Aquaculture Opportunities in Ontario

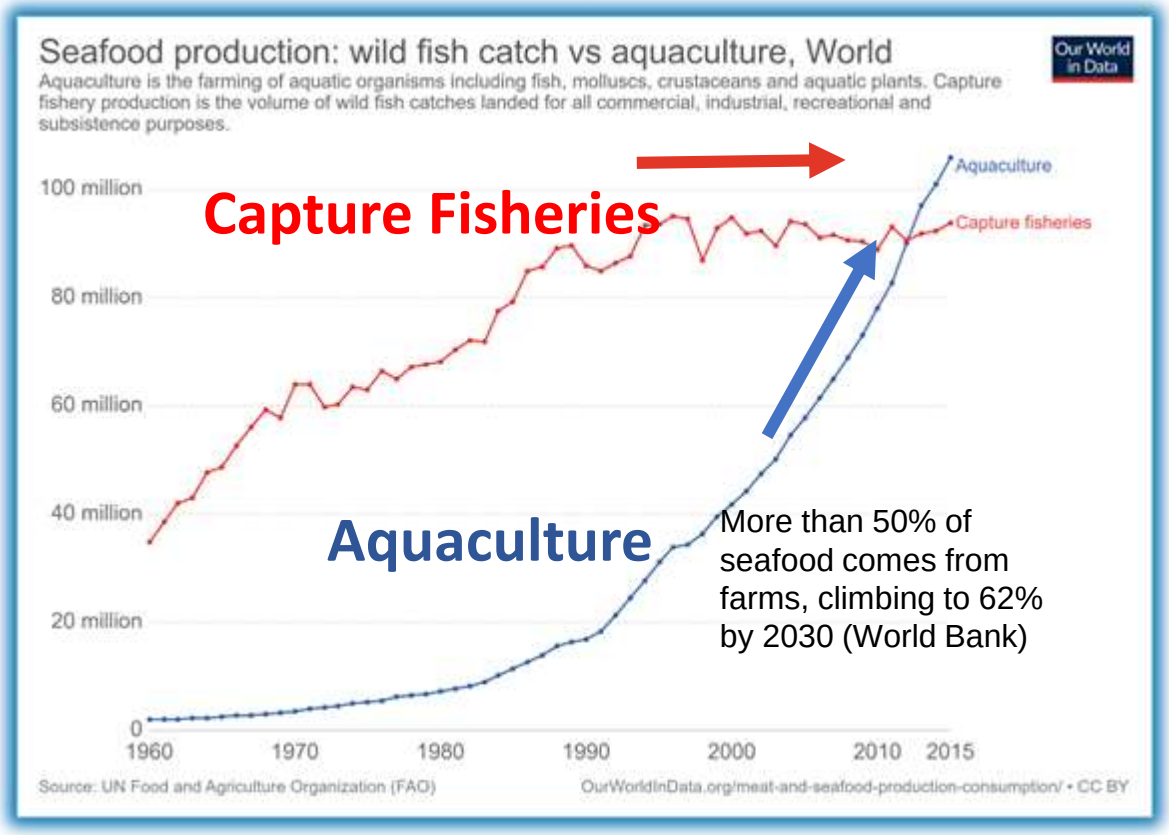
Meekers Aquaculture
1984

Steve Naylor, Fisheries & Oceans Canada

October 24, 2019

Lands, Resources & Economic Development Forum, North Bay

Why Aquaculture?



- Demand for seafood exceed fisheries capacity
- Represents a sustainable and healthy source of food
- Provides means to rehabilitate wild populations

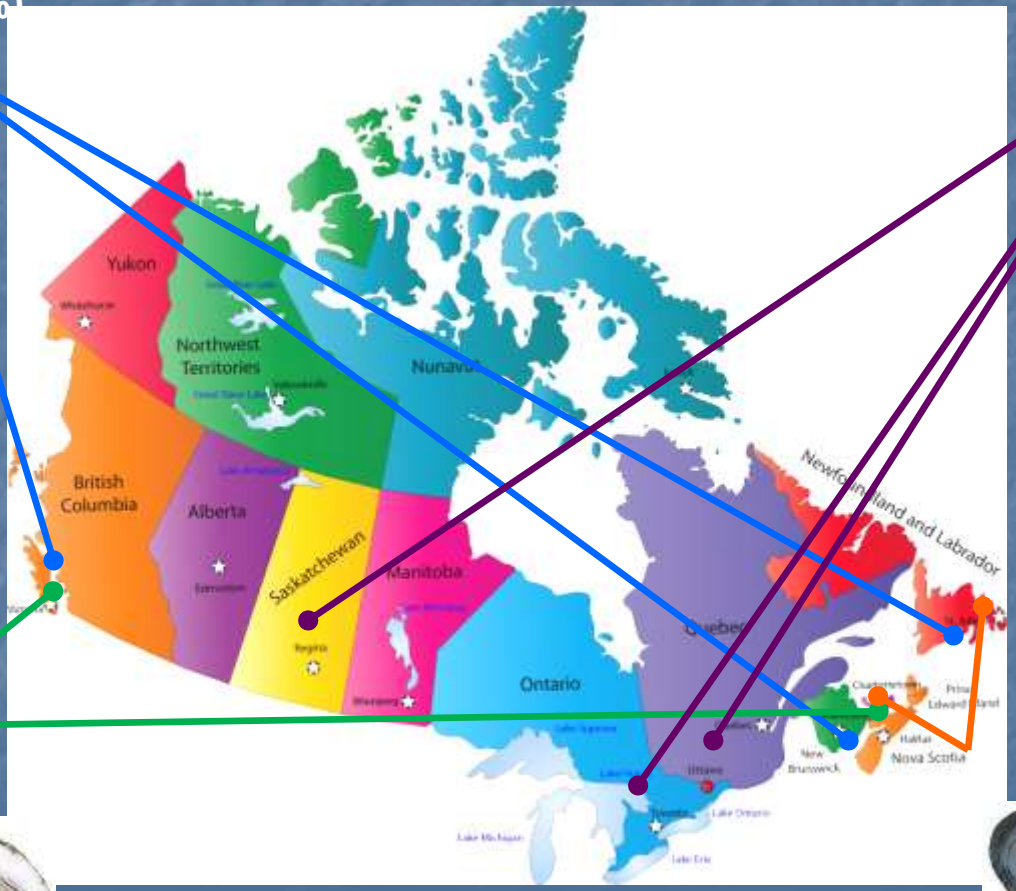
Regional Distribution of Aquaculture






Salmon (72%)

Trout (4%)



Oysters (6%)

Mussels (14%)

