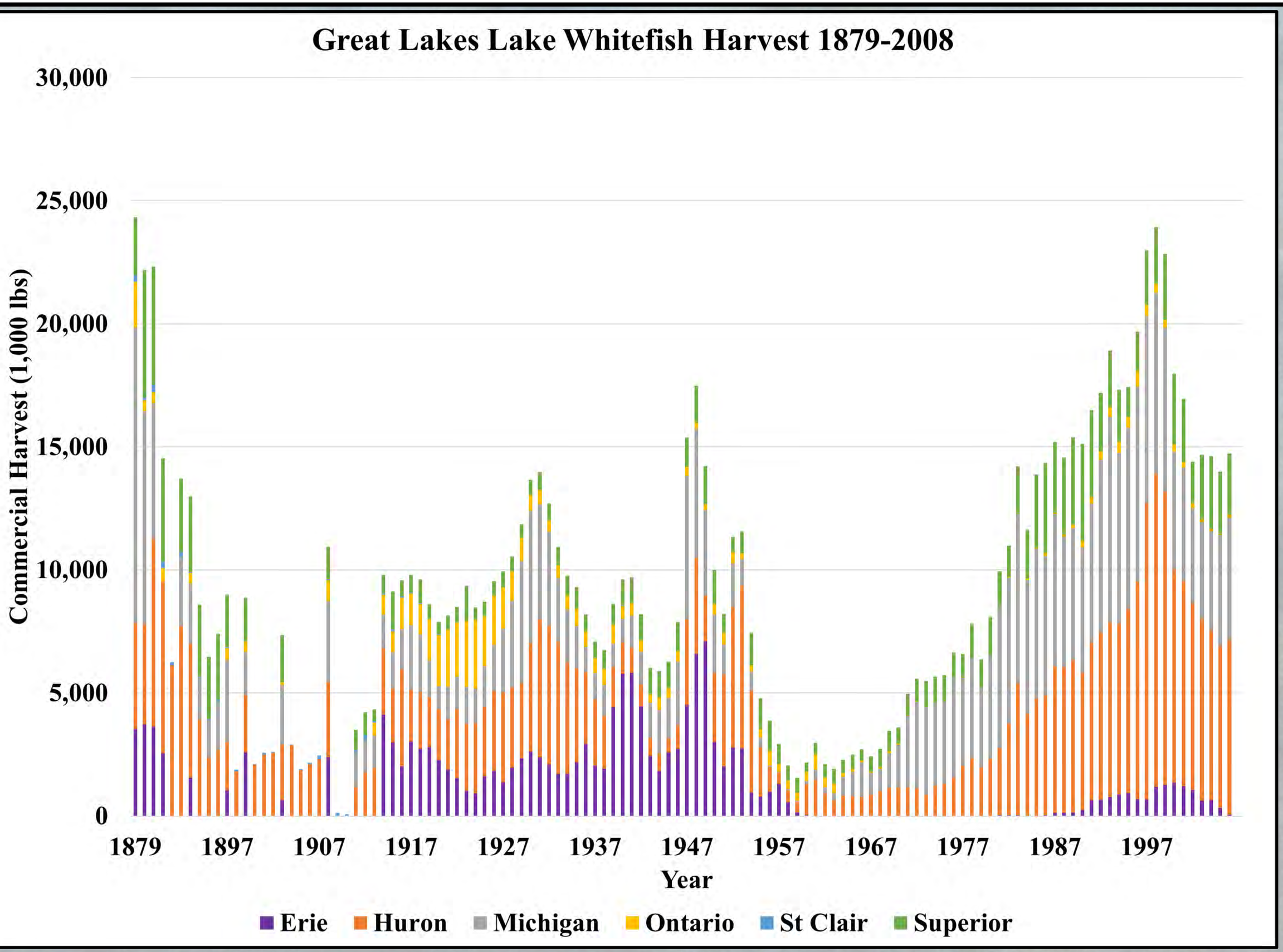








Lake Whitefish Commercial Harvest 1879-2006



MI Lake Whitefish Commercial Harvest 1940-2016

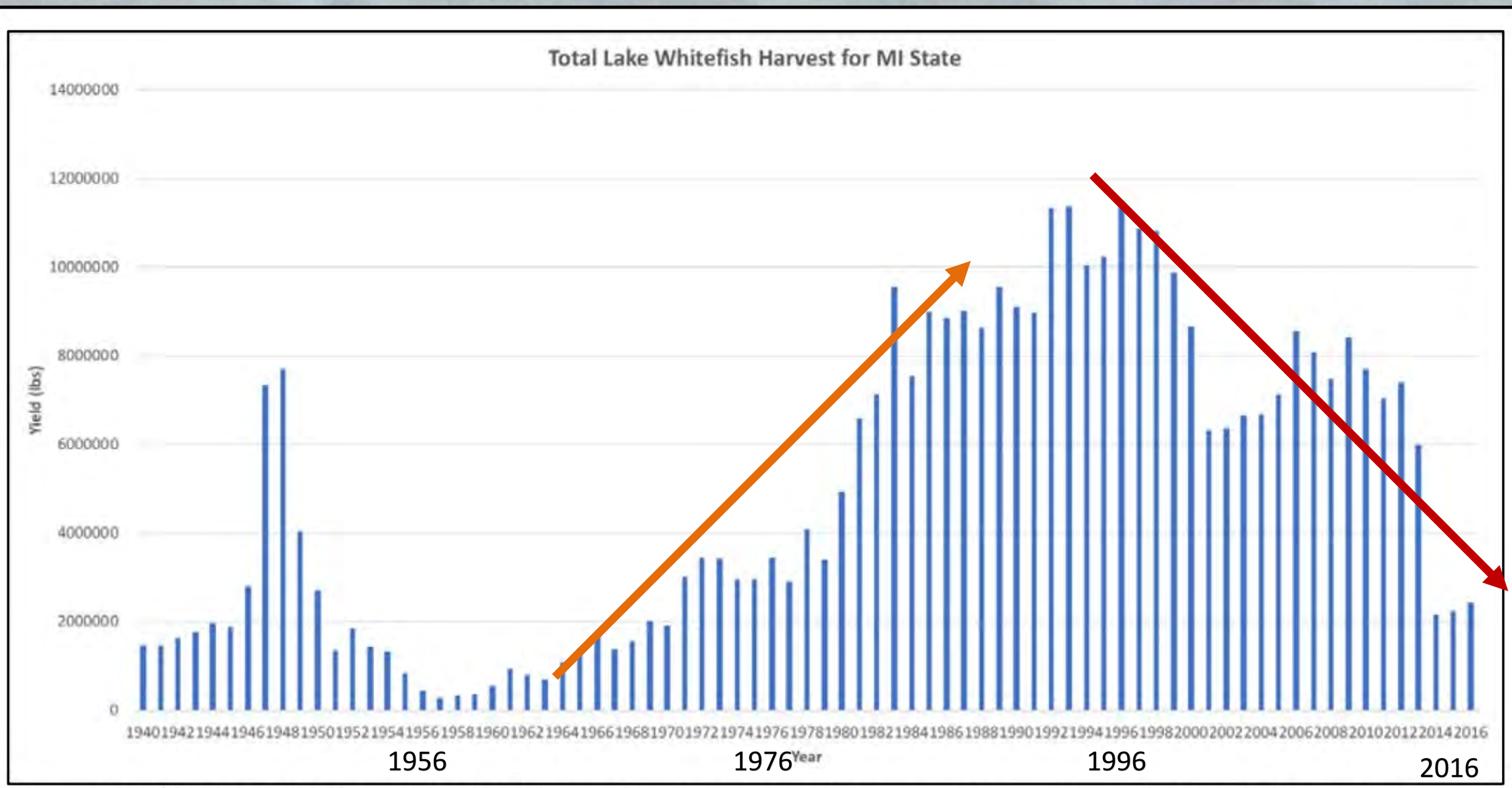
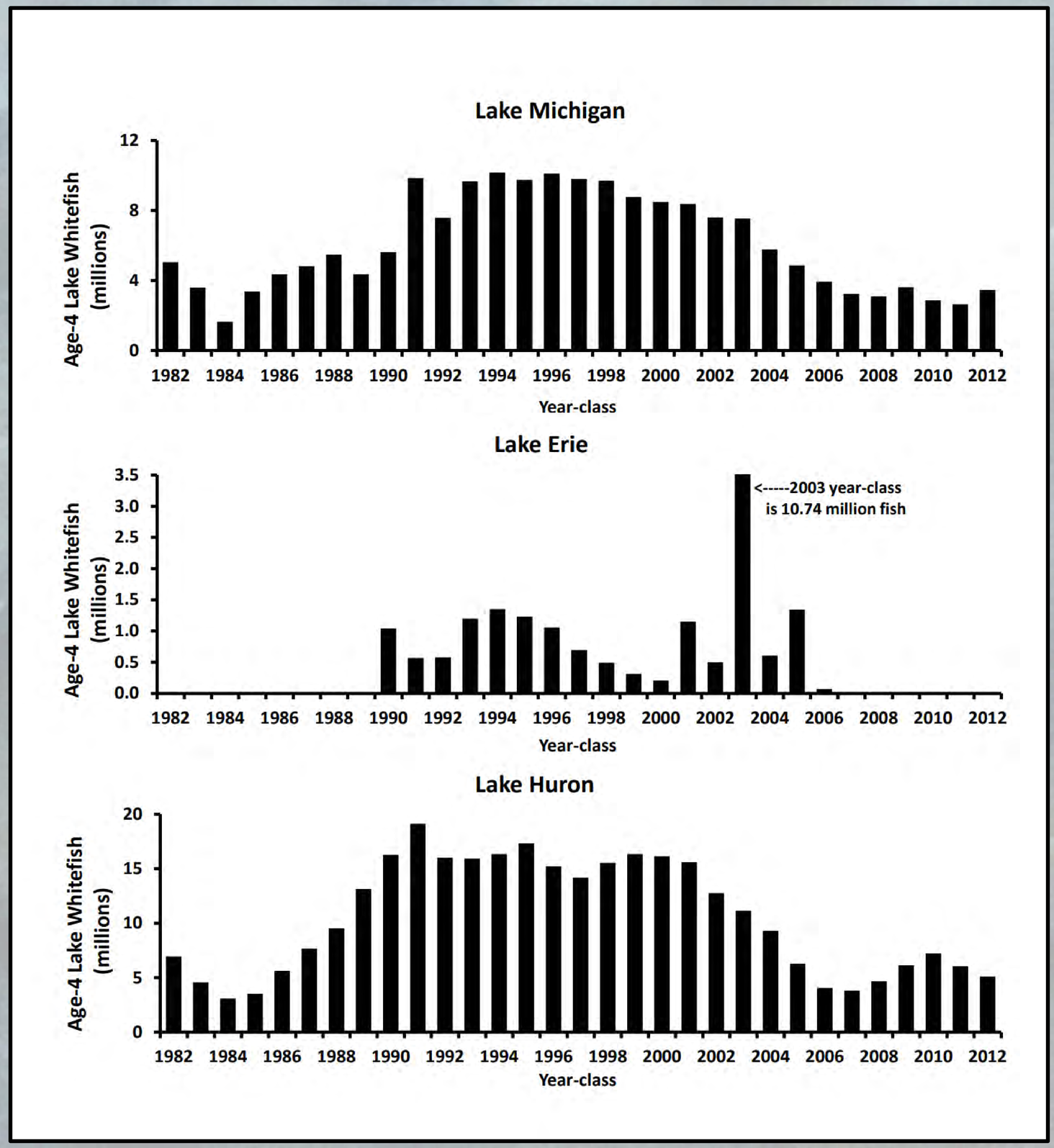


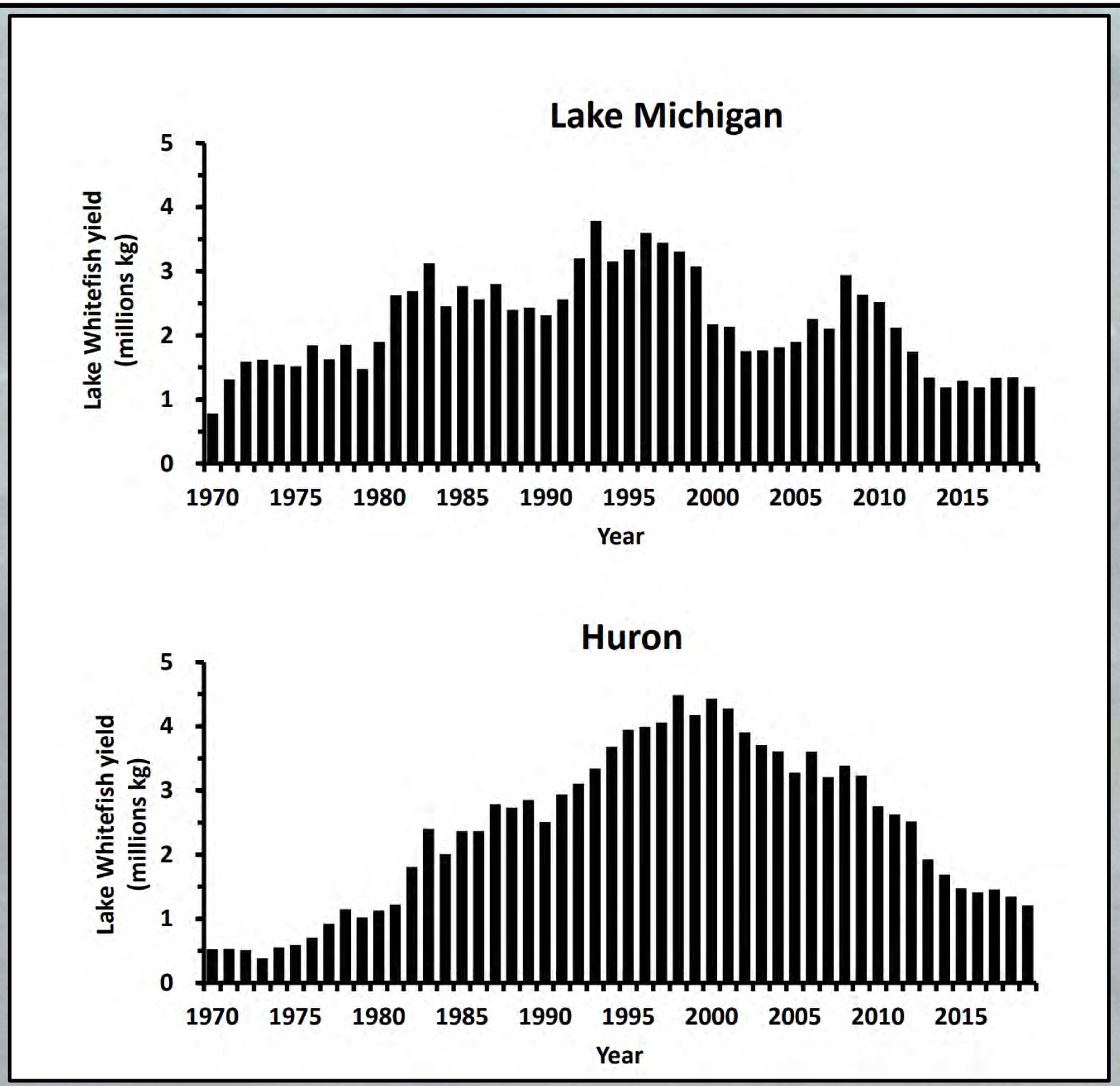
Figure 1. Yields of lake whitefish from the state of Michigan. Data were obtained from Baldwin et al. (2000) and MDNR.

Where are the babies??



Ebener, M.P., Dunlop, E.S., Muir, A.M., 2021. Declining Recruitment of Lake Whitefish to Fisheries in the Laurentian Great Lakes: Management Considerations and Research Priorities (Miscellaneous Publication No. 2021– 01). Great Lakes Fishery Commission, Ann Arbor, Michigan.

Whitefish Production



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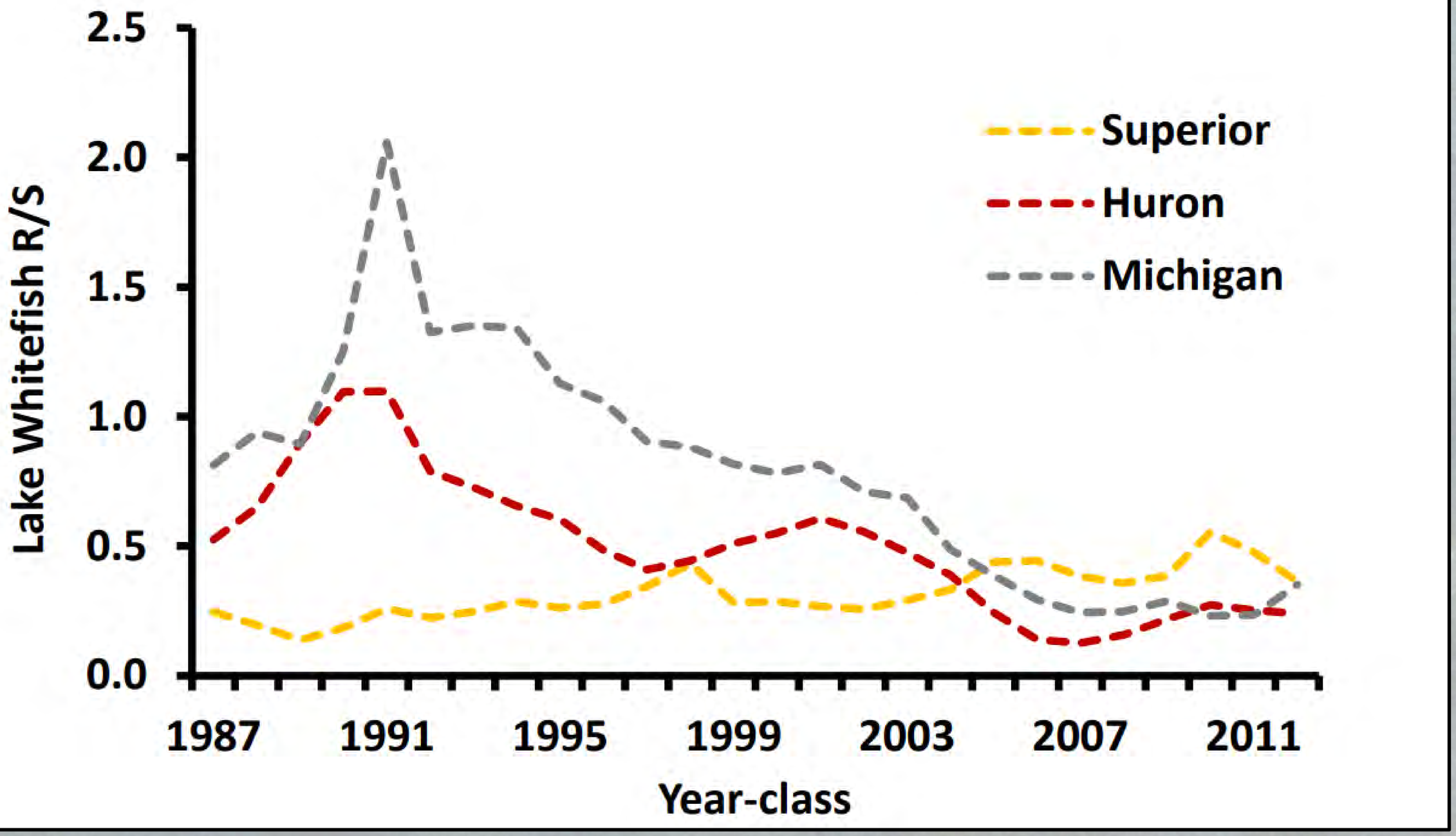
Where are the babies??