- Introduced from the west coast

by fisheries managers into the Great Lakes

- Genetically plastic, hardy
- Naturalized

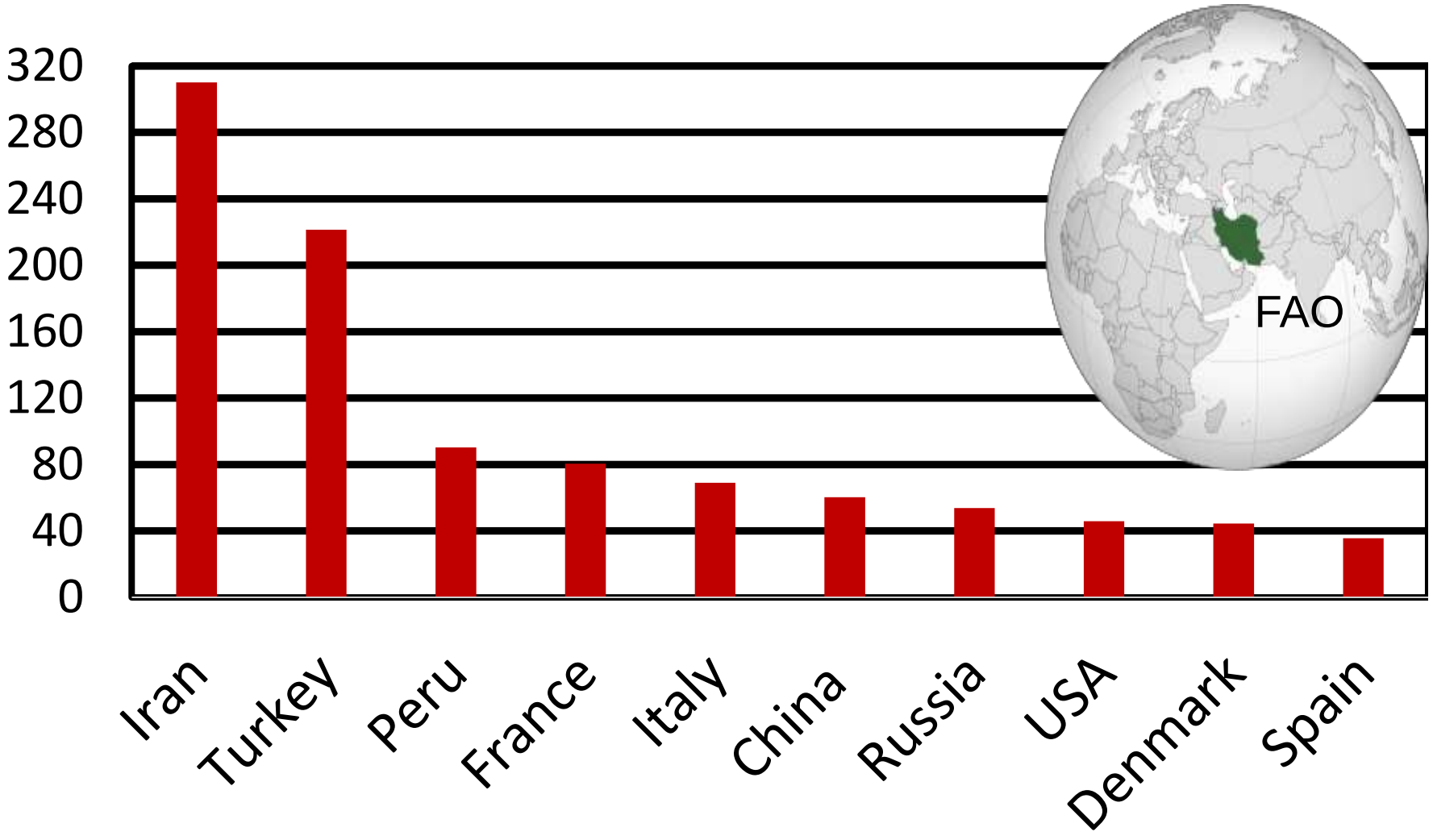





Why Rainbow Trout?

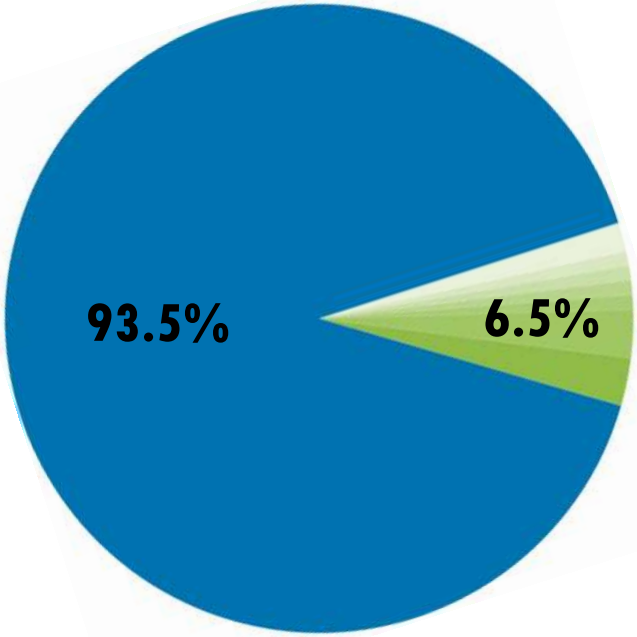
- Culture techniques, based on more than 100 years of research and practice, are well established;
- Domesticated strains of trout have been bred to improve performance and yield;
- Nutritional requirements are well defined and efficient commercial feeds are available from several suppliers;
- Water temperatures and the biophysical resource base throughout much of Canada are near ideal for the species;
- An established market exists for rainbow trout; and
- Naturalized species in most parts of the country and thus poses little to no genetic threat to feral populations.

2015 Top 10 Trout Producing Countries (million pounds)



SEAFOOD SPECIES FARMED IN ONTARIO

Rainbow Trout



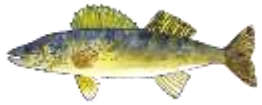
Tilapia

Barramundi

Shrimp

Lake Whitefish

Perch



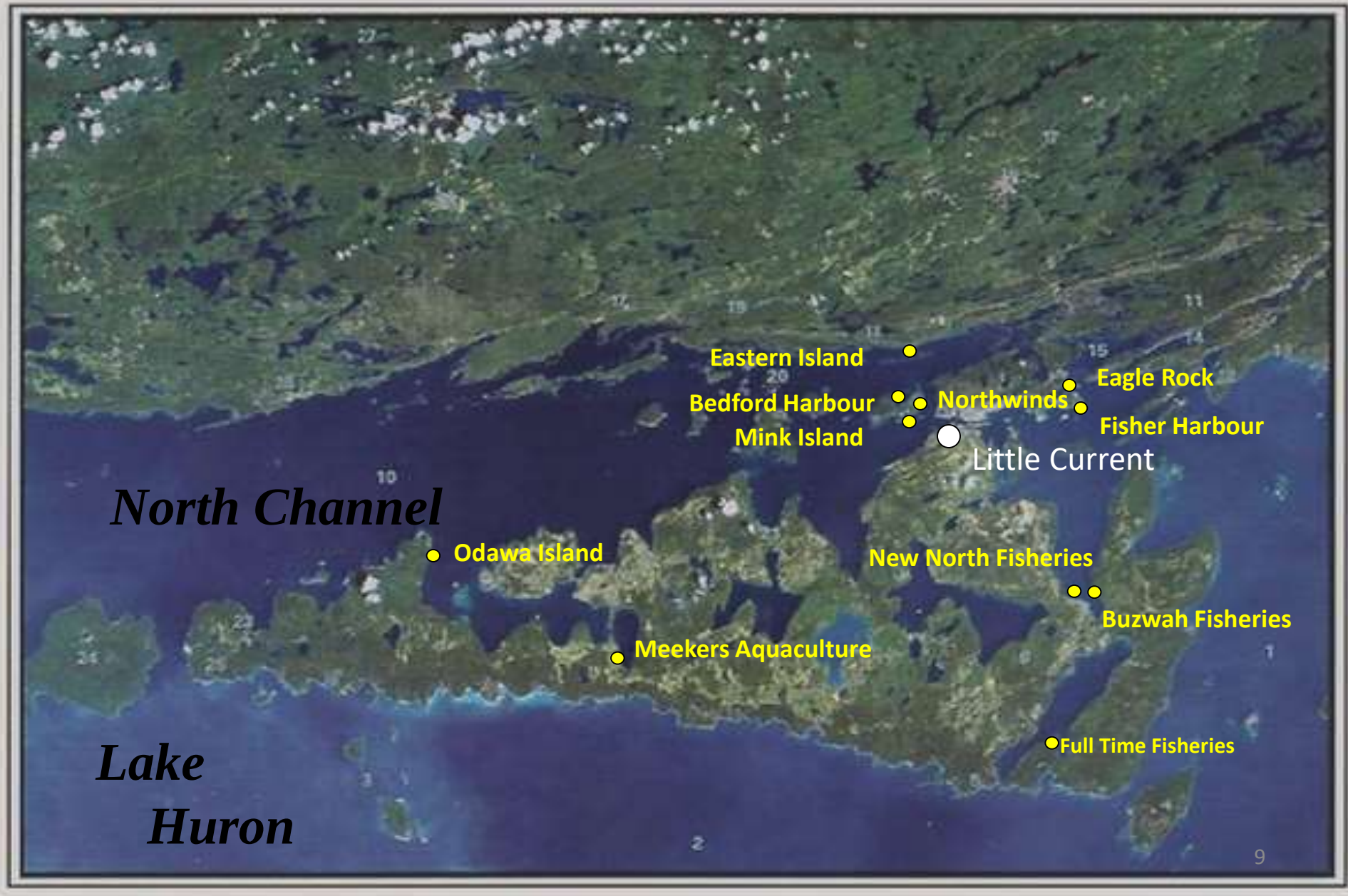
Walleye

Arctic Char

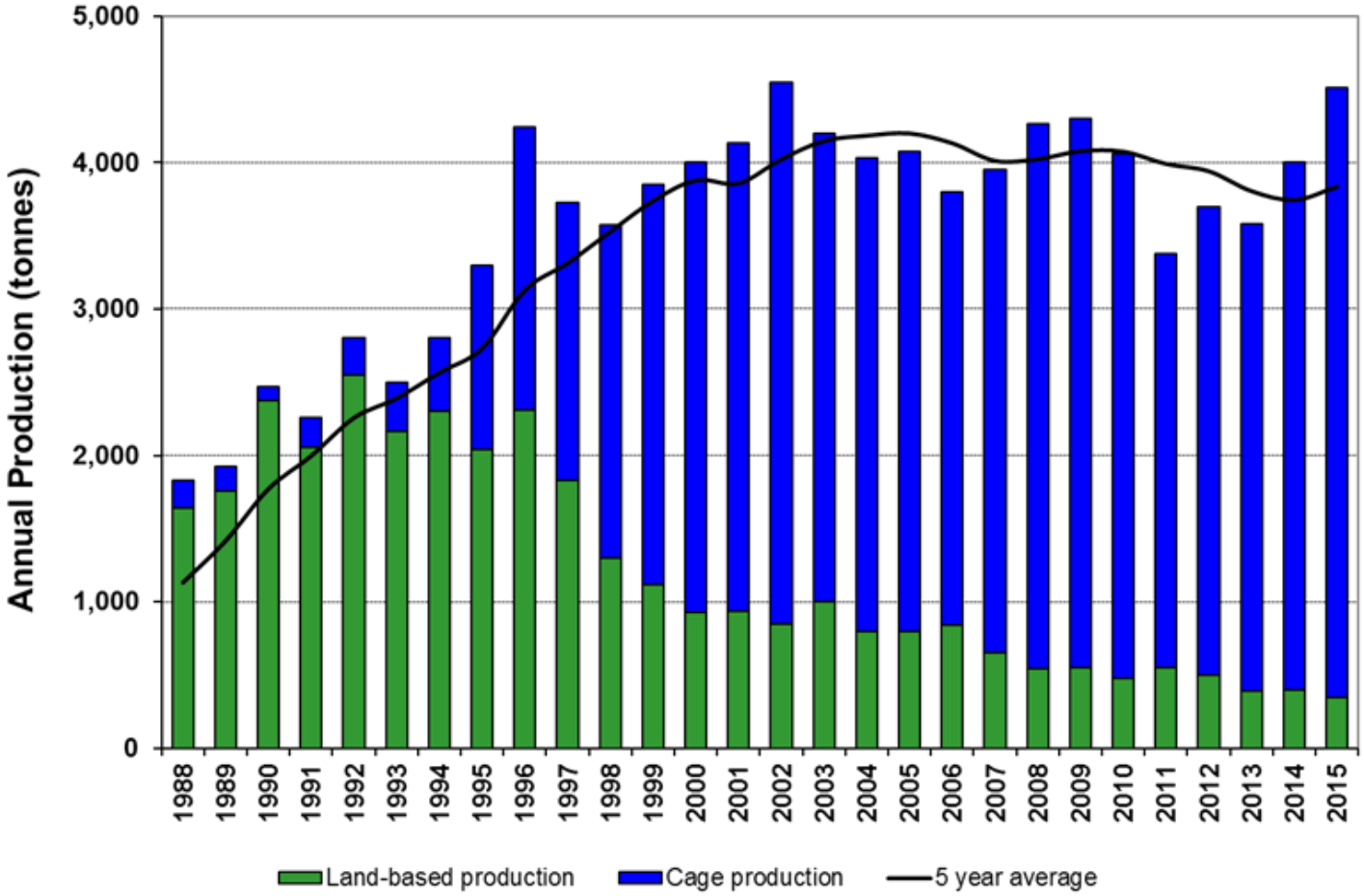
Bass

240 Ontario Fish Farms

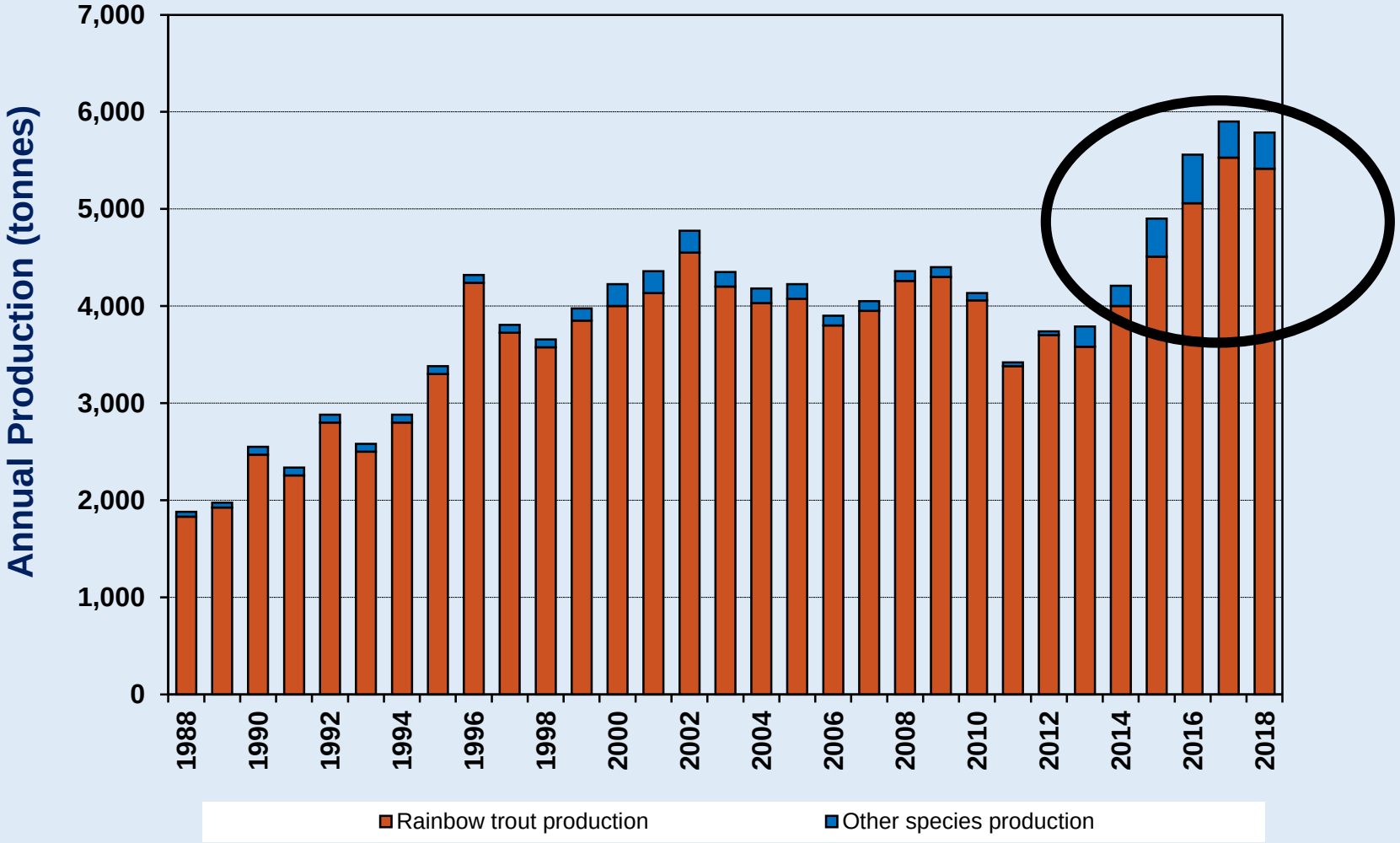
THE NORTH CHANNEL - MANITOULIN ISLAND



Ontario Farmed Trout Production



Ontario Aquaculture Production: 1988-2018



Source: Aquastats 2018, University of Guelph, by R.D. Moccia, D.J Bevan and M.G. Burke