Fig. 19. The number of age-4 Lake Whitefish recruits (R) produced per kg of spawners (S) for the 1987 to 2012 year-classes in Lakes Superior, Huron, and Michigan based upon statistical catch-at-age stock assessments (see Lenart and Caroffino 2017).



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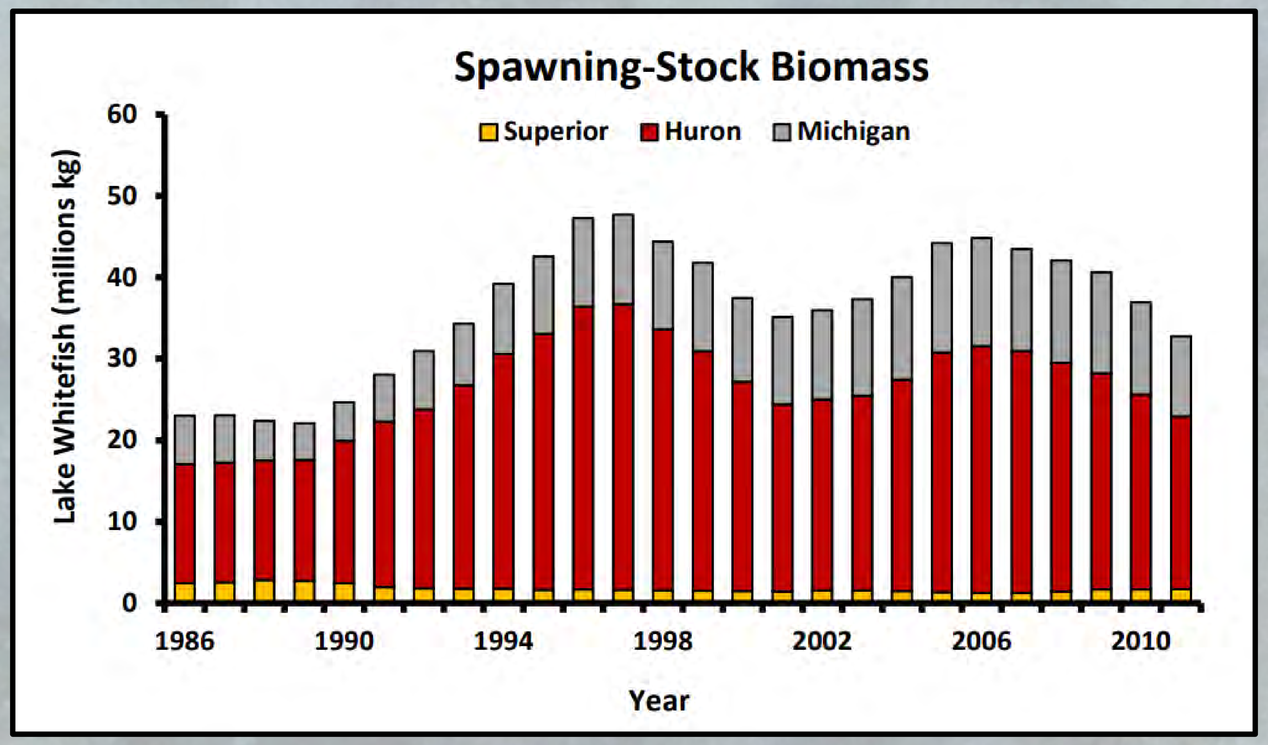
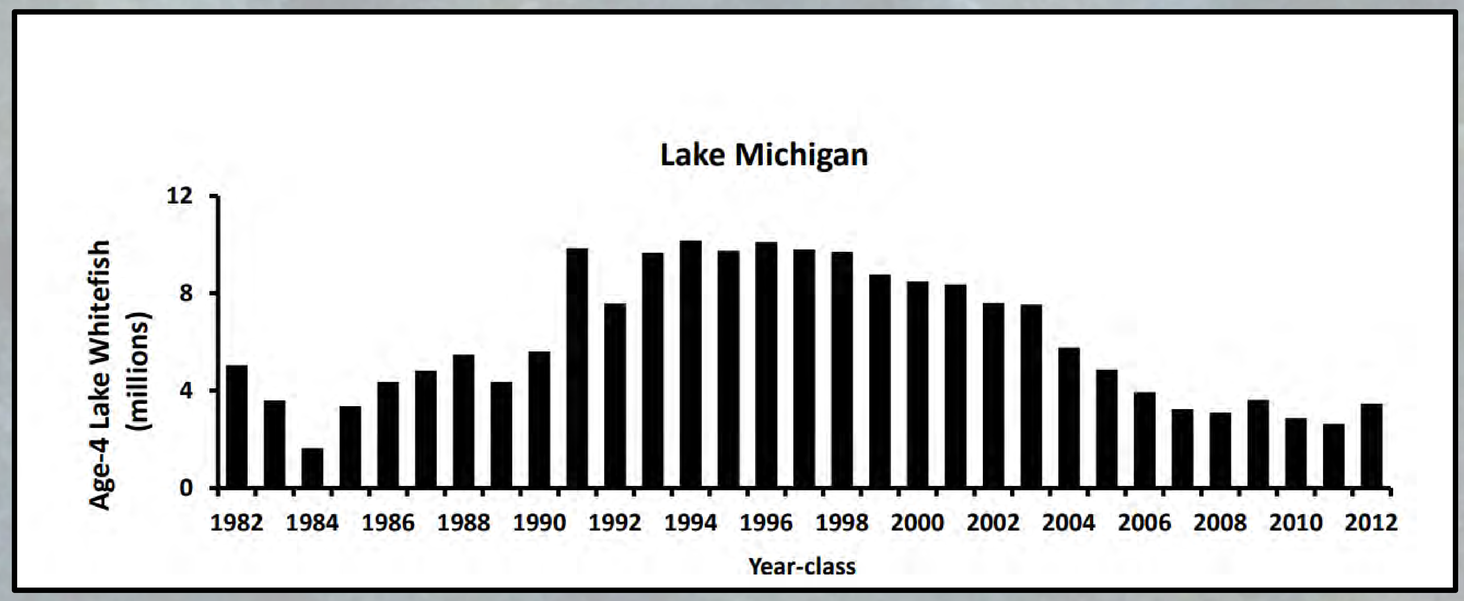
Lake Whitefish Situation

Fairly Large Population persisting



Limited Recruitment



Research Project Breakdown

Why is this happening?

Possible Solutions?

What can buy us more time?

Invasive Species

Lateral View

Zebra Mussel

Highly variable dark and light stripes; or solid brown or yellow

Up to nearly 2" long but most are less than 1"