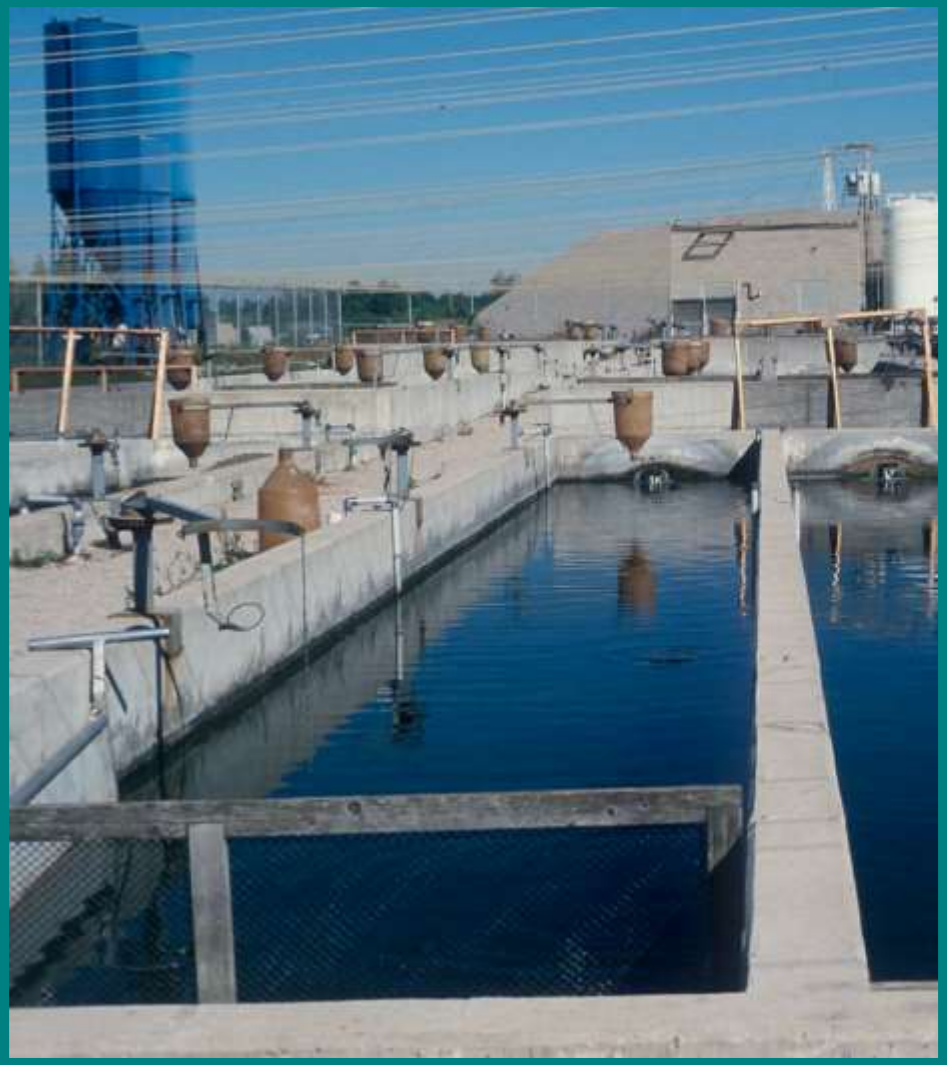
Pond Culture


Kinmount
FISH FARM
TROUT FISHING SMOKED TROUT
FRESH DRESSED TROUT, LIVE BAIT
TROUT & BASS FOR STOCKING
488-2660
VISIT
OPEN

Raceway Culture





Circular Tank Culture

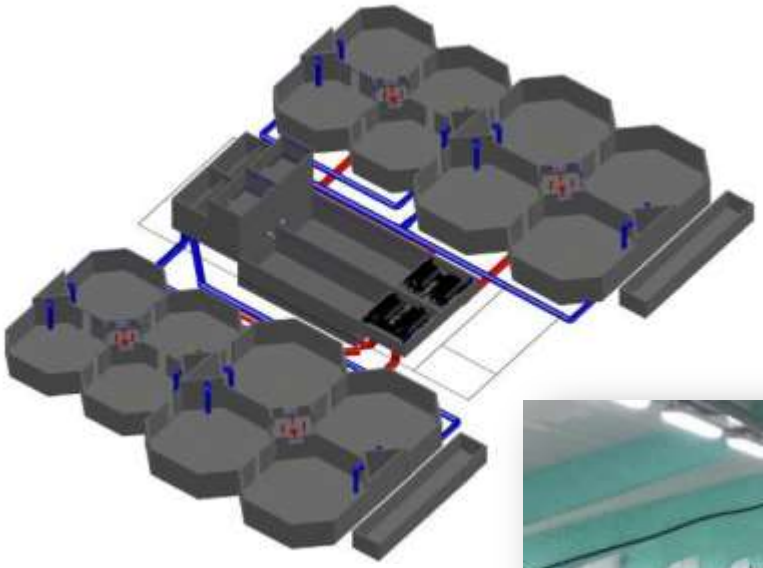









Octagonal Tanks



Floating Containment Systems

NET-PEN FARMS

Most trout now come from Indigenous fish farms


Buzwah Fisheries – Manitowaning Bay

Lake 375 Cage Aquaculture (2003 – 2007)

Approximately 10,000 rainbow trout cultured each year

Added as fingerlings in the spring and harvested each fall

Experimental Lakes Area
(Dept. of Fisheries & Oceans)

- Established in 1968
  - **Controlled experiments to address aquatic issues**

ELA aquaculture project in Lake 375

- Led by Dr. Cheryl Podemski, Freshwater Institute, DFO
- Whole-lake ecosystem effects to understand processes
- 2 years of pre-operational data
- 6 years of production data
- 3 years of decommissioning data

- Further research completed in Lake Diefenbaker & Lake Huron
- DFO funding with support from NOAA, Industry, MNRF, MECP, OMAFRA

Lake 375
Fish Community

- Abundant (many present)
  - lake trout
  - white sucker
  - fathead minnow
- Much less abundant
  - pearl dace minnow
  - northern redbelly dace minnow
  - finescale dace minnow
  - slimy sculpin

13 Years background data

Fish Population Parameters

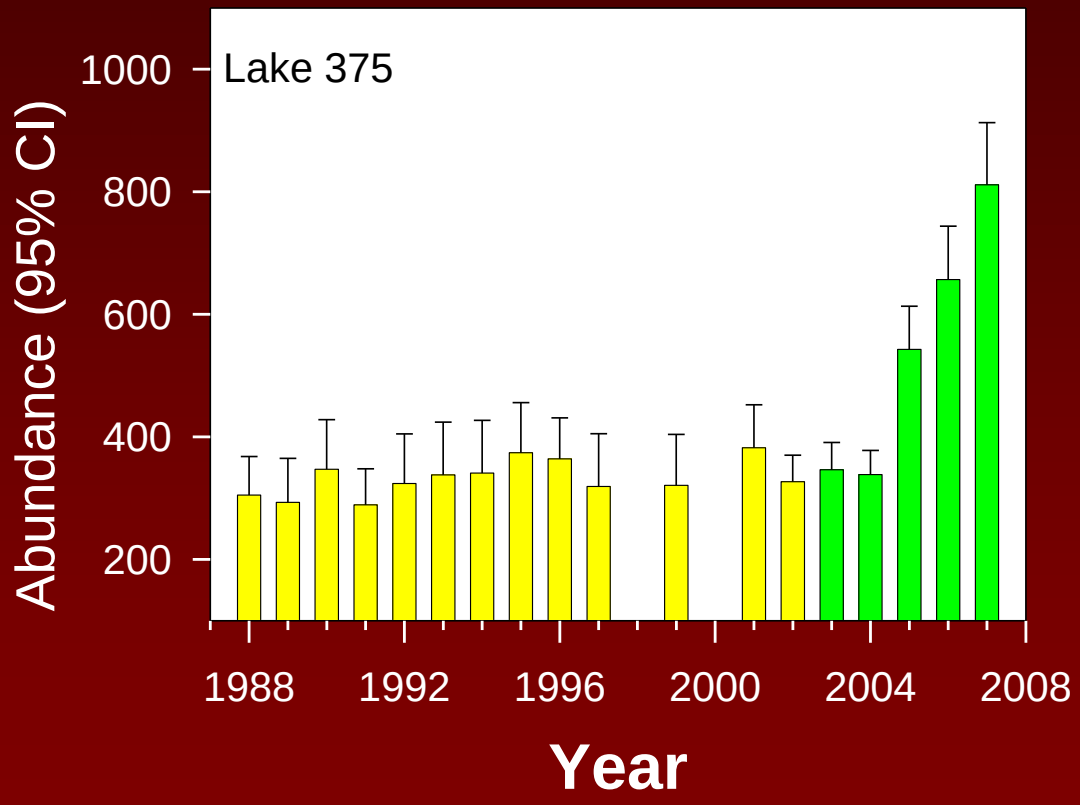
- Abundance
- Annual survival
- Recruitment (reproduction)
- Growth
  - Length
  - Fatness
- Age at maturity