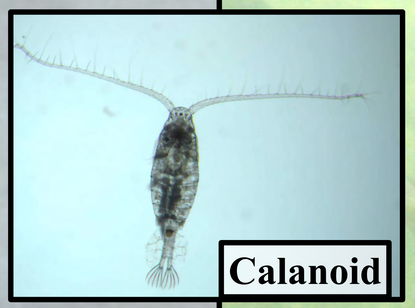
Lateral View

Quagga Mussel

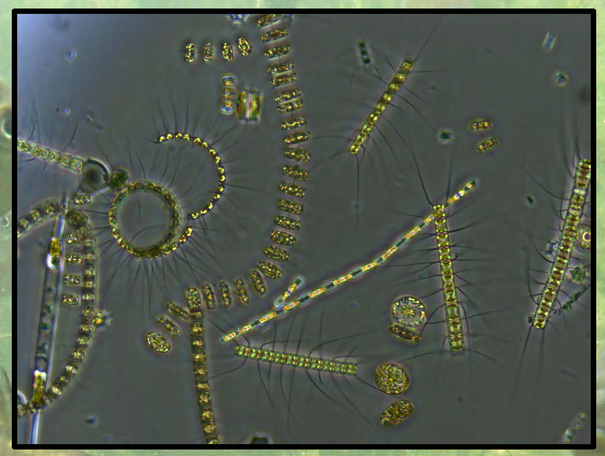
Photos: John Karl

System Nutrients

Good



Calanoid



Cyclopoid

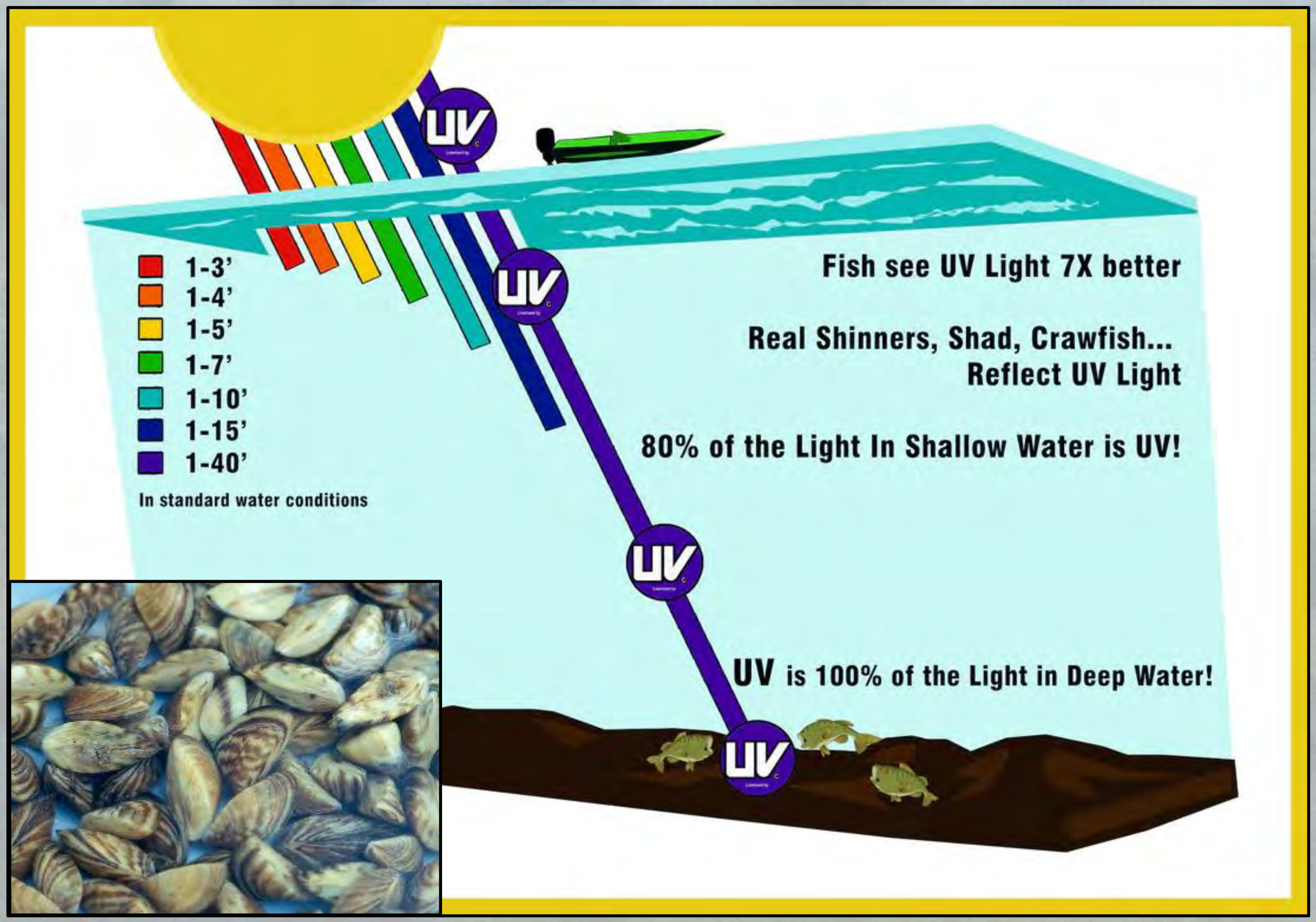
Daphnia

Botsmina

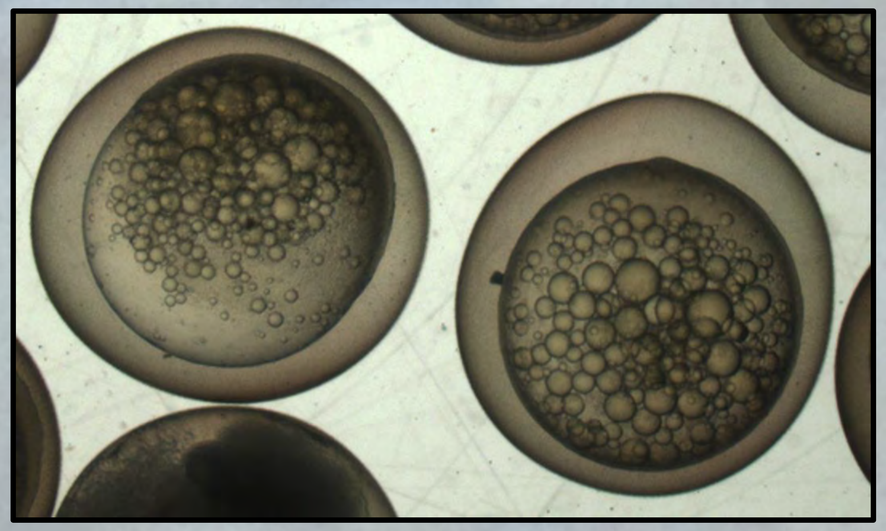
Diporeia

System Nutrients

Why: Ultraviolet Radiation Effects



Why: Ultraviolet Radiation Effects



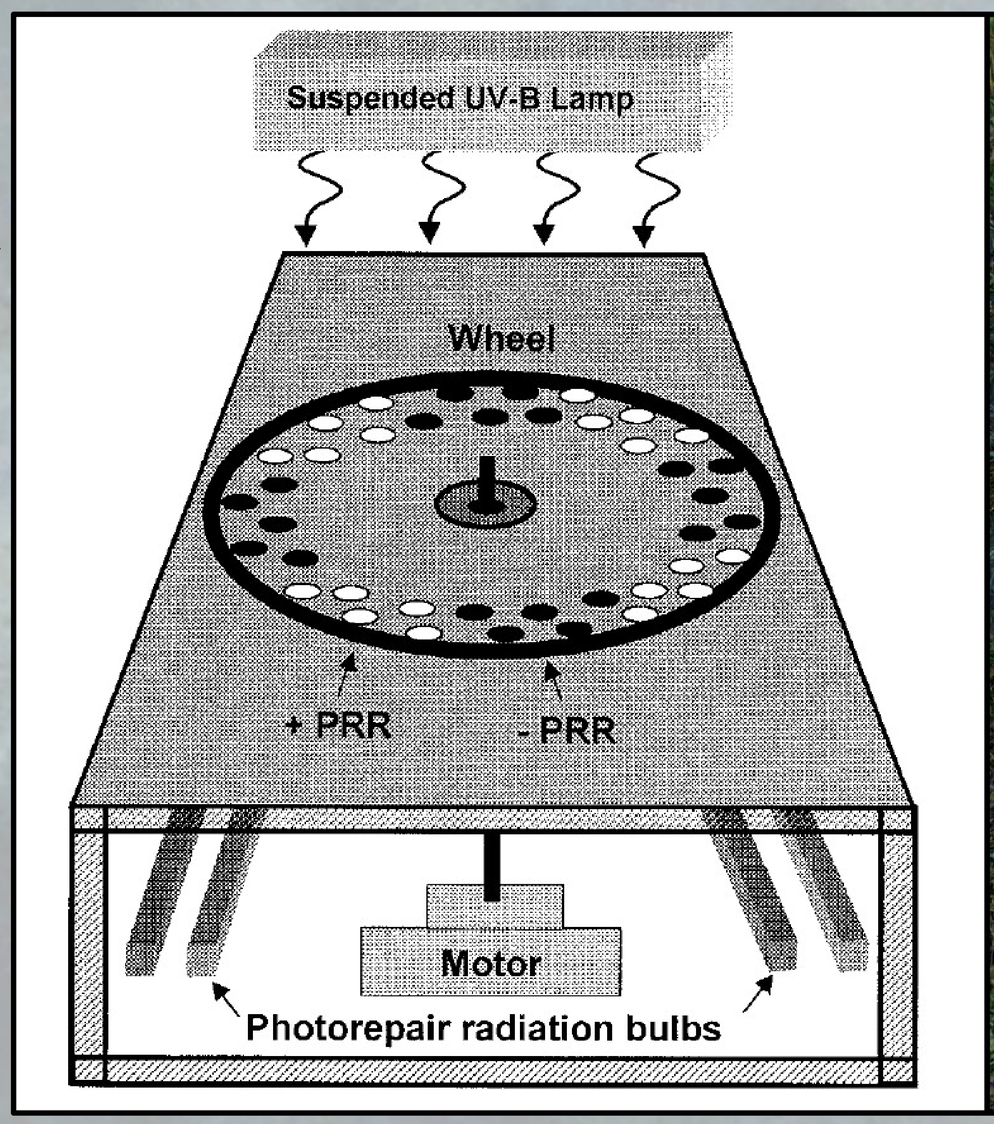
MIAMI UNIVERSITY

OXFORD, OH • EST. 1809

PhD Student Nikki Berry

USGS

science for a changing world



Why: Lake Whitefish Fertility

NORTHERN MICHIGAN UNIVERSITY

MICHIGAN STATE UNIVERSITY

Sault Ste. Marie Tribe of Chippewa Indians

BAY MILLS INDIAN COMMUNITY GNOOZHEKAANING

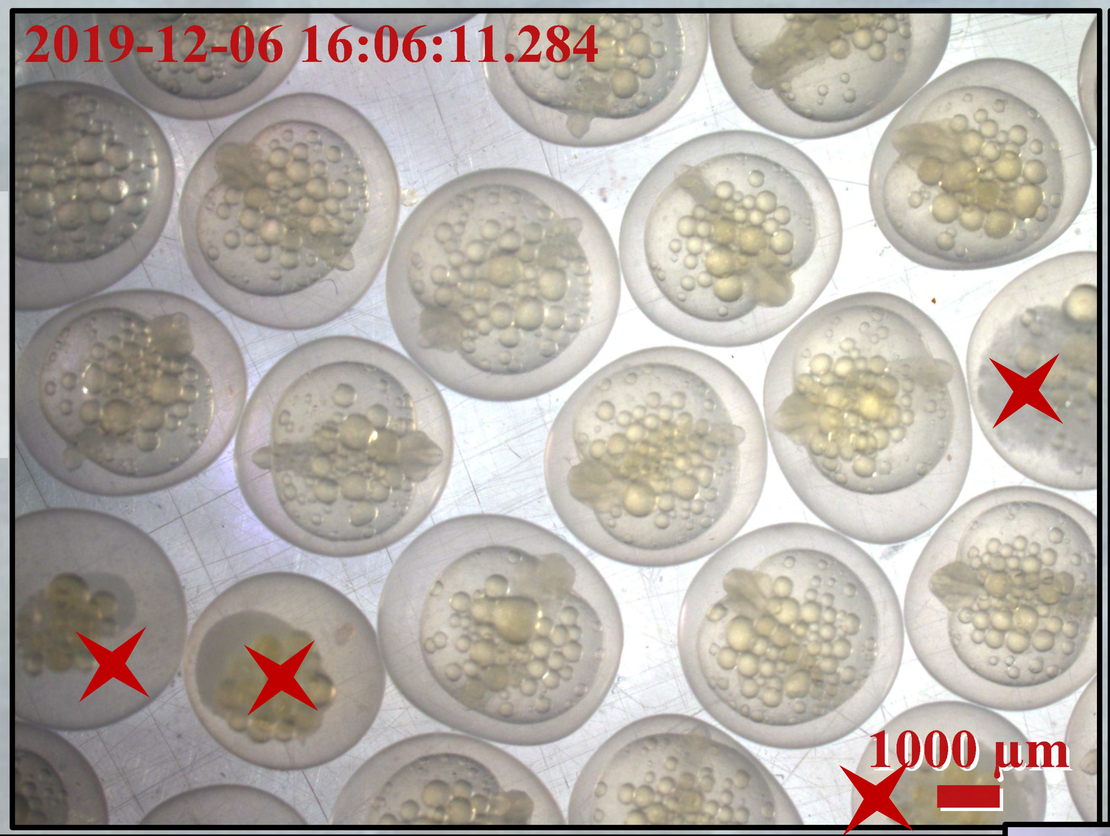
WISCONSIN DEPT. OF NATURAL RESOURCES

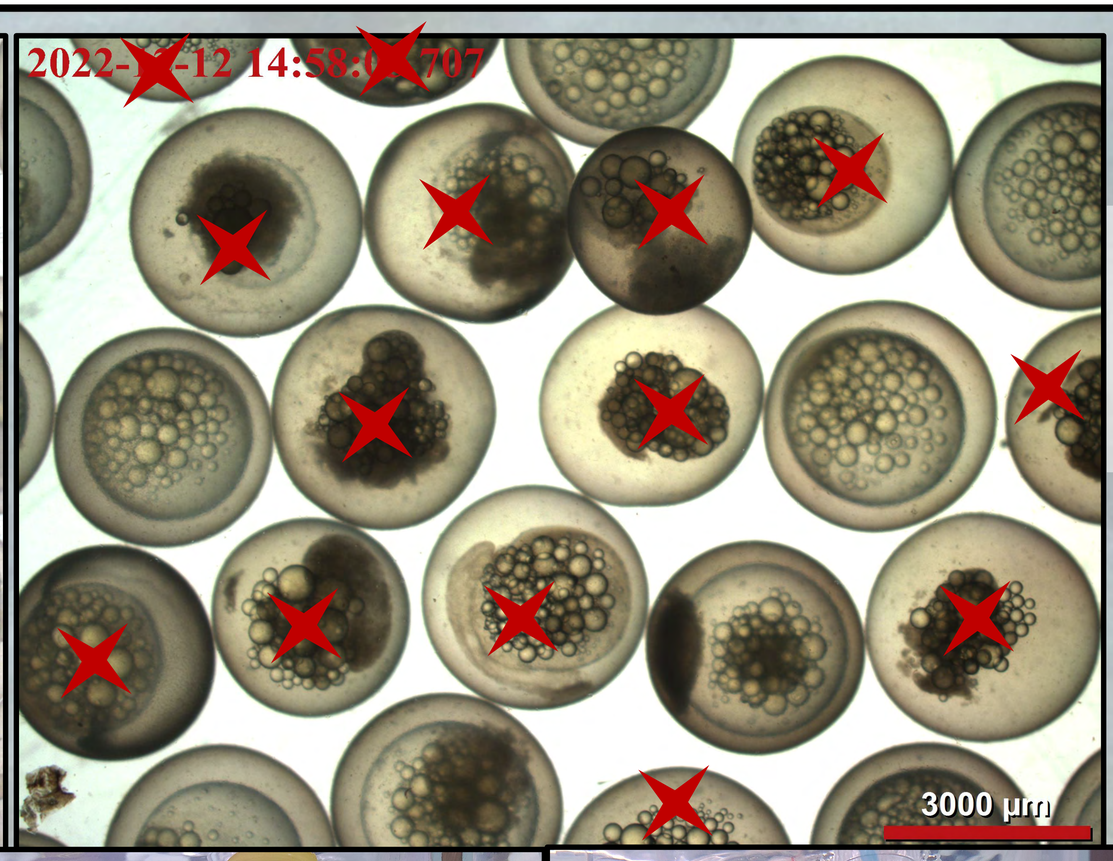
Graduate Student Mike Diefenbach

Funded through the Great Lakes RESTORATION Initiative

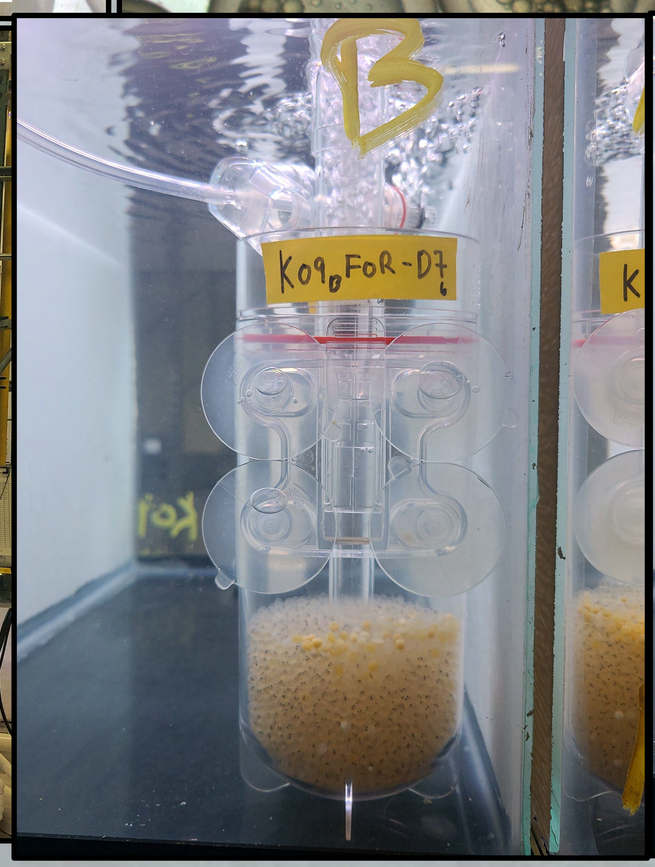
Why: Lake Whitefish Fertility

4 Bad,
18 good
81.8%
good





14 Bad,
8 good
36.4%
good



Why: Lake Whitefish Predation

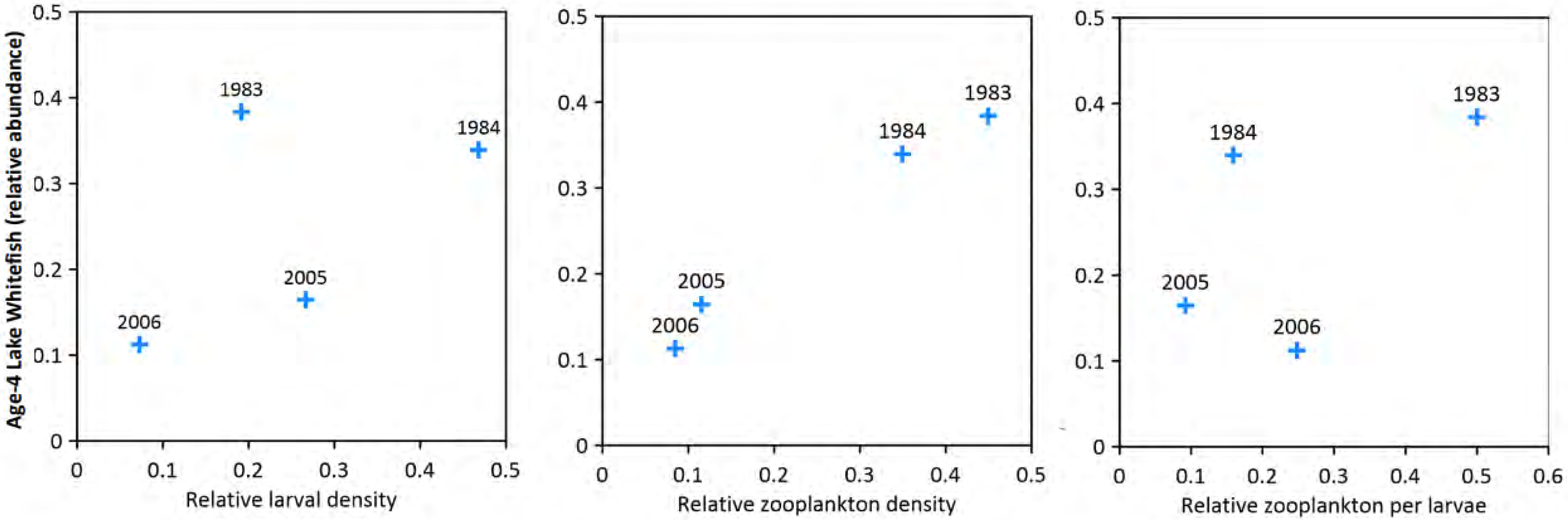
PhD Student Kelly Hoyer

Central Michigan University

Great Lakes Fishery Trust

Where are the babies??

Fig. 21. Relative abundance of four year-classes of Lake Whitefish at age 4 in relation to relative larval density, zooplankton density, and zooplankton per larvae. Lake Whitefish numbers at age 4 were estimated from statistical catch-at-age stock assessments (Lenart and Caroffino 2017), and relative rankings are the value/sum of all values. All data are for the 1983, 1984, 2005, and 2006 year-classes produced at the Elk Rapids spawning shoal in Grand Traverse Bay, Lake Michigan, as reported by Freeberg et al. (1990) and Claramunt et al. (2010b).



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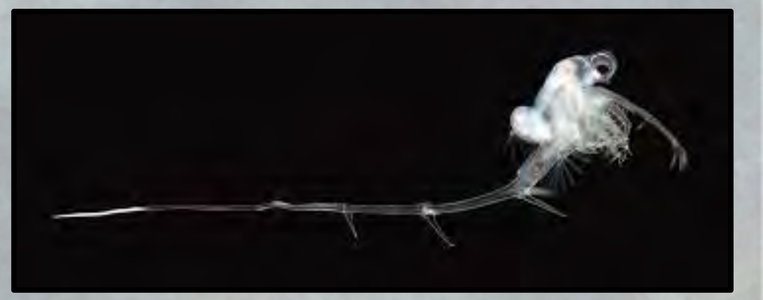
Why: Lake Whitefish Feeding

Central Michigan University

Great Lakes Fishery Trust



BAY MILLS INDIAN COMMUNITY
GNOOZHEKAANING

LAKE SUPERIOR STATE UNIVERSITY

Why: Juvenile LAW Movement/Predation

InnovaSea V5D-2x-180kHz acoustic tags

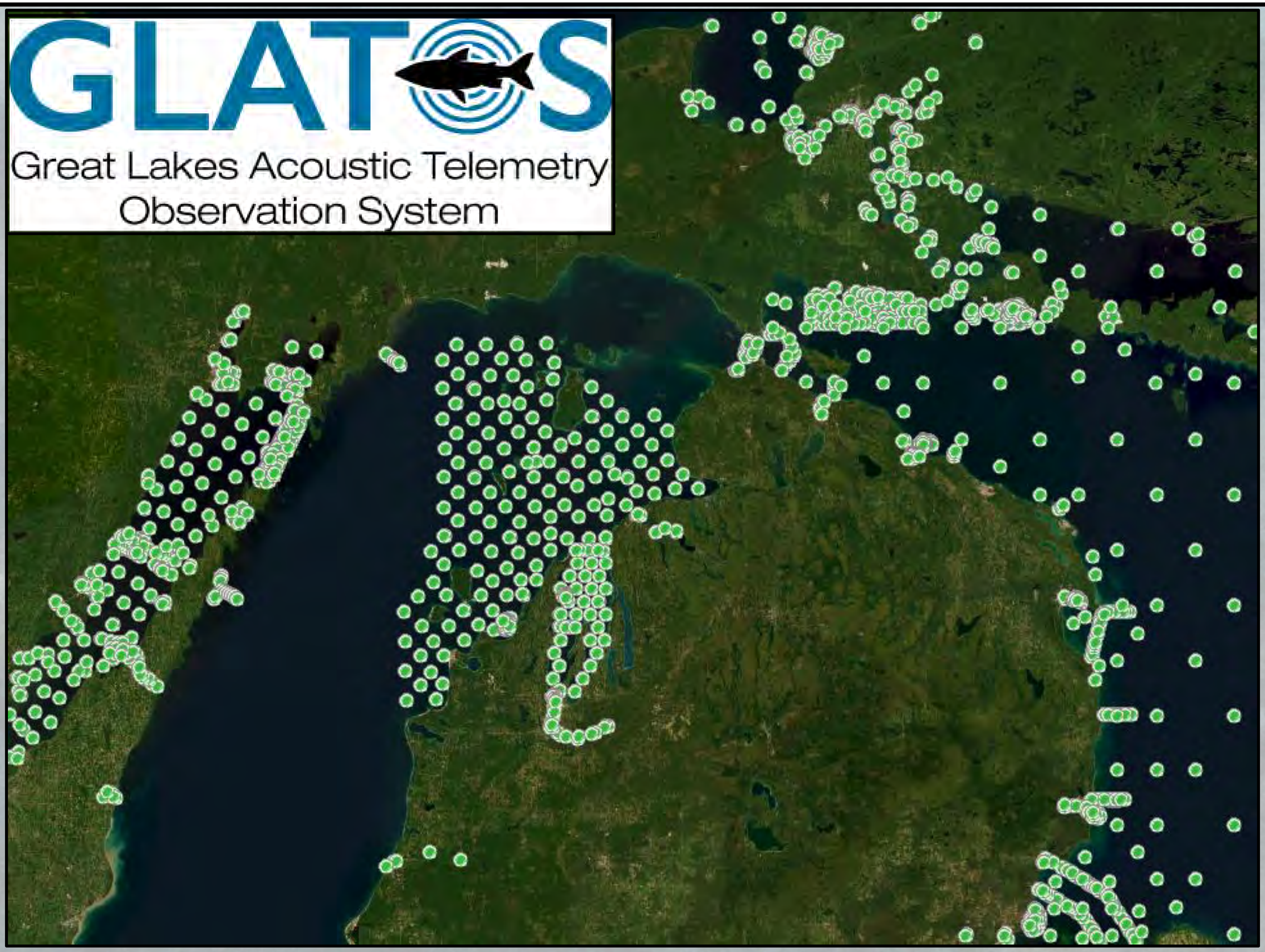
GLATOS

Great Lakes Acoustic Telemetry Observation System

Why: Juvenile LAW Movement/Predation

GLATOS

Great Lakes Acoustic Telemetry Observation System

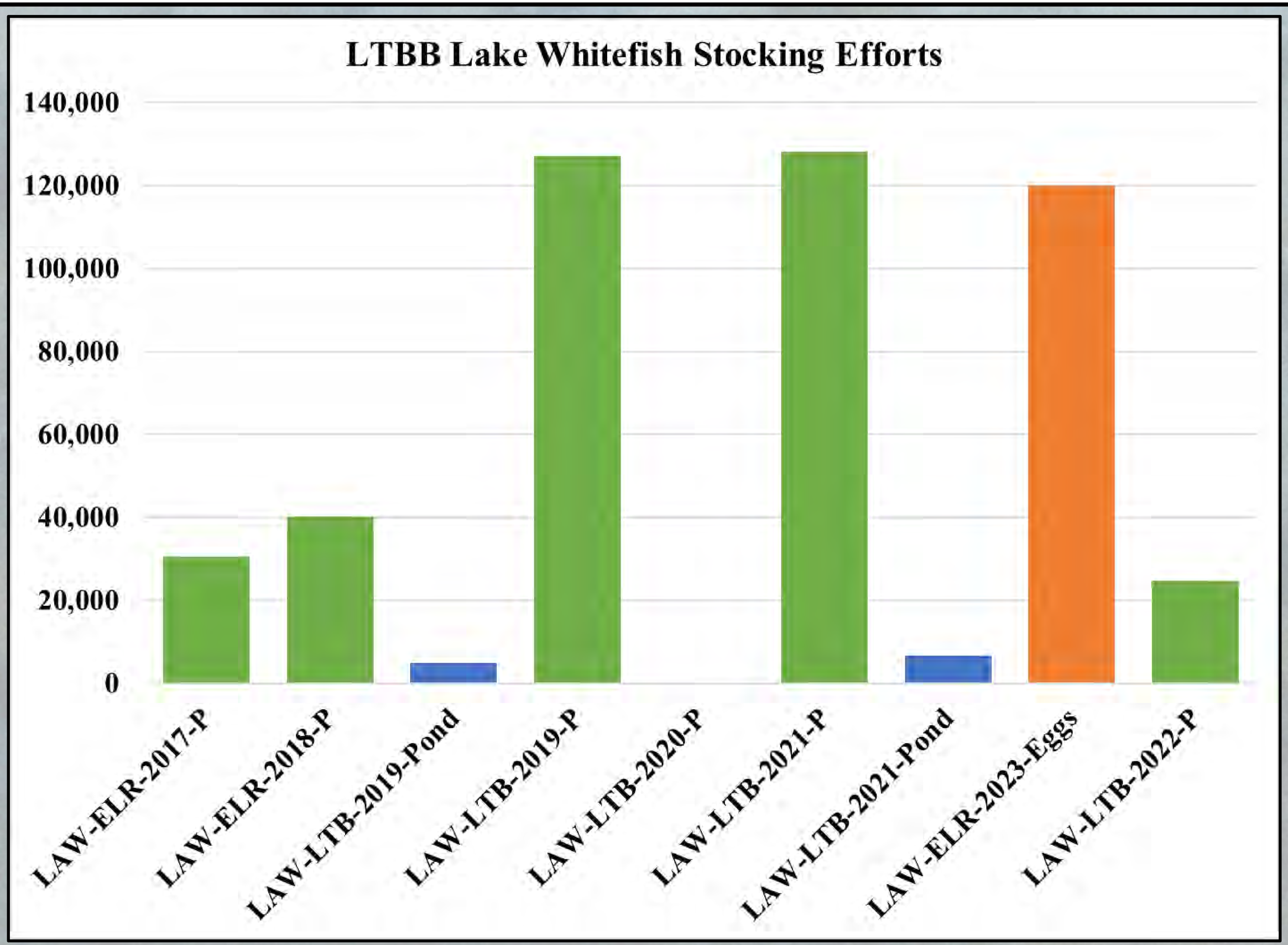


Life Raft: Stocking Options - Intensive Rearing

Life Raft: Stocking Options – Intensive Rearing

Year Class	Mort/Remove	Stocked	Total	Mort/Remove %
2017	5,203	30,476	35,679	14.58%
2018	25,258	40,112	65,370	38.64%
2019	43,649	124,430	168,079	25.97%
2020	8,408	134,583	142,991	5.88%
2021	30,301	54,546	84,847	35.71%
2022	11,068	24,546	35,614	31.08%
	123,887	408,693	532,580	23.26%

Life Raft: Stocking Options – Intensive Rearing



Life Raft: Stocking Options - Ponds

Partnership Sault Tribe of Chippewa Indians

Life Raft: Stocking Options – Ponds (STCI)

2020 Stockout: 2,673 @ 2.90g 86mm
2020 Stockout: 4,917 @ 1.20g 73mm
2021 Stockout: 7,747 @ #.##g ###mm
2022 Stockout: 2,457 @ 34.97g 178mm
2023 Stockout: #,### @ #.##g ###mm

Life Raft: Stocking - Pond Rearing (LTBB)

Year 1 – Gladstone

4 Acre Pond; Avg Depth 6.6ft; Max depth 12.2ft

Ponds east side is the border with Lake Michigan

****Partnership with the <u>Bay De Noc Great Lakes Sports Fishermen</u>****

Life Raft: Stocking - Pond Rearing (LTBB)

Year 1 – Gladstone

- September 13th 2022:
  - ✓ 2,736 whitefish @ 5.41g and 94mm
- September 14th 2022:
  - ✓ 1,361 whitefish @ 7.31g and 103mm