Fish Capture

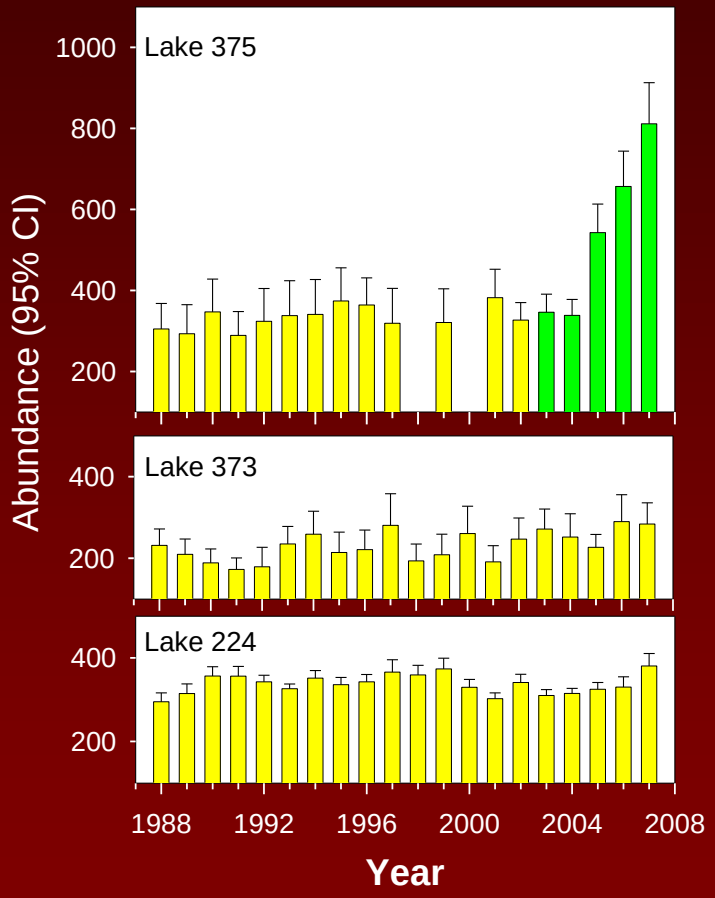
Lake trout

Lake trout abundance

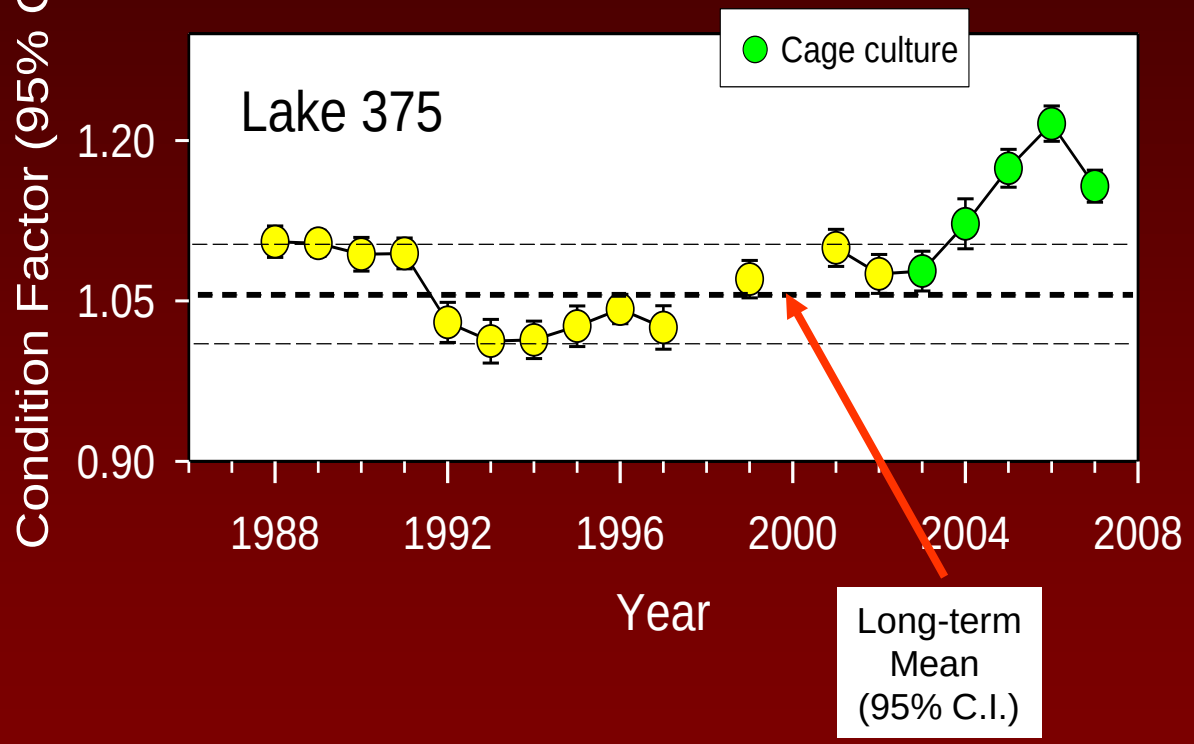
(age 1 and older)



Lake trout abundance



Lake trout fatness

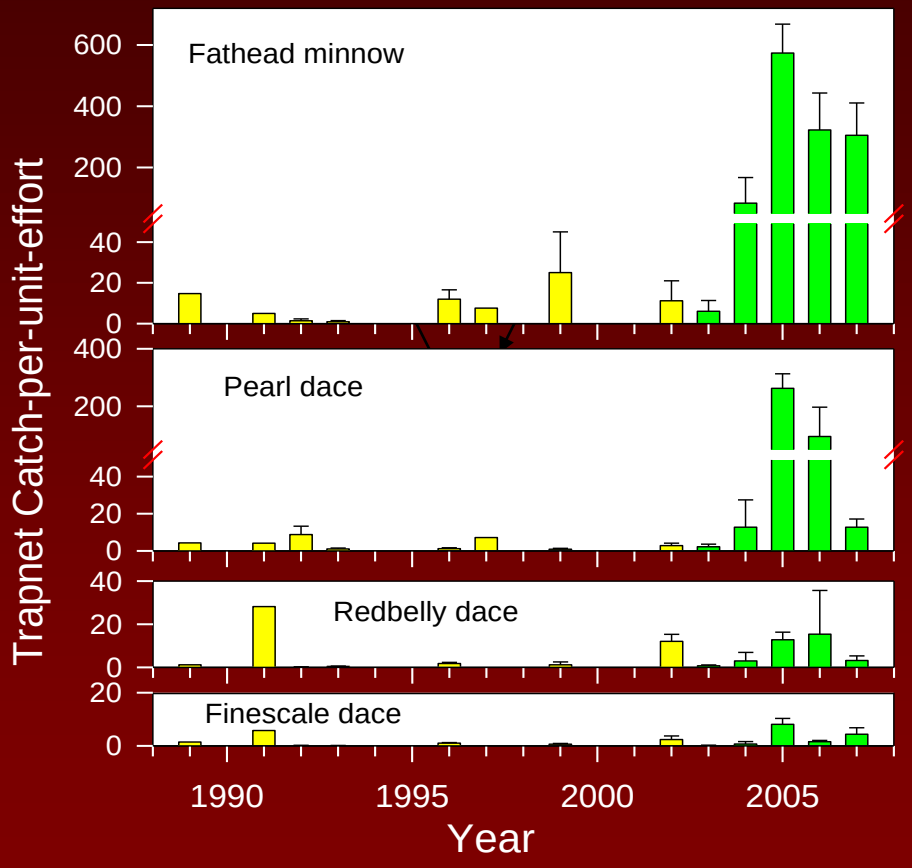


Summary

- Abundance of most fish populations increased during the 5 years of cage culture
  - No negative impacts
- Lake trout
  - Fatter
  - Grew faster
  - Earlier age of sexual maturity
  - More females spawning each year
  - Annual survival increased
  - Increased “recruitment”

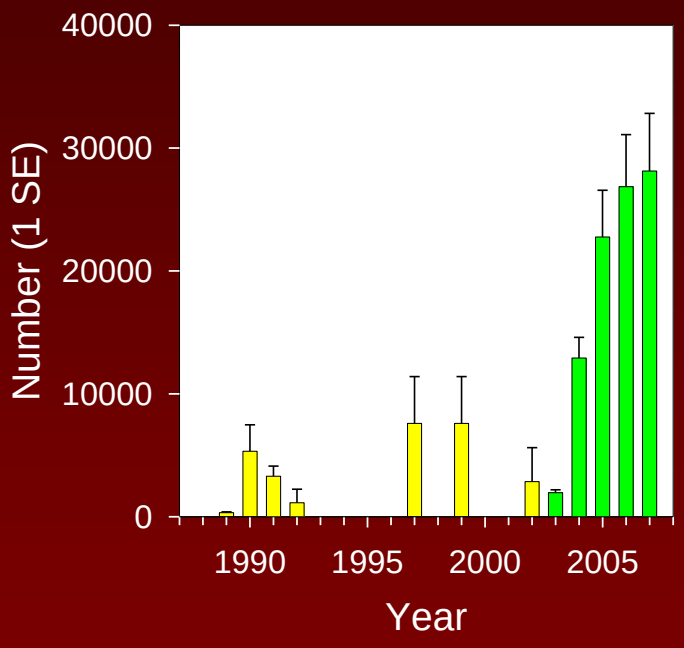
Lake trout prey species

Minnow abundance

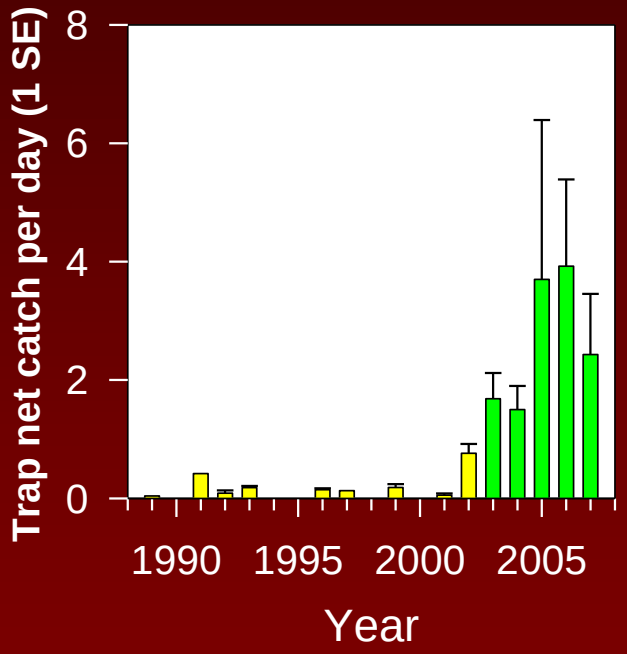


Abundance

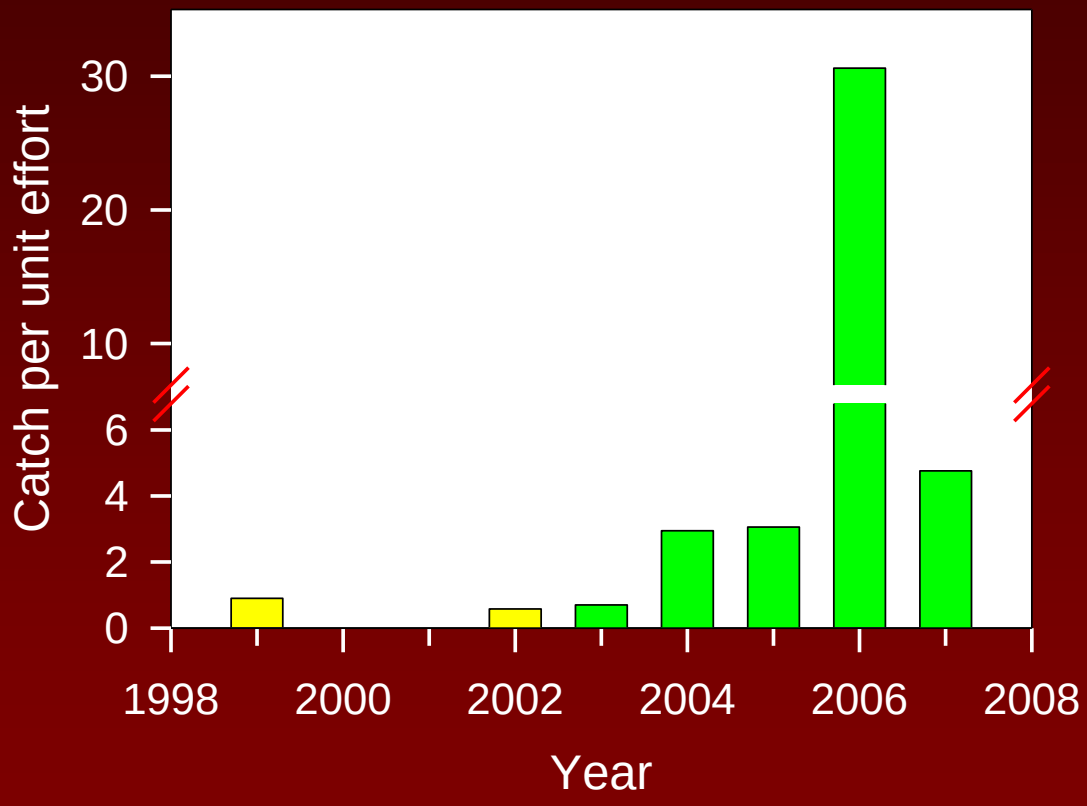
White sucker



Slimy sculpin



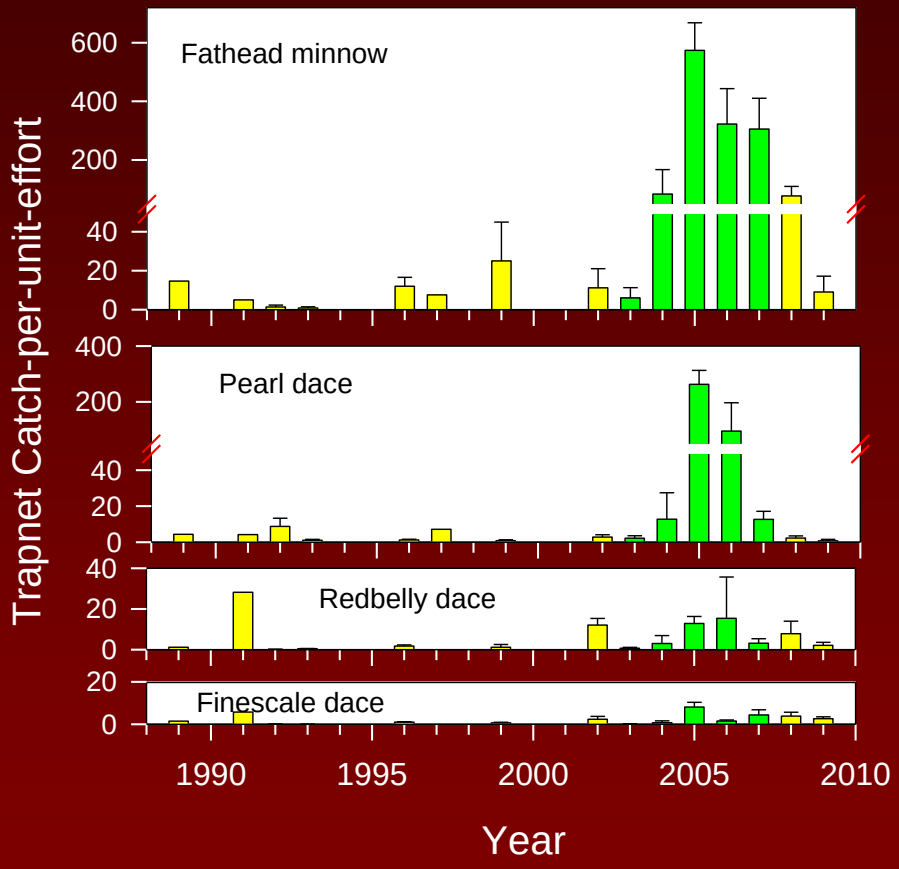
Crayfish



Post Cage culture

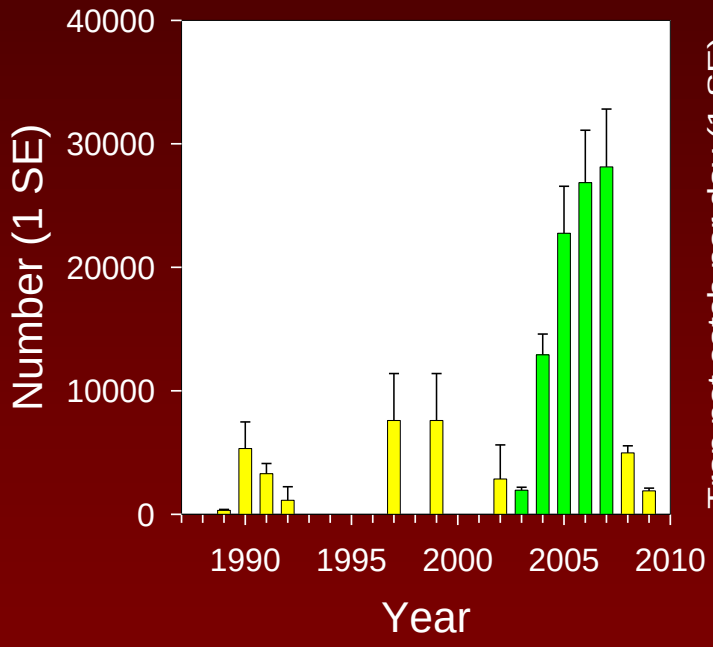
“The Big Crash?”