Roughly 13.95% survival
And avg 4.14g of growth over 103 days

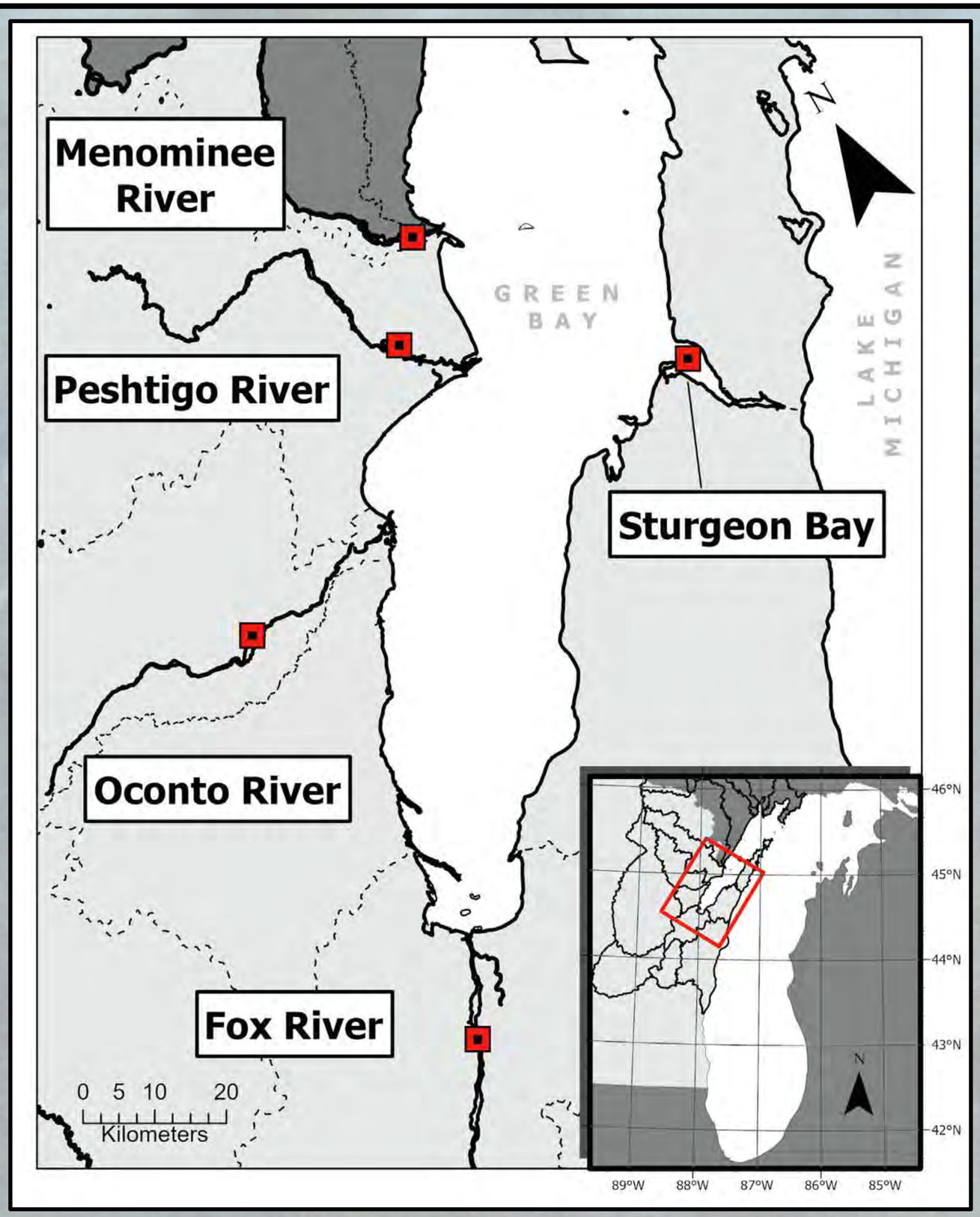
Minimal fertilizing was done
during the rearing cycle

Predation from Mergansers and Cormorants
was High in early September

****Partnership with the <u>Bay De Noc Great Lakes Sports Fishermen</u>****

Abundant Whitefish?

Green Bay, Lake Michigan



Doerr, L.R., Houghton, C.J., Hansen, S.P., Pangle, K.L., Ransom, A.L., Forsythe, P.S., 2021. Can otolith microchemistry identify the natal origin of larval lake whitefish Coregonus clupeaformis in the waters of Green Bay? Journal of Great Lakes Research 47, 1771–1780. https://doi.org/10.1016/j.jglr.2021.08.021

Solutions: River Spawning Populations

Tributary Spawning Whitefish Workgroup

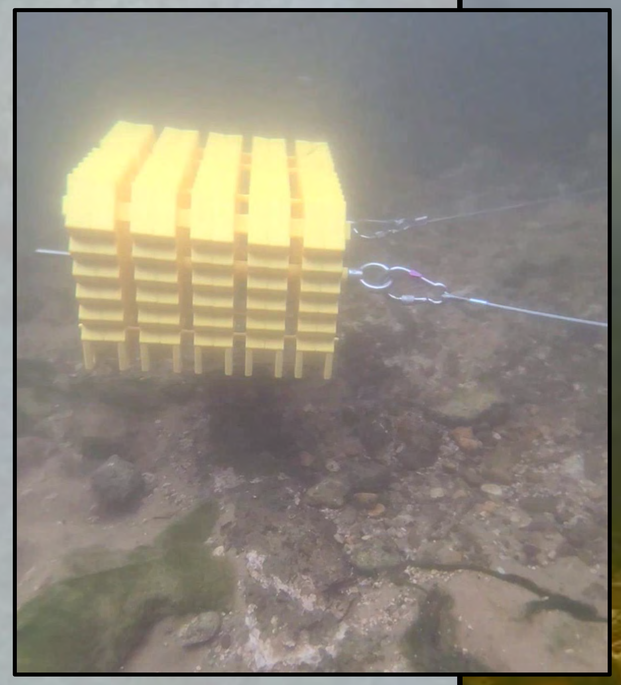
- Established in 2018, with the goal of investigating the feasibility of the establishment of tributary spawning population of Lake Whitefish in Lake Michigan and Lake Huron.

The Nature Conservancy
Protecting nature. Preserving life.™

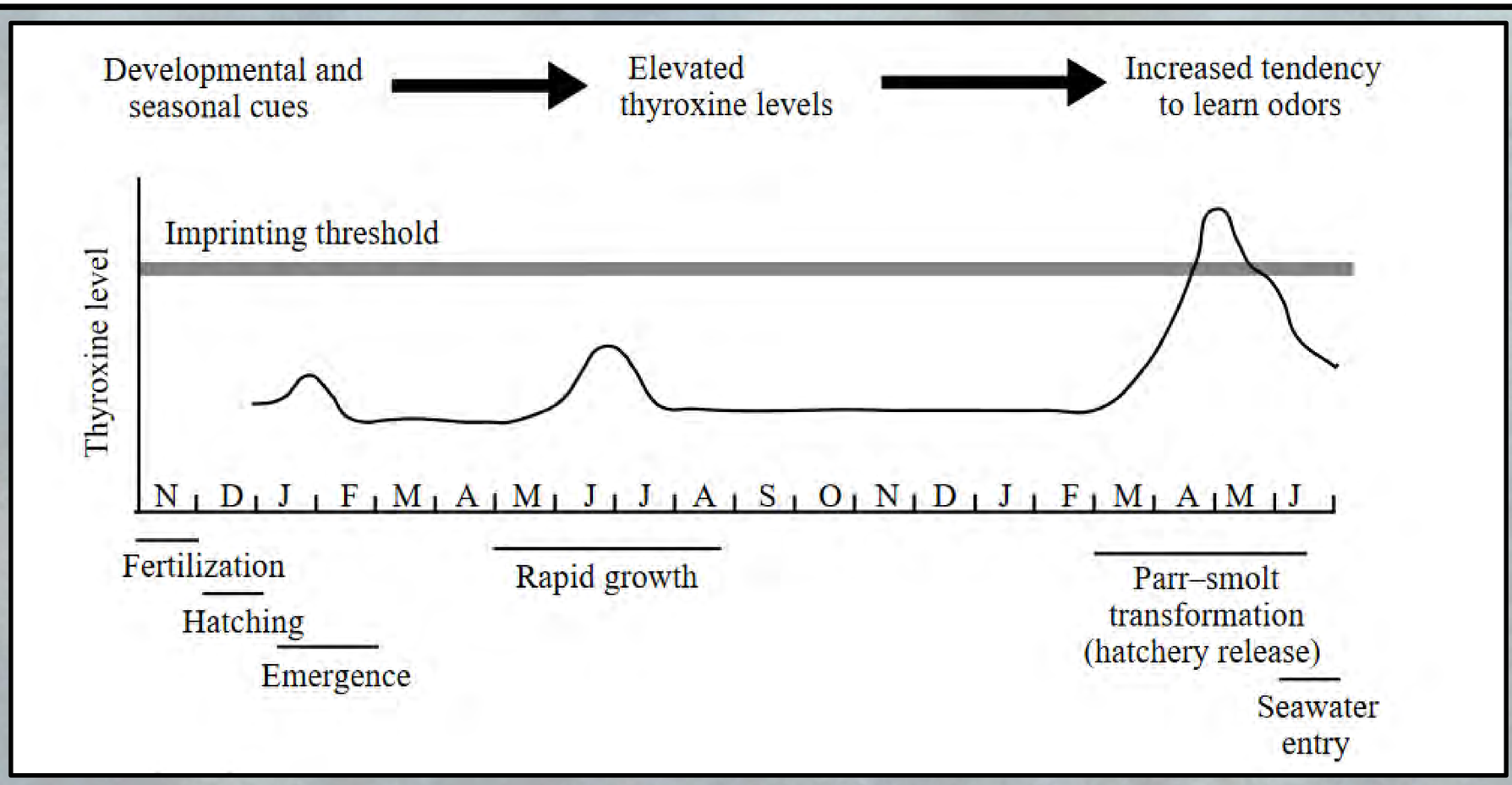
Sault Ste. Marie Tribe of Chippewa Indians

Bay Mills Indian Community — Gnoozhekaaning

Department of Natural Resources — DNR — Michigan ™

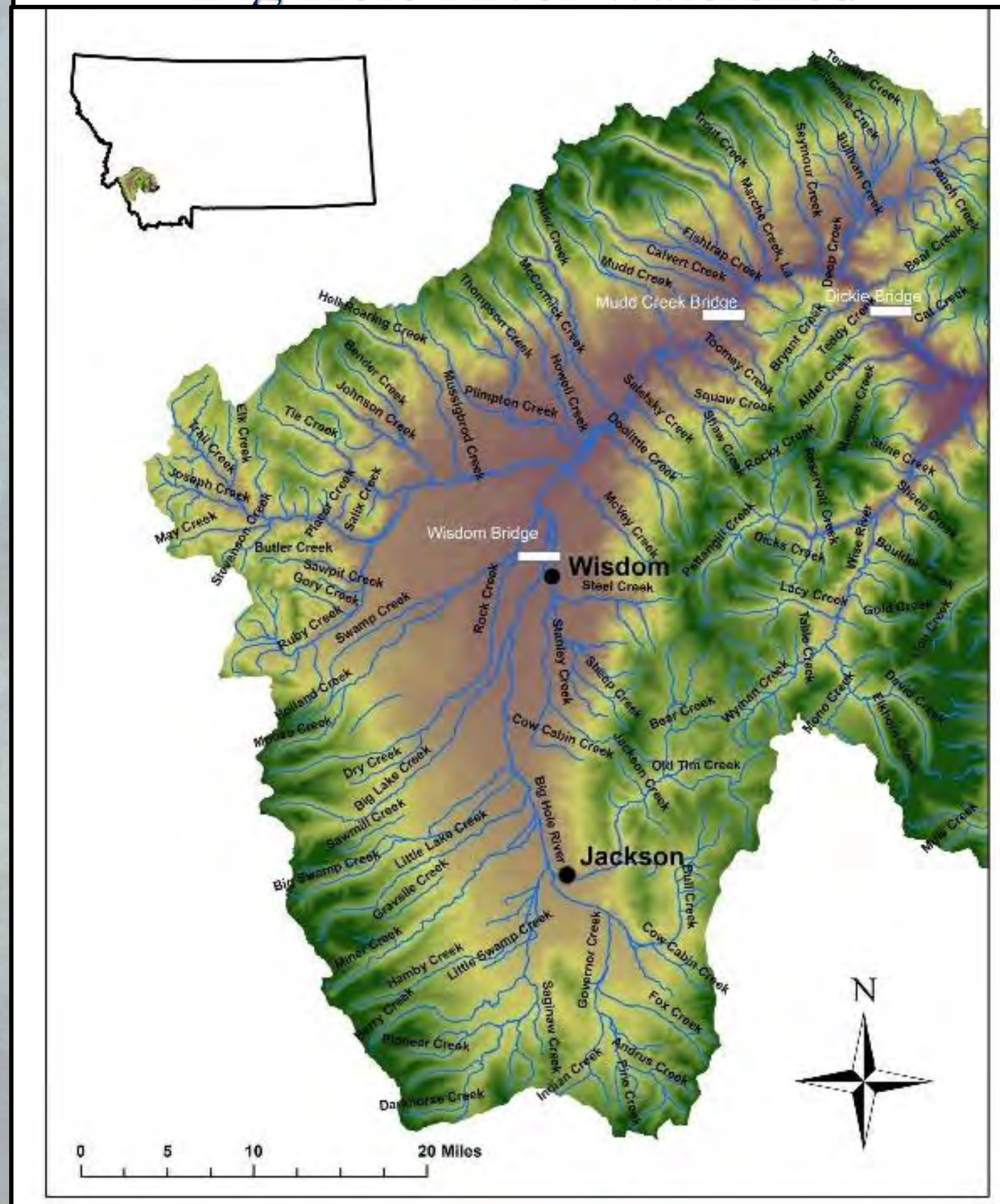


Solutions: River Spawning - Imprinting



Montana Artic Grayling Restoration

Big Hole River Watershed



Incubators on Small Tributaries

Incubators on Small Tributaries

Incubators Near Barriers

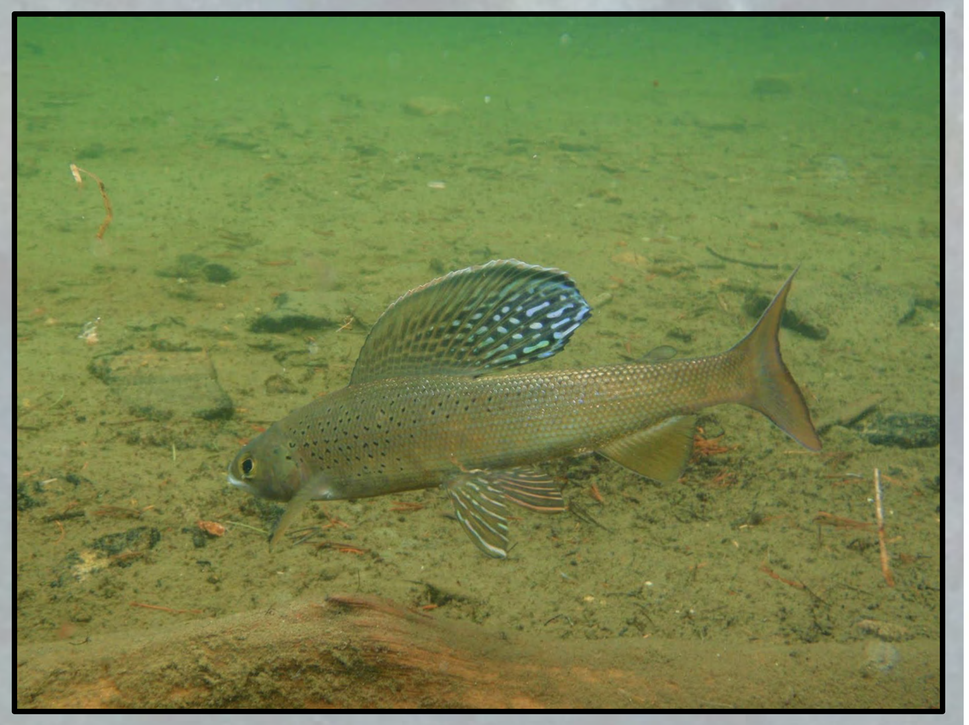
Montana Artic Grayling Restoration - Success

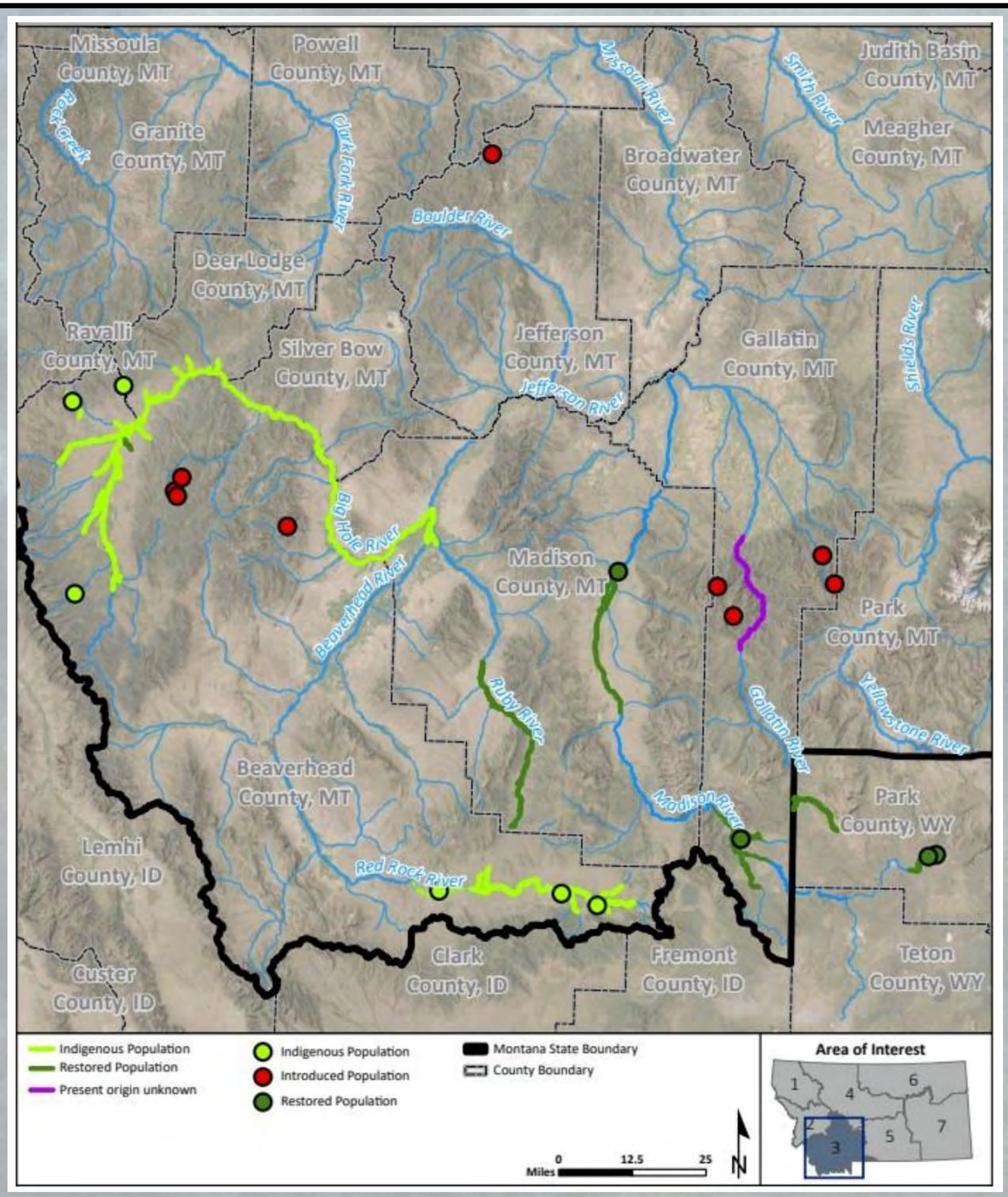
Complete Restoration

- Big Hole River

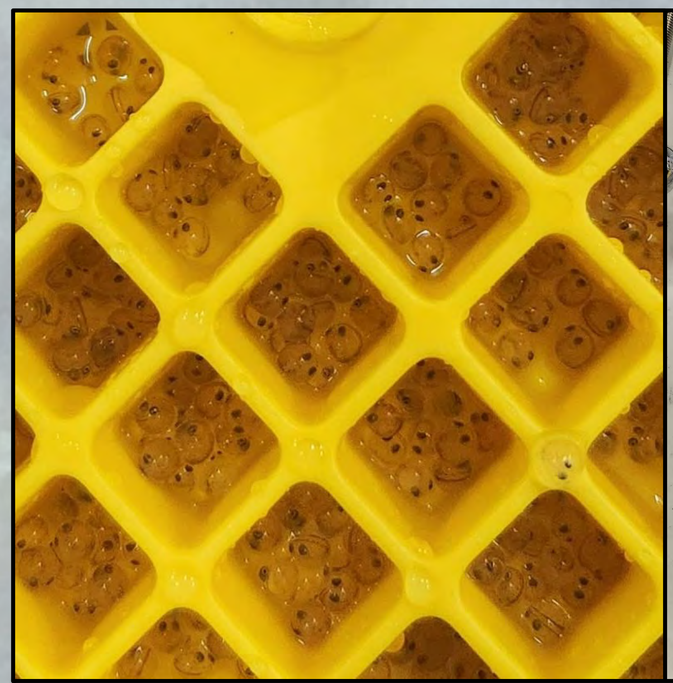
Partial Restoration

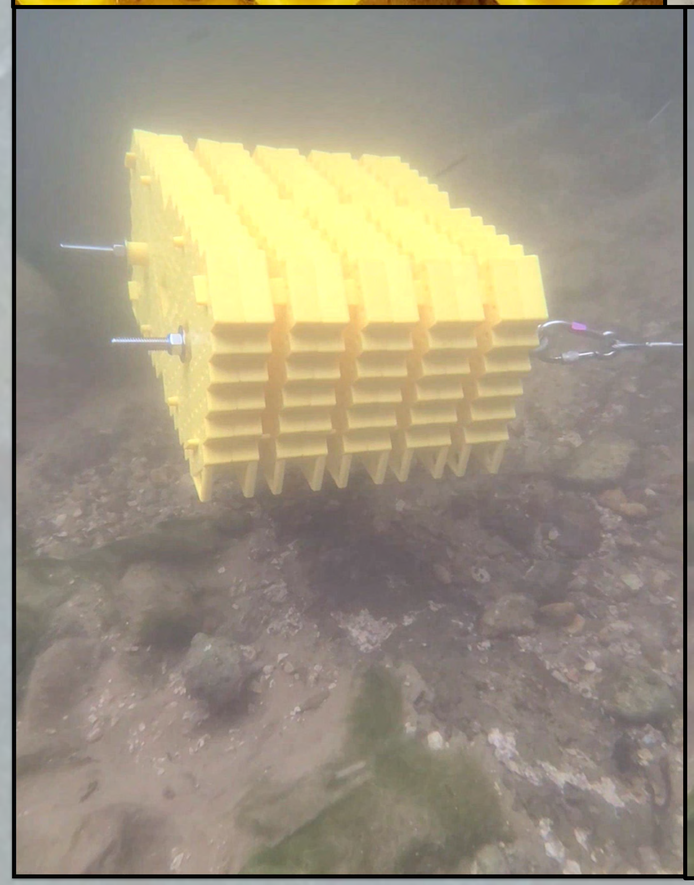
- Ruby River
- Red Rock River
- Madison River





Solutions: Imprinting– Instream Incubation





Solutions: Imprinting– Instream Incubation

Sault Tribe Tributary Spawning Whitefish - Egg Stocking

Carp River (Upper Peninsula)
November 2022 & November 2023

Tributary Spawning Lake Whitefish 2024

Jordan River, Antrim and Charlevoix Counties

Solutions: Imprinting– Instream Incubation

2024-02-05:
Filling Incubators

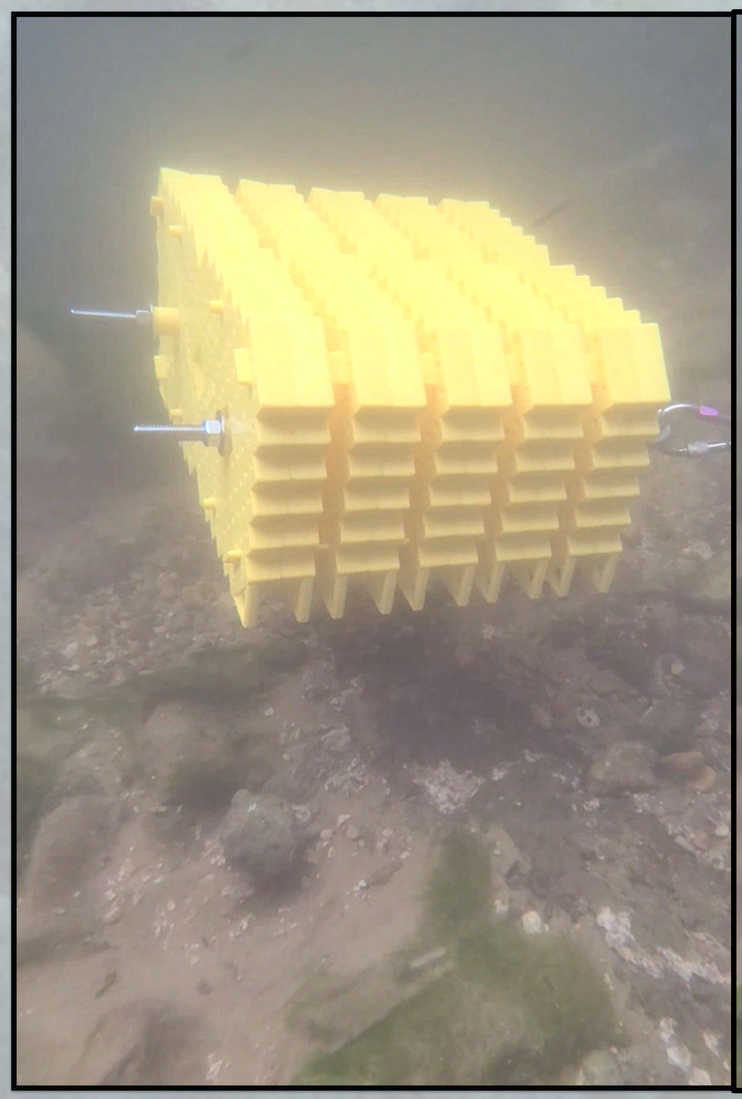
Pack ID	Location	Total Eggs	Plate?	Thalweg
1	8	19,271	No	No
2	1	19,271	Yes	Yes
3	6	10,232	No	Yes
4	7	10,232	Yes	Yes
5	2	10,232	No	No
6	5	10,573	Yes	No
7	4	10,232	No	Yes
8	3	10,573	Yes	No
		100,616		

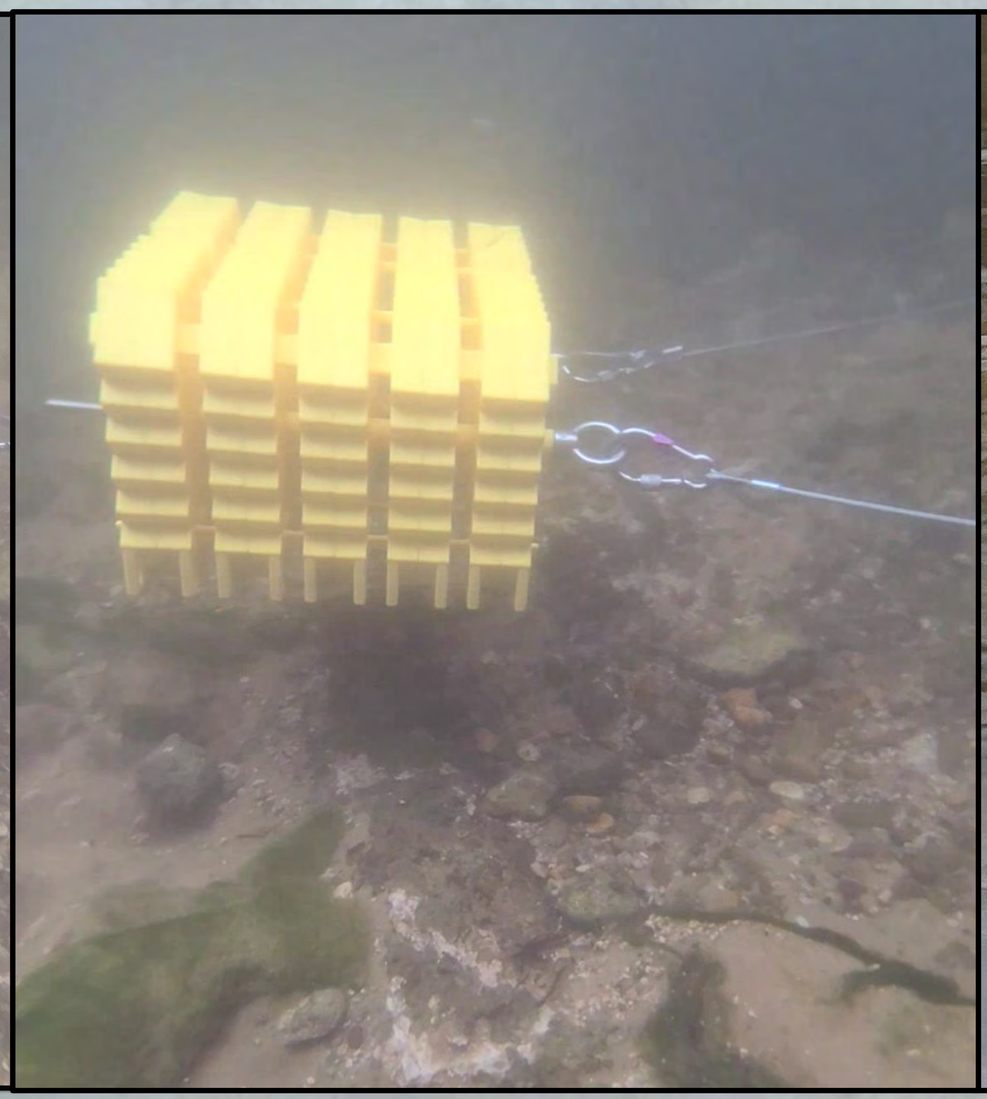
Tributary Spawning Lake Whitefish 2024

Larval Drift Sampling 2024

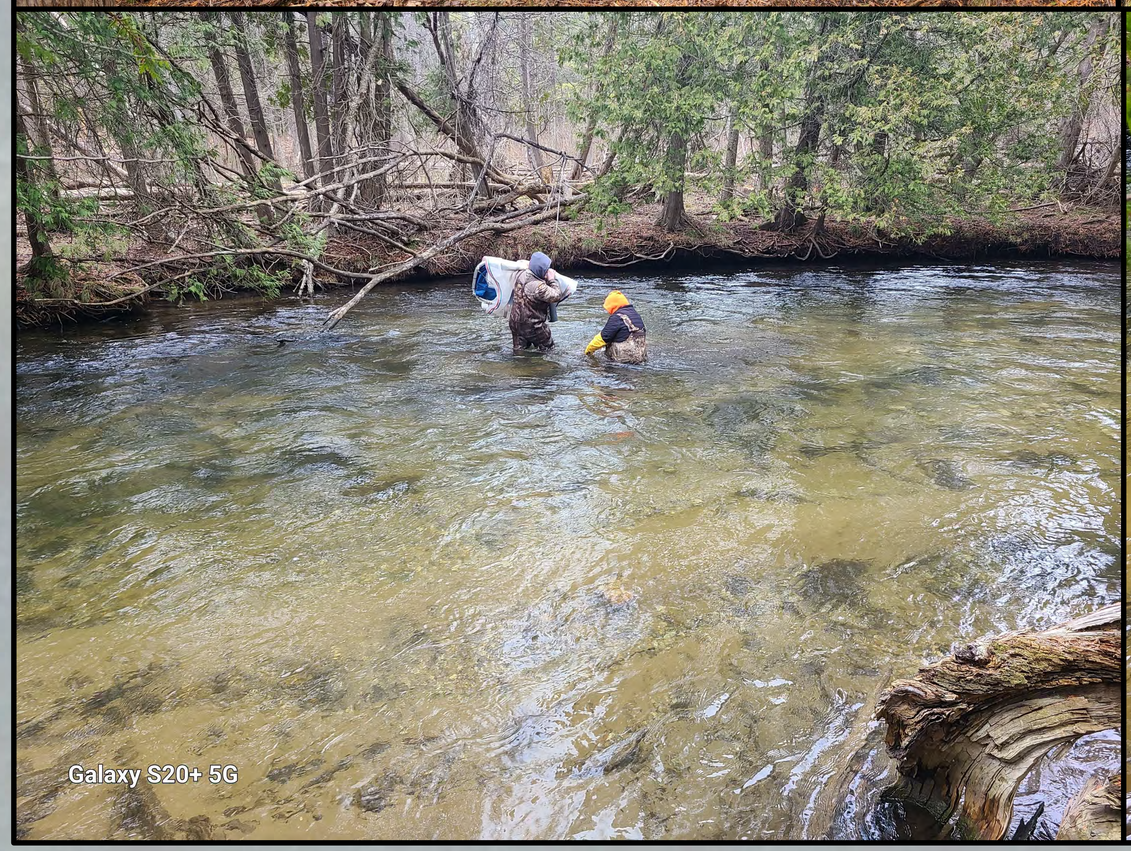
Tributary Spawning Lake Whitefish 2024

2024-02-05:
Incubator Install





Tributary Spawning Lake Whitefish 2024



Tributary Spawning Lake Whitefish 2024

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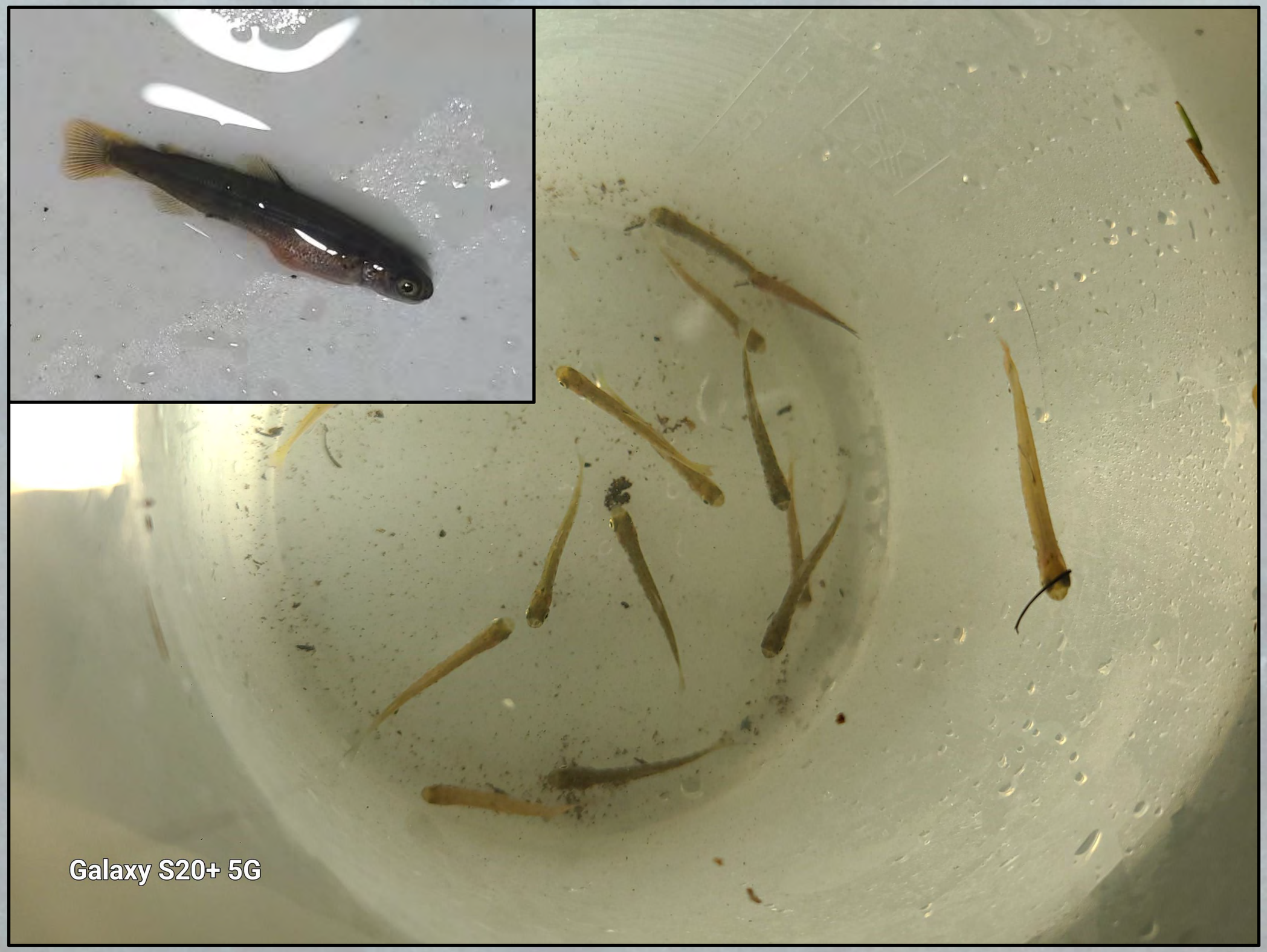

Tributary Spawning Lake Whitefish 2024

Larval Drift Sampling 2024

Tributary Spawning Lake Whitefish 2024

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Tributary Spawning Lake Whitefish 2024