Minnow abundance



Abundance

White sucker



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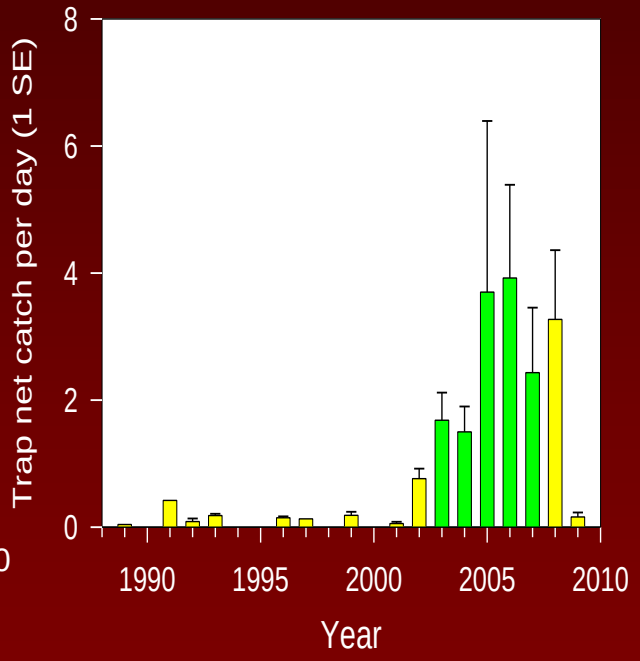
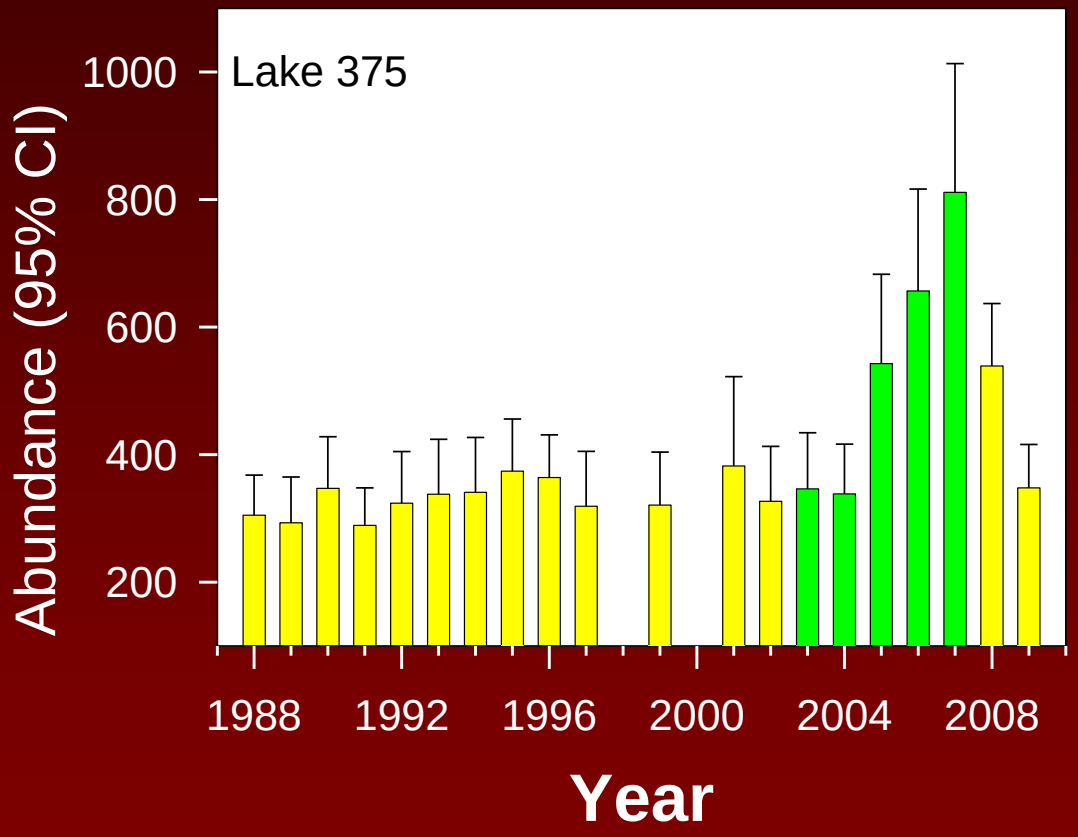


Lake trout

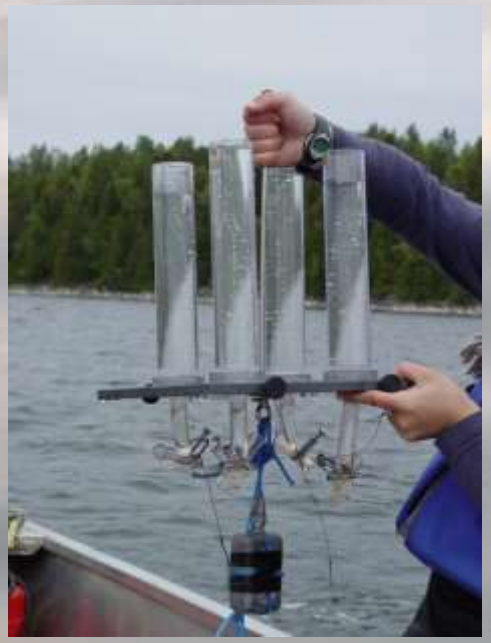

Lake 375
Abundance (95% CI)
1000
800
600
400
200
1988
1992
1996
2000
2004
2008
Year

Summary: Post Culture

- All fish populations returned to pre-culture abundance two years after cage culture stopped
- Lake trout
  - Fatness decreased
  - Growth decreased
  - Increased age of sexual maturity
  - fewer females spawning each year
  - decreased annual survival
  - greatly decreased “recruitment”

Fisheries & Oceans Canada
Science at Buzwah Fisheries

Measuring sedimentation - North Channel Farms

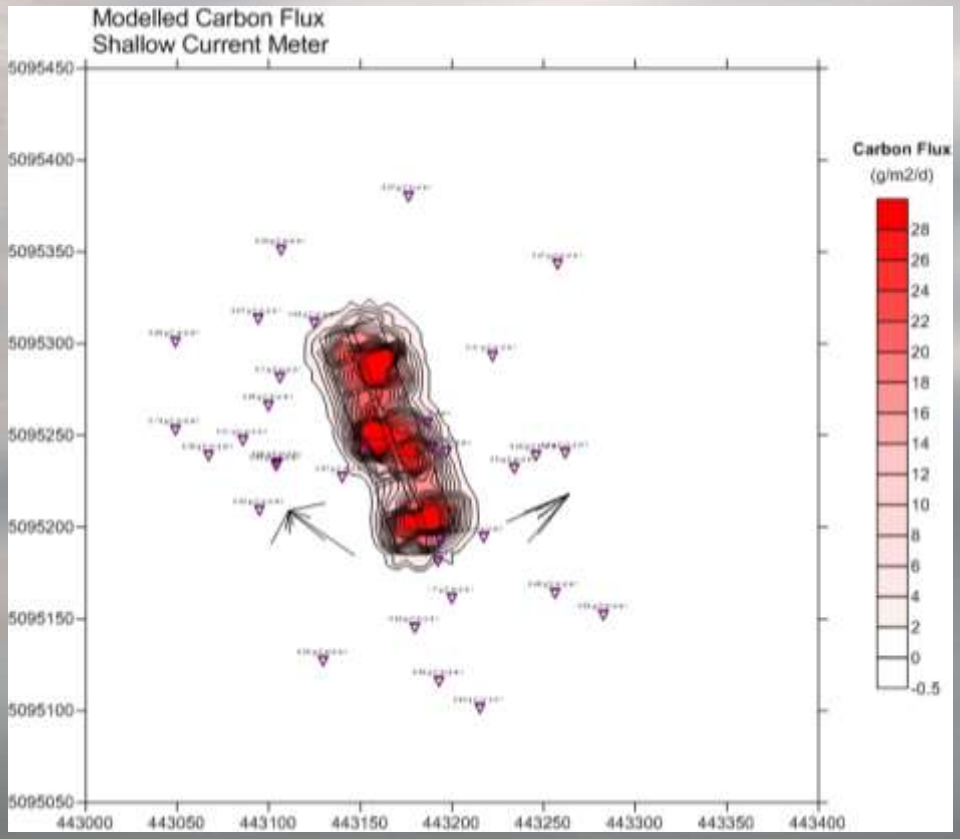


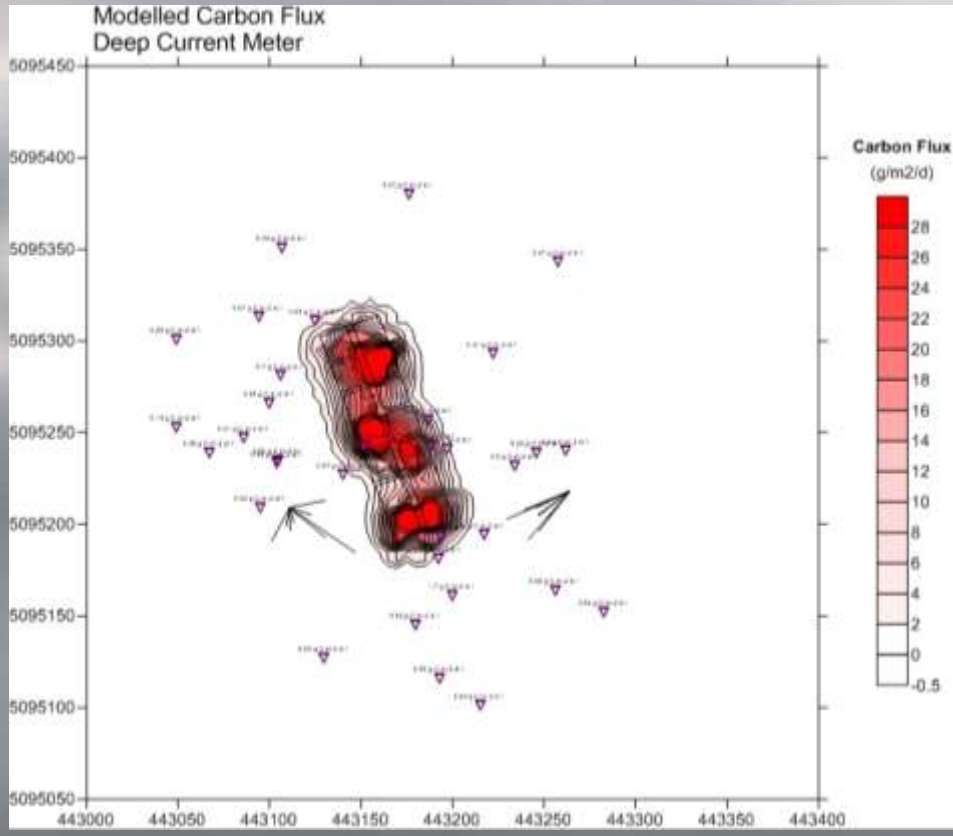
24hr set sedimentation traps around farm.