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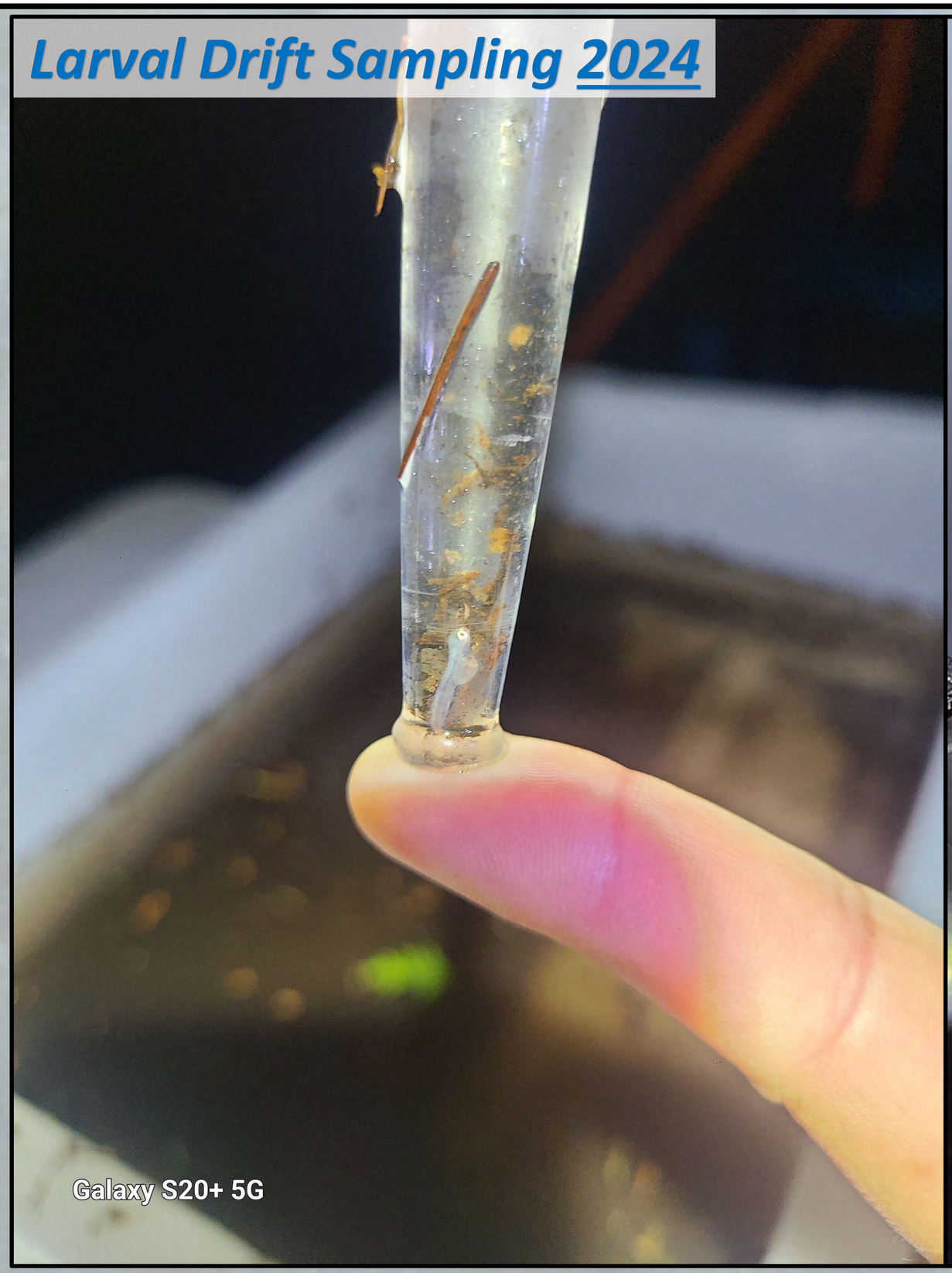
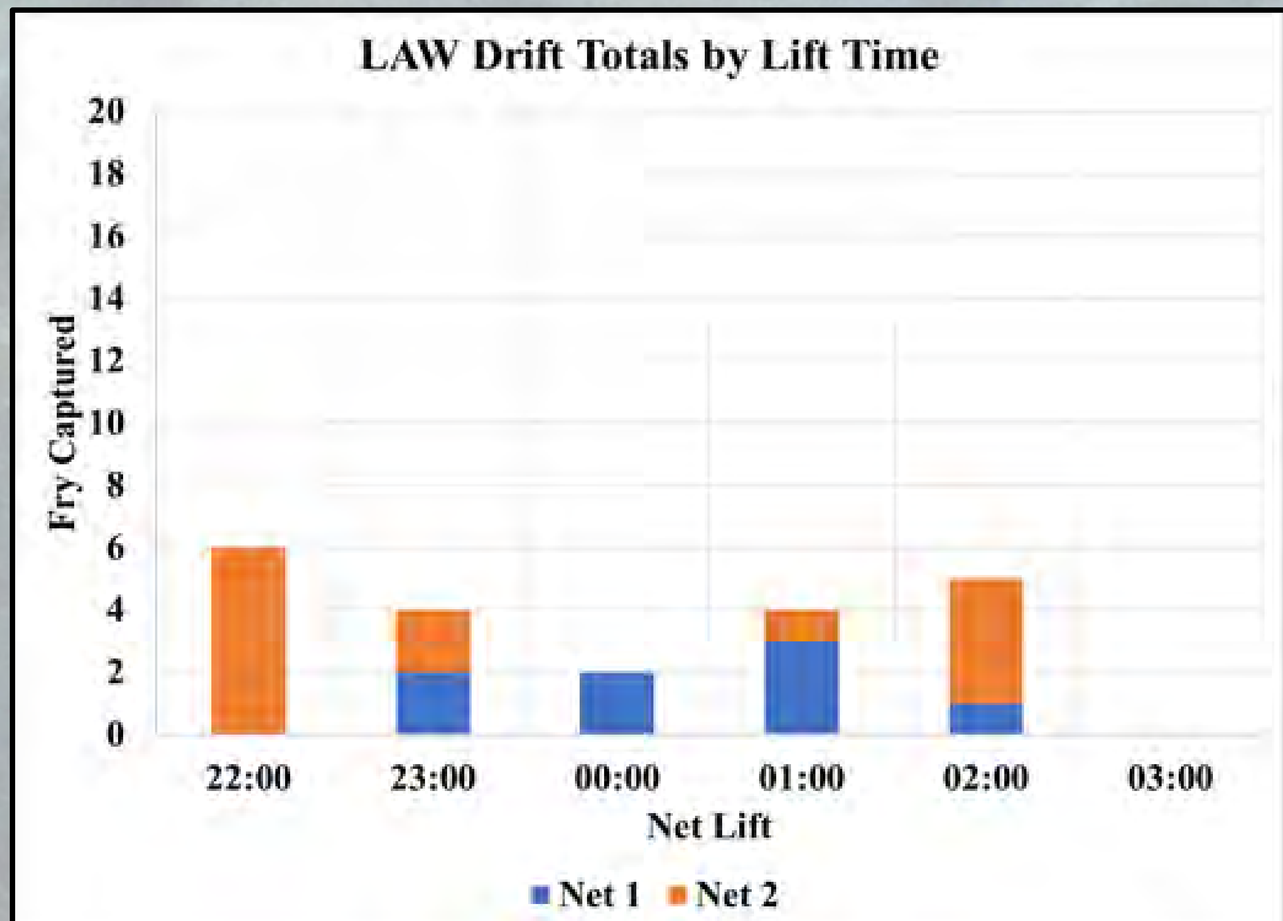
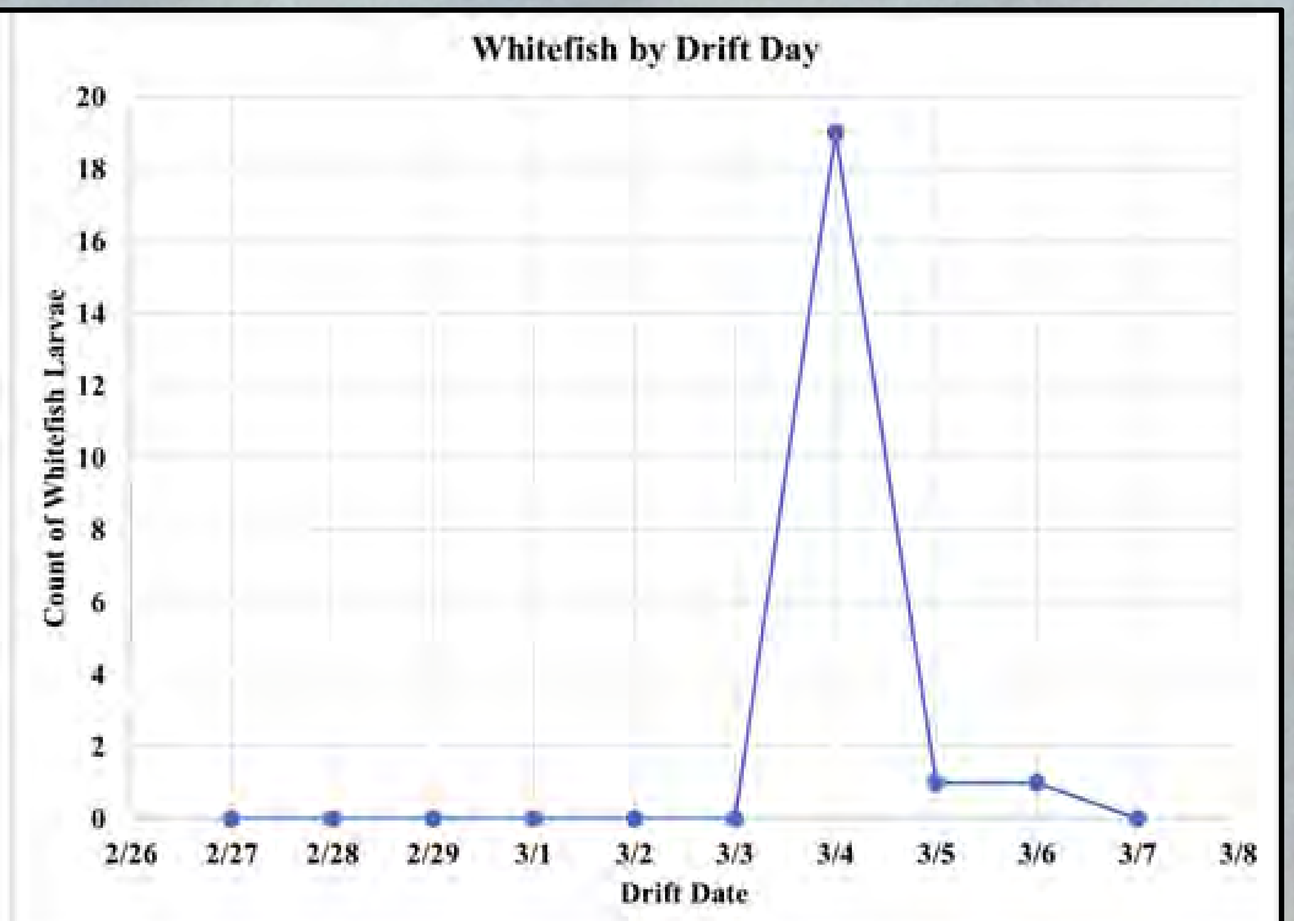


Jordan River – Larval Drift





Tributary Spawning Lake Whitefish 2024

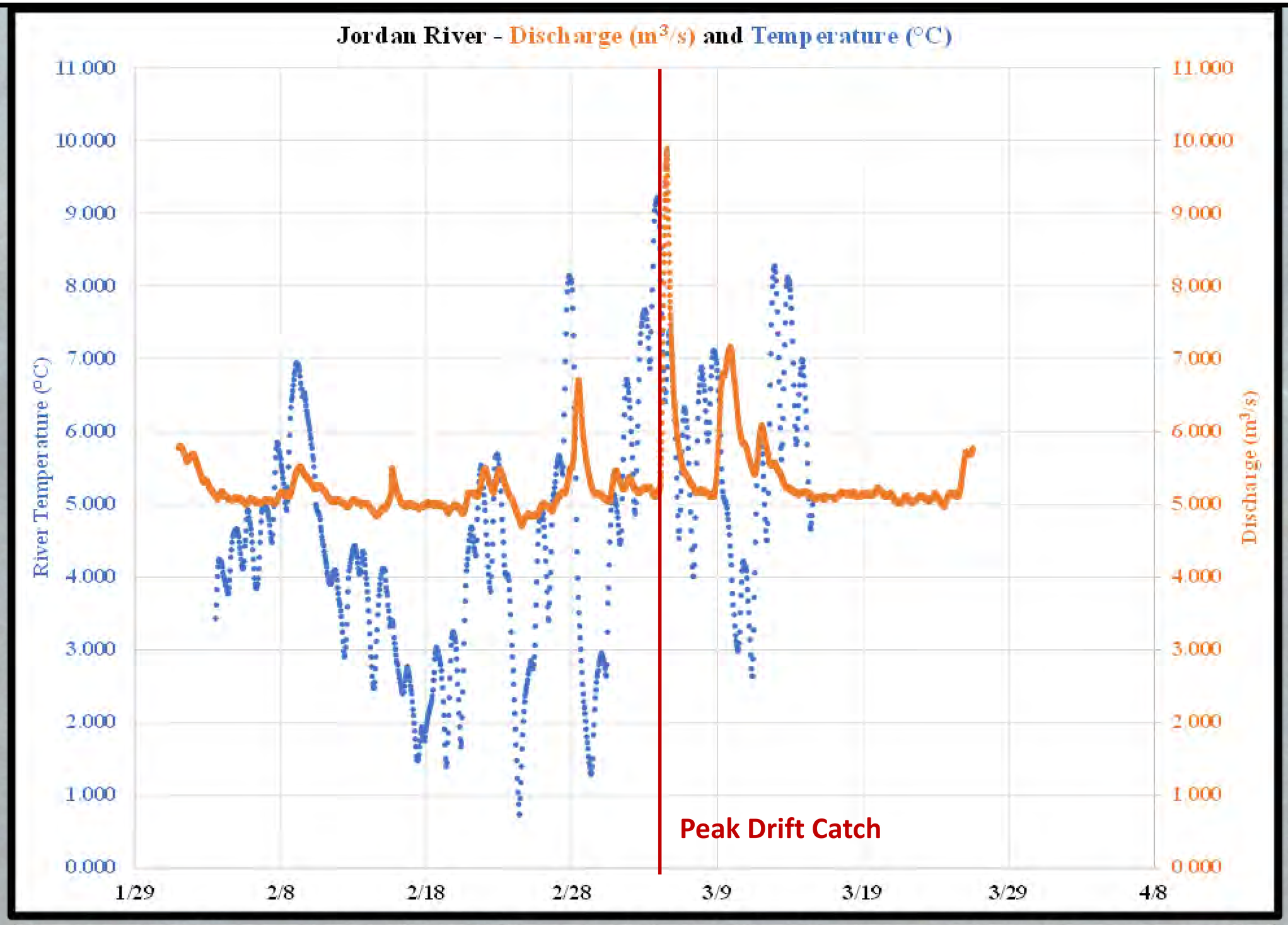


Figure 1: Plot of Jordan River discharge (m^3/s) at the Webster Bridge USGS gage station and temperature (°C) at Graves Crossing. Important to note that the calculated peak hatch occurred at the same time as the peak discharge and temperature during this period.

Tributary Spawning Lake Whitefish 2024

Incubator Pull 2024

Tributary Spawning Lake Whitefish 2024

2024-03-15:
Pulling Incubators

Tributary Spawning Lake Whitefish 2024

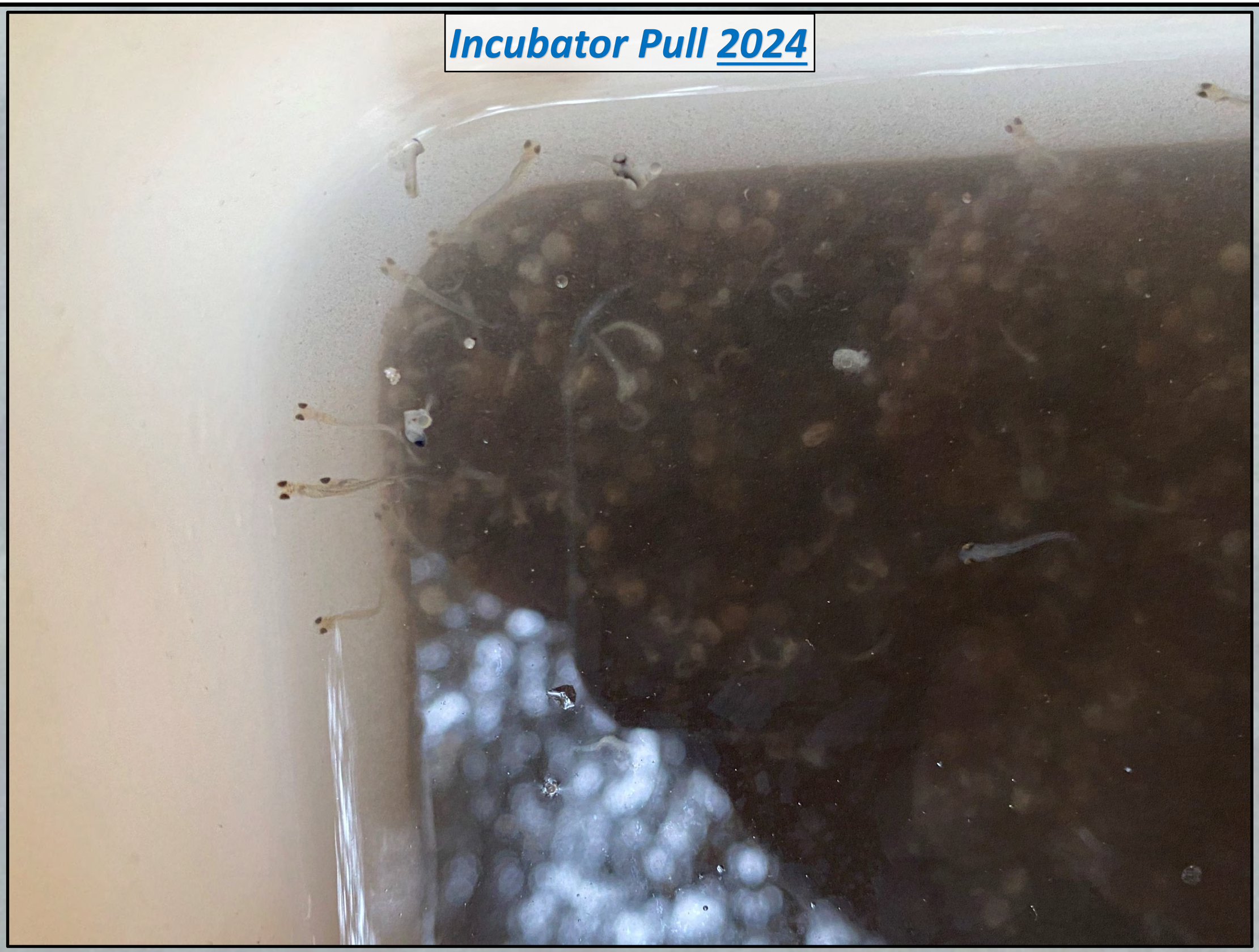
2024-03-15:
Pulling Incubators

Tributary Spawning Lake Whitefish 2024

Incubator Pull 2024

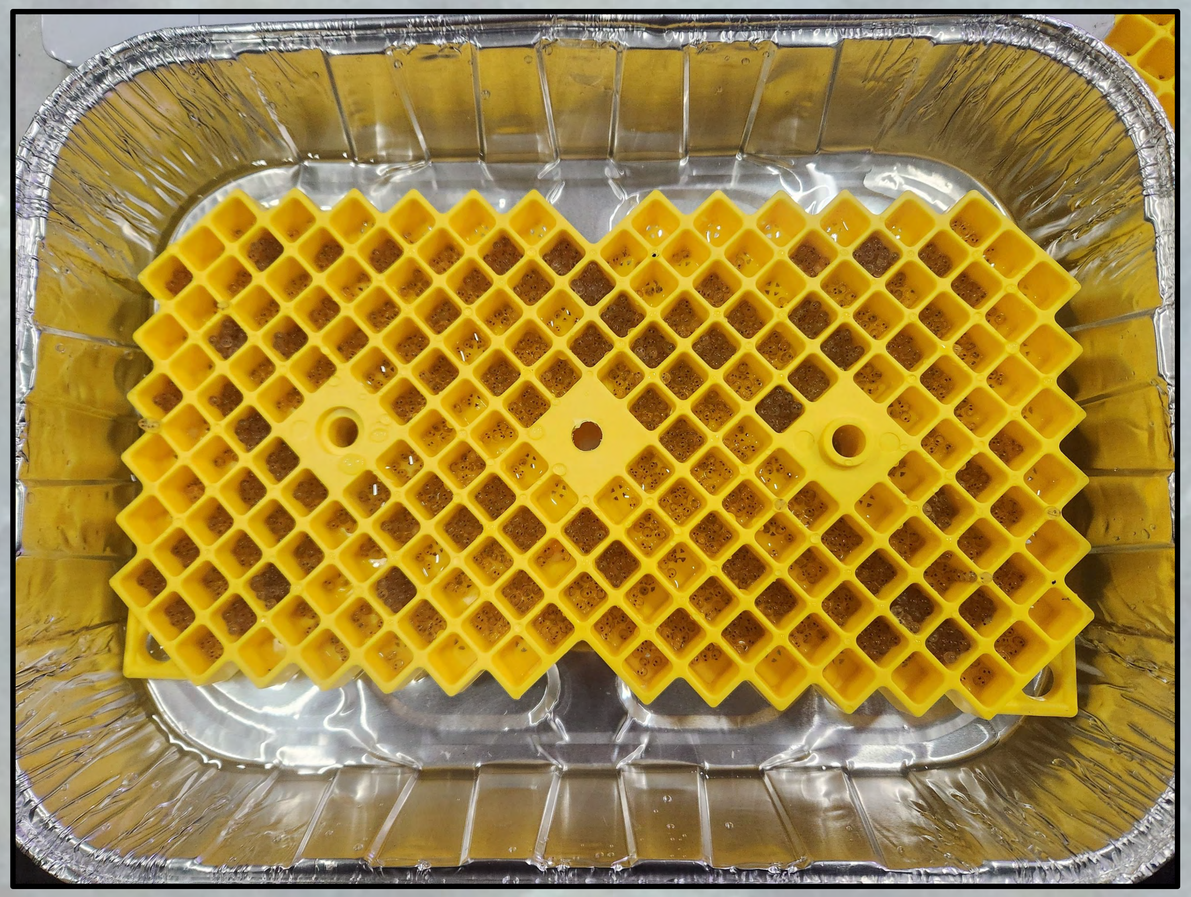
Tributary Spawning Lake Whitefish 2024

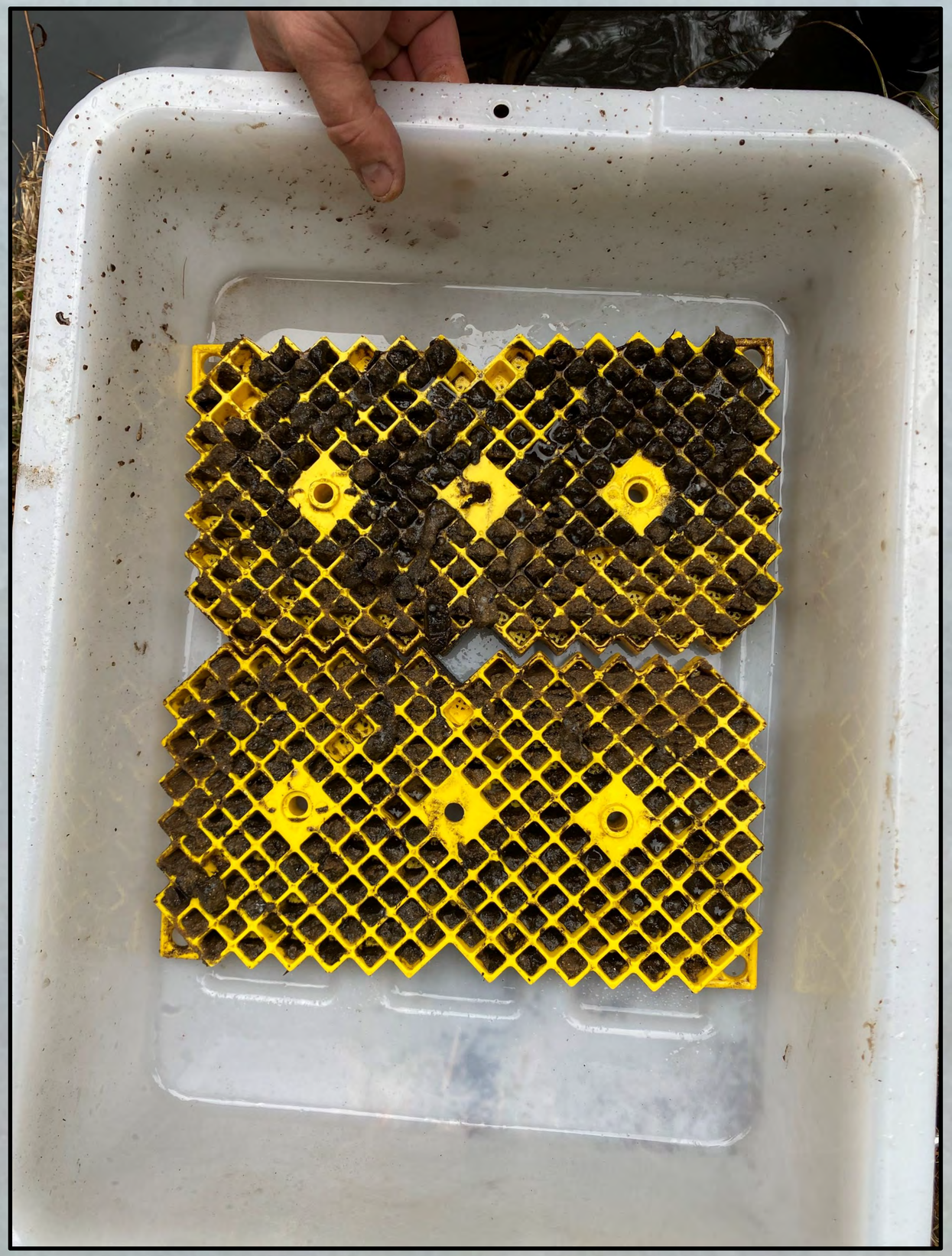
Incubator Pull 2024



Tributary Spawning Lake Whitefish 2024

2024-03-15:
Pulling Incubators



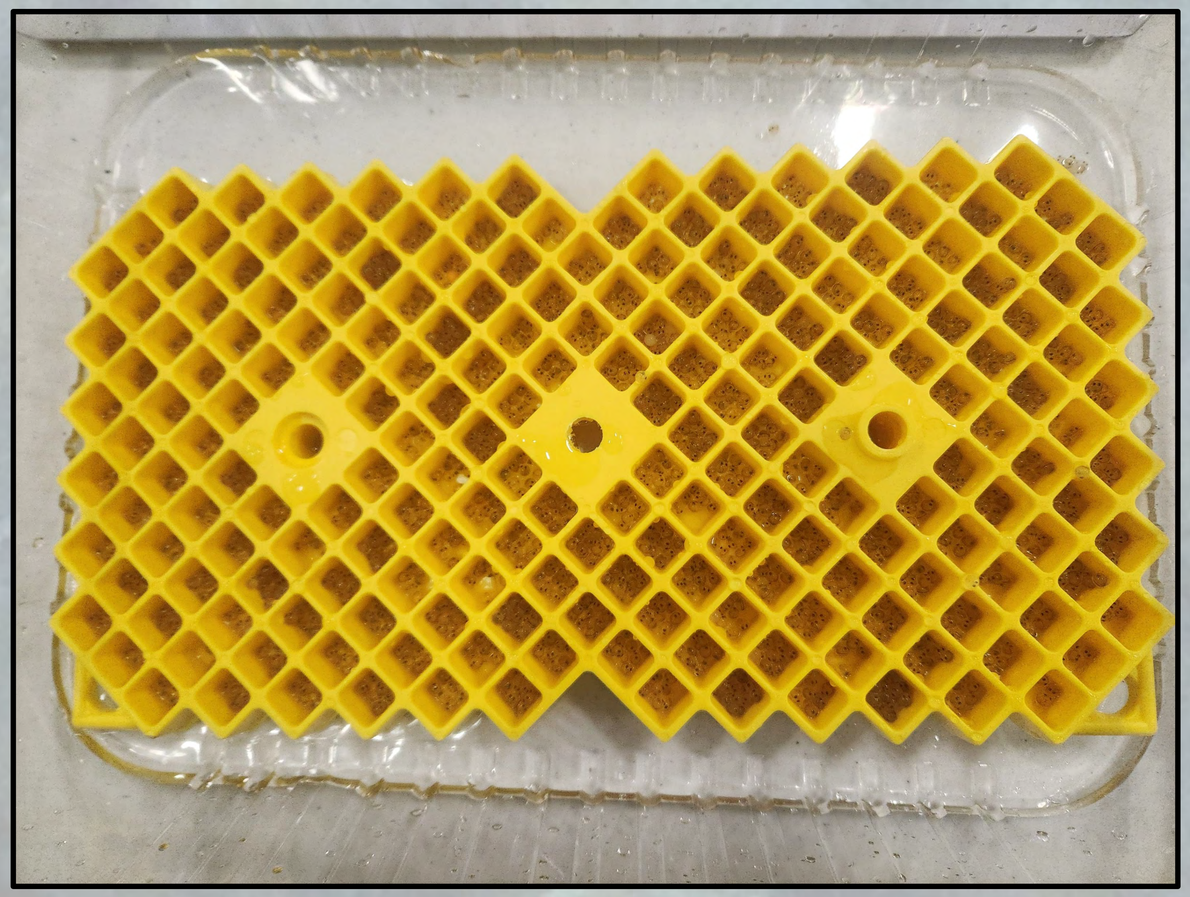


Incubator # 5, Plate #25

27 fry remaining
2,612 eggs to start
1.03%

Tributary Spawning Lake Whitefish 2024

2024-03-15:
Pulling Incubators



Incubator 4, Plate #16

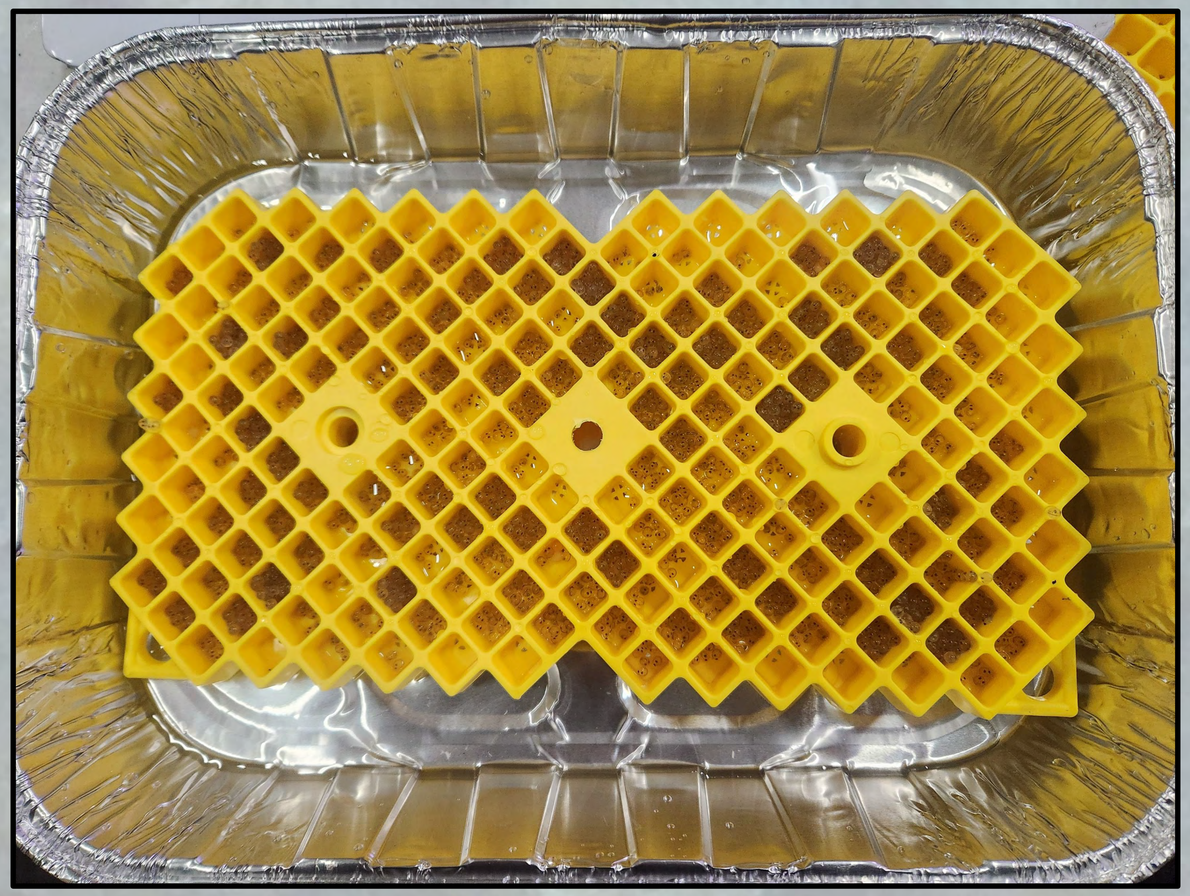
76 fry

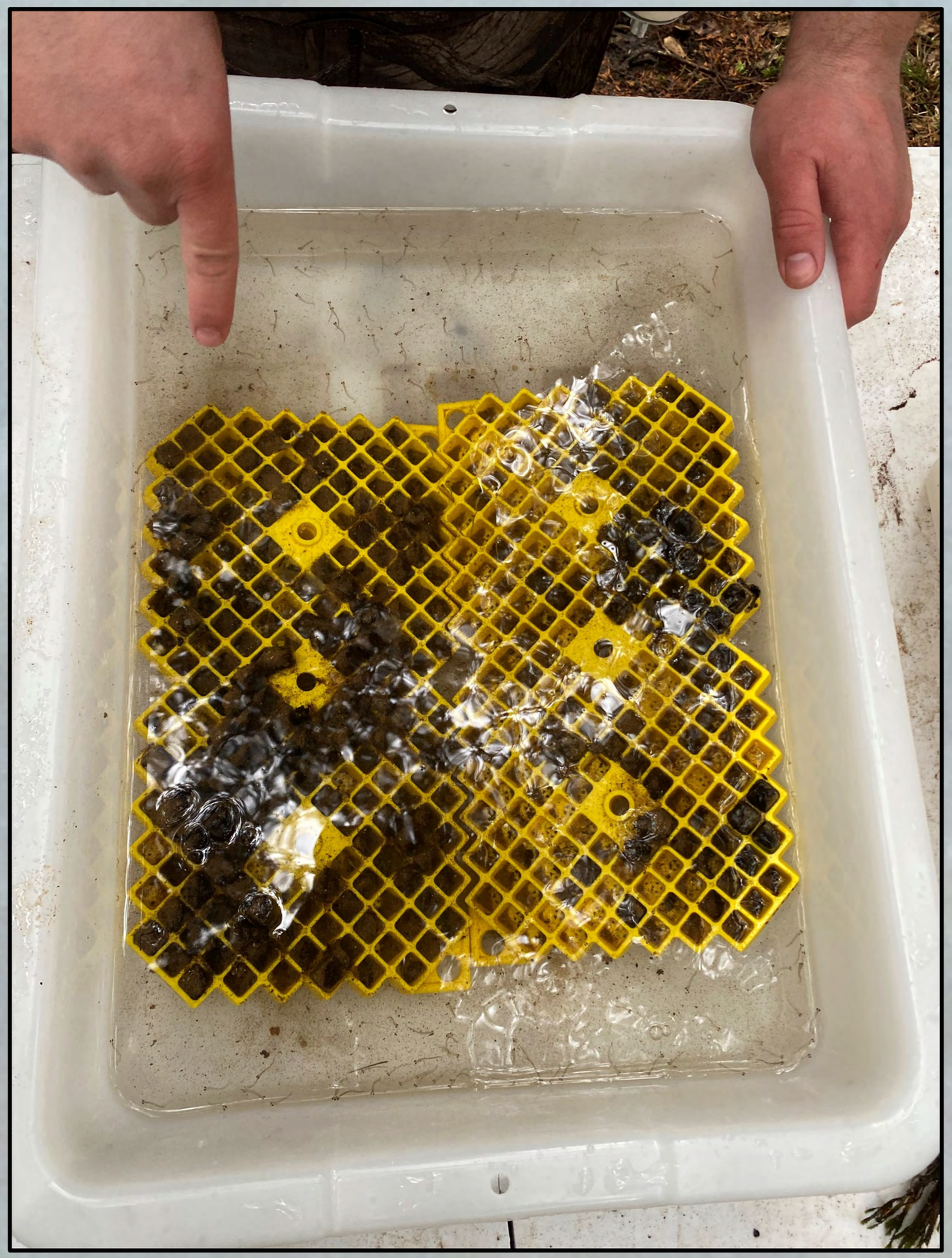
2,612 eggs to start

2.91%

Tributary Spawning Lake Whitefish 2024

2024-03-15:
Pulling Incubators





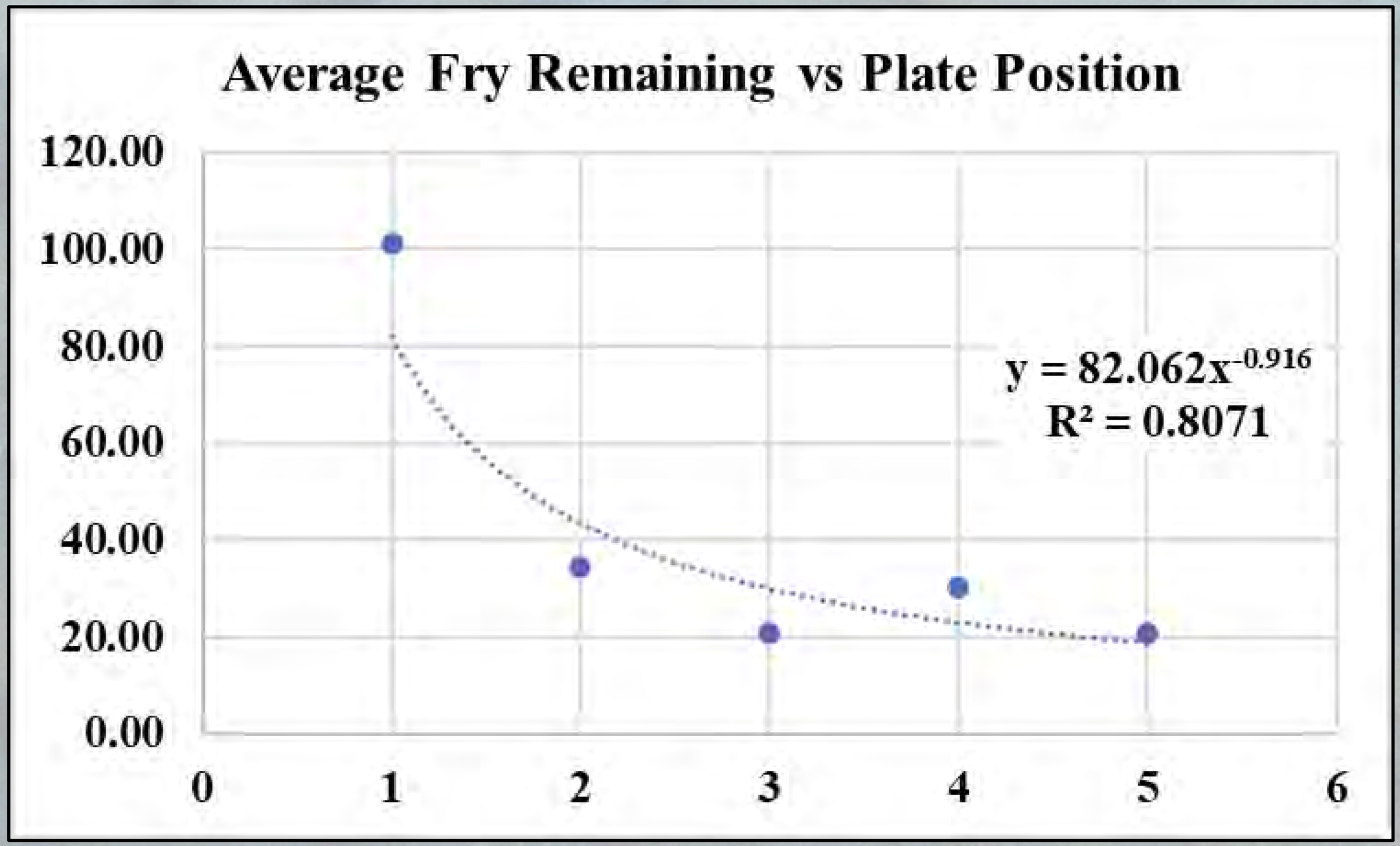
Incubator 1, Plate #1

481 fry

5,006 eggs to start

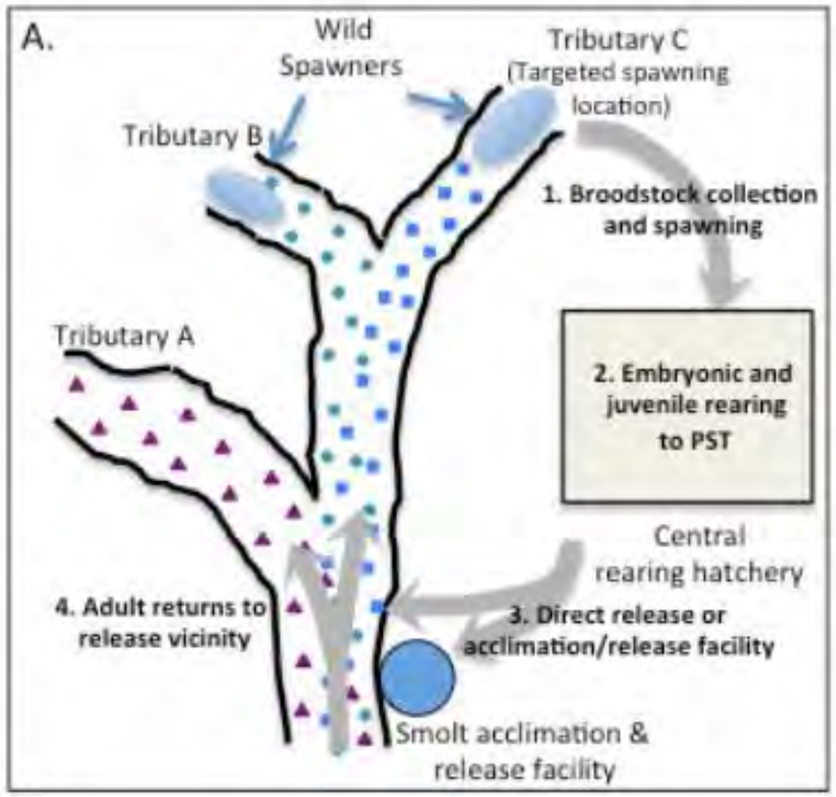
9.61%

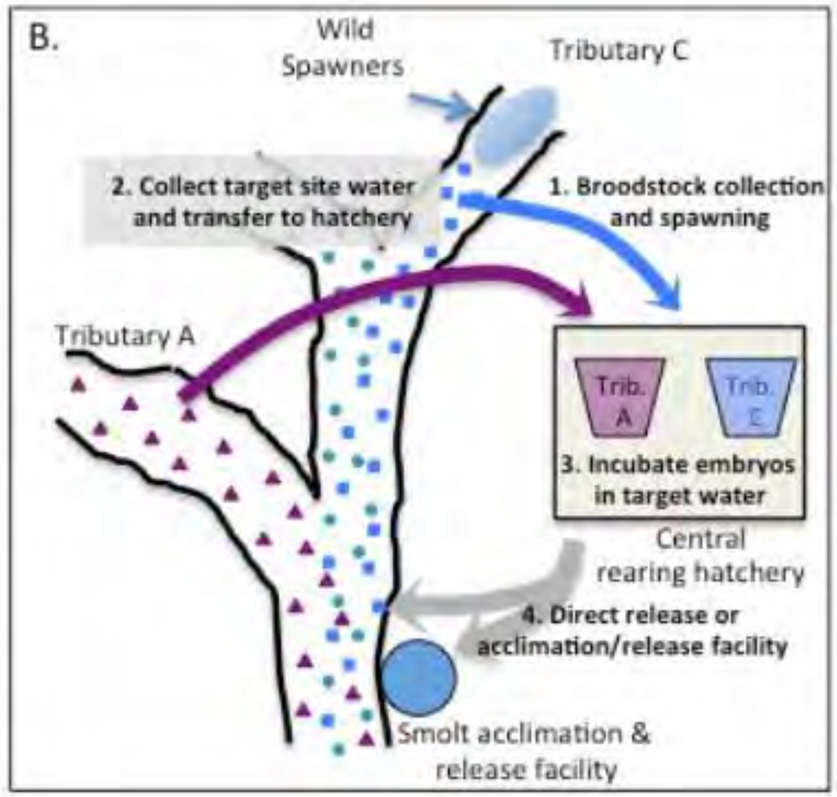
Tributary Spawning Lake Whitefish 2024

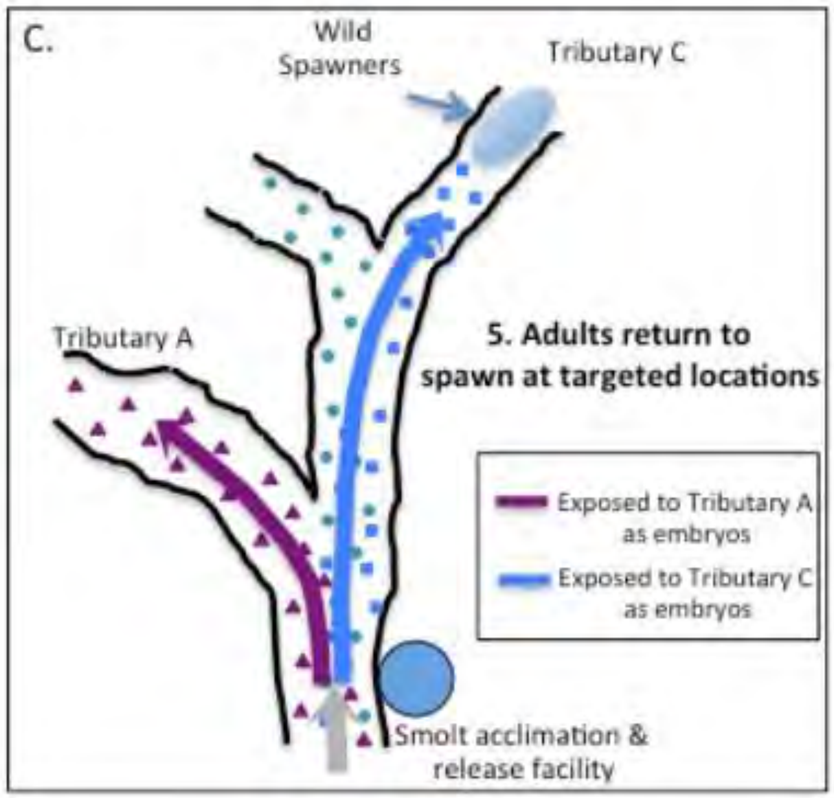


Flow Direction →

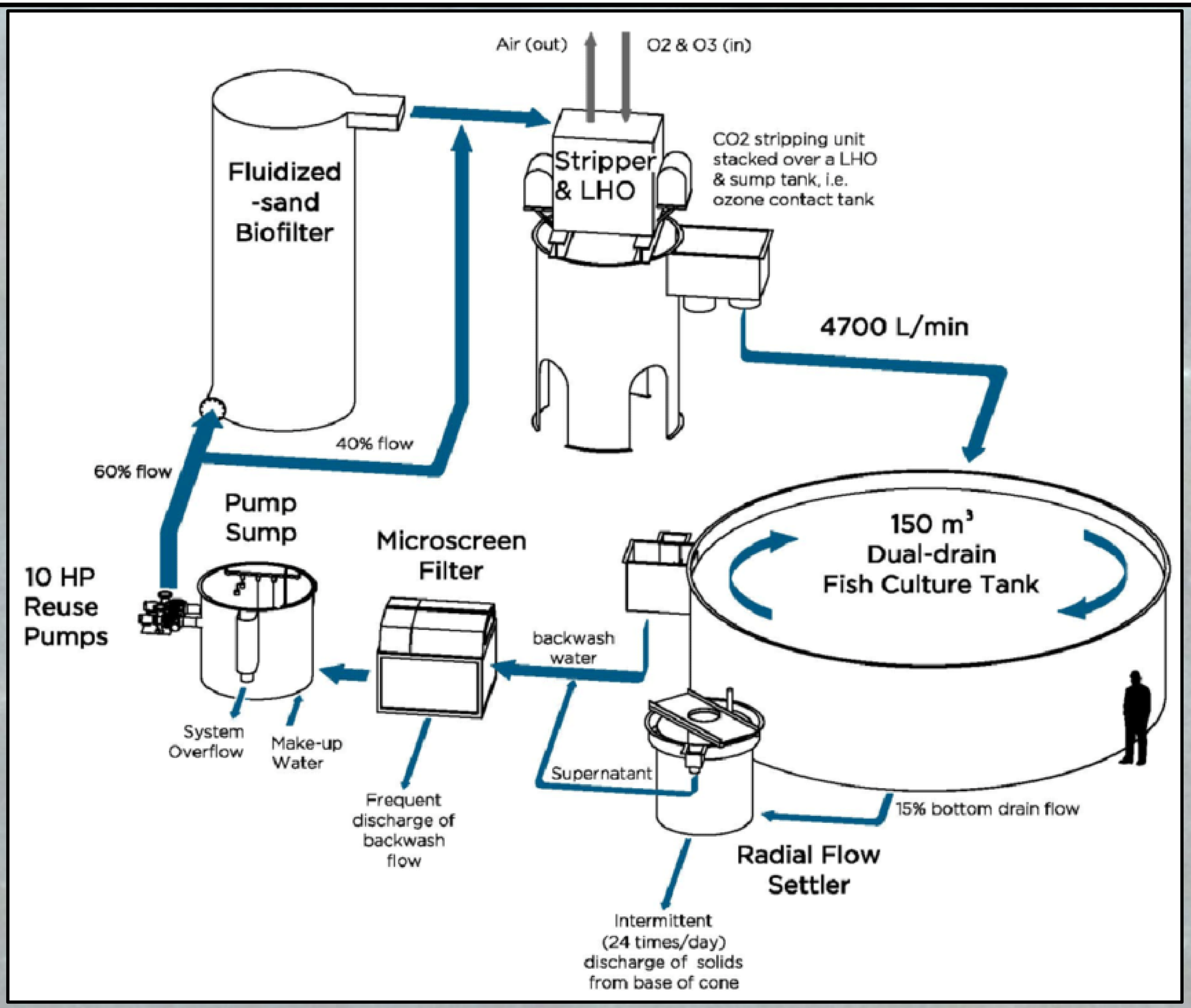
Solutions: Imprinting



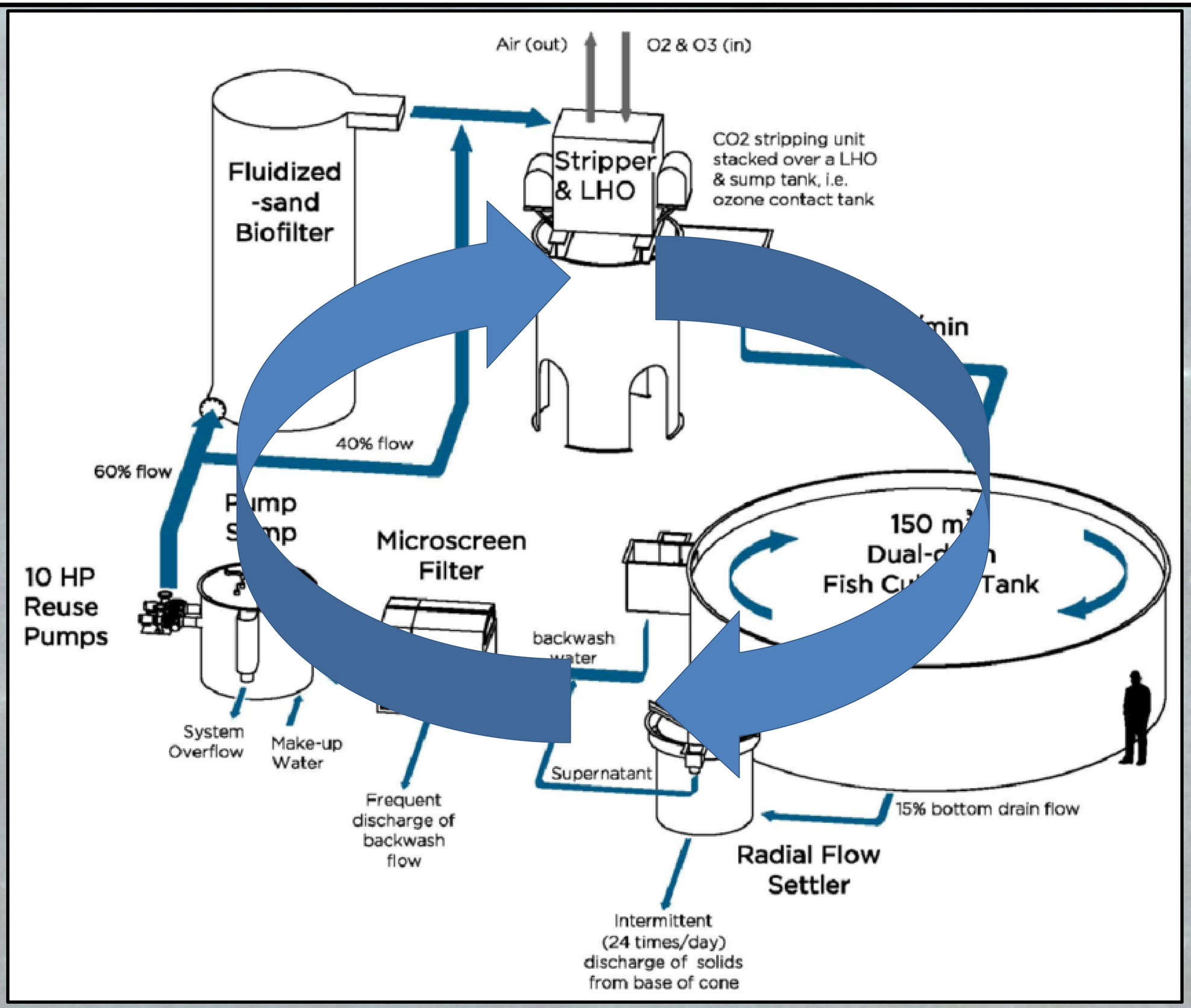




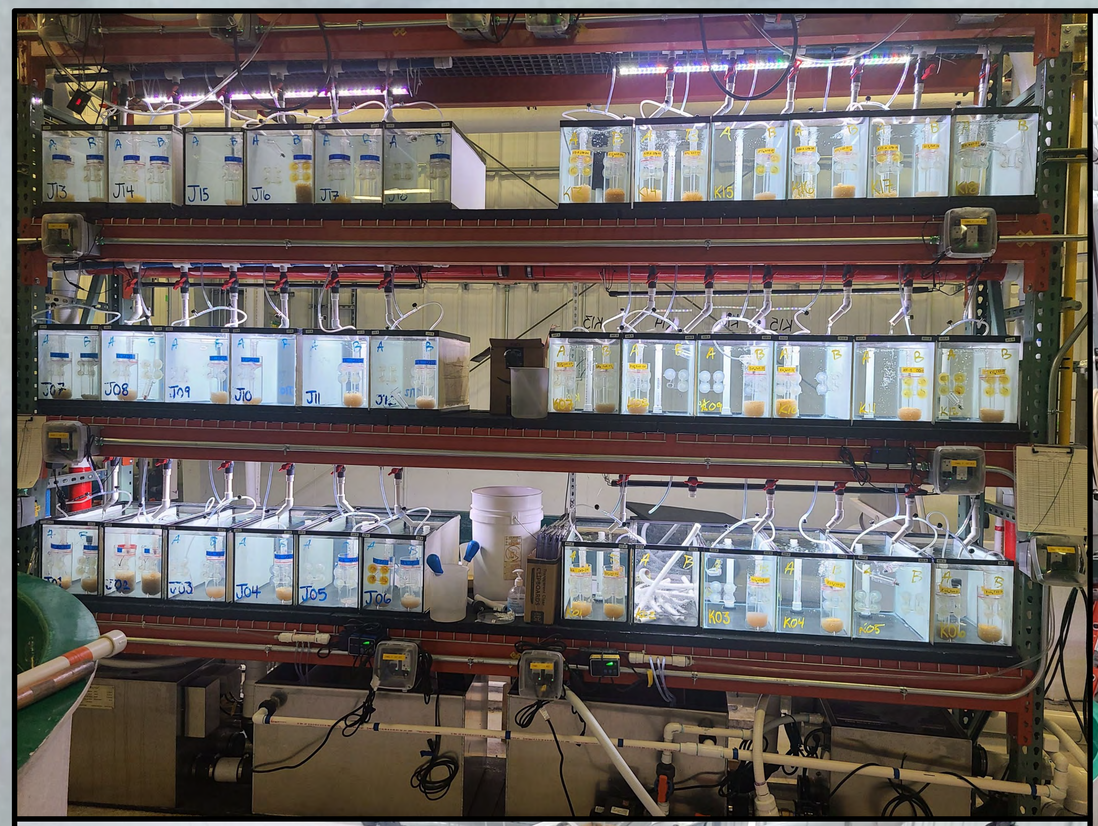
Solutions: Imprinting



Solutions: Imprinting



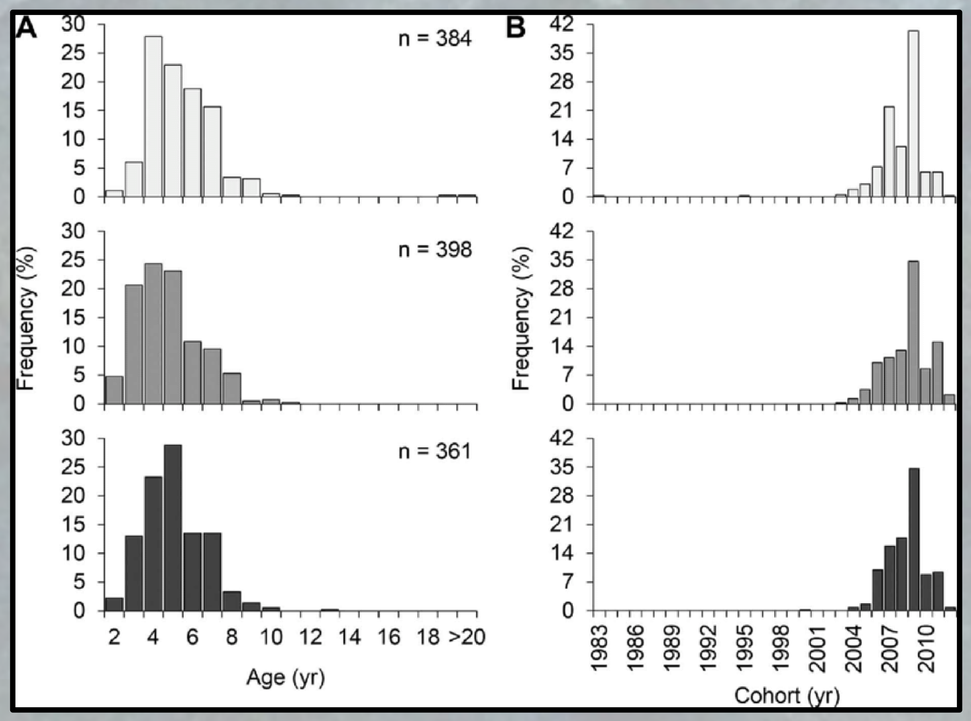
Solutions: Imprinting



Lake Whitefish Goals

What does success look like?

Natural Recruitment



Multiple Year classes

Spawning Runs

Questions?