Material measured as TSS (total suspended solids) and Carbon (C).

Faecal material is approximately 38% C (ELA) 37.5% (Burynuik et al. 2006, *Salmo salar*)

Comparison of outputs from shallow *versus* deep meter





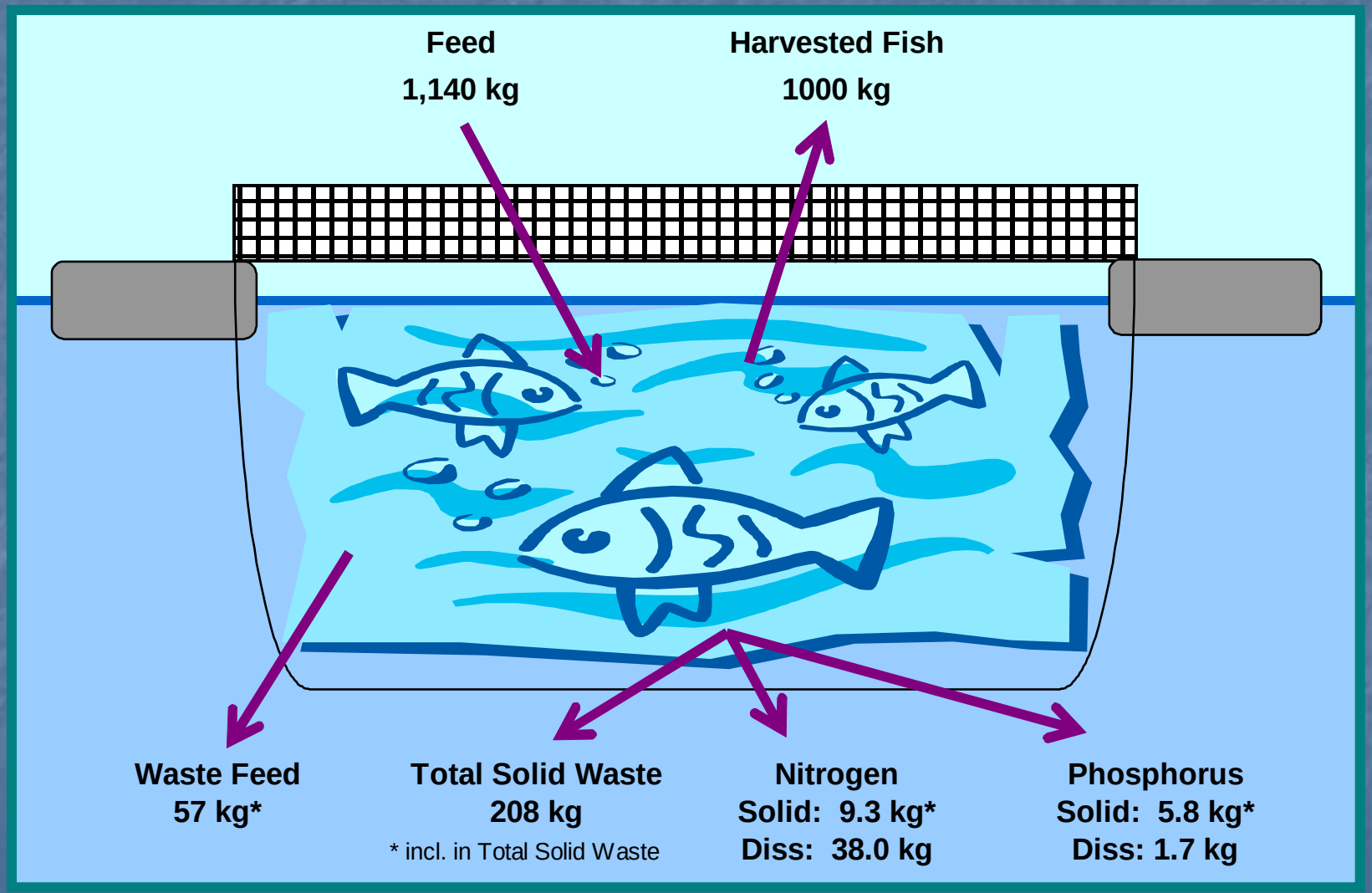
Current meter location irrelevant

High deposition under cages, limited footprint





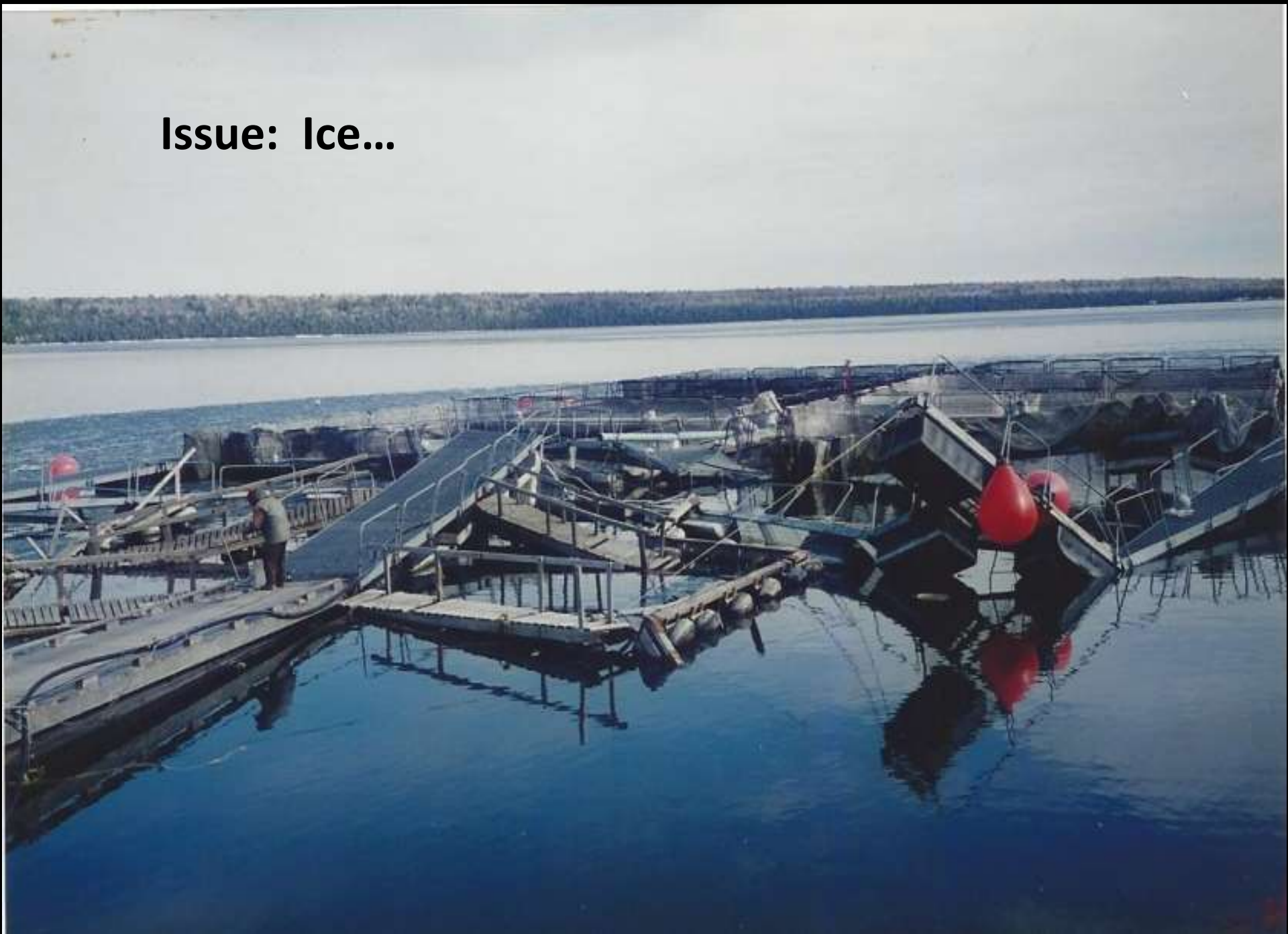

Feed & Feeding




APPLICATION
GUIDELINES
FOR
CAGE
AQUACULTURE
FACILITIES

Net Pens and Risk Management

- Fish Health Management Plans
- Fish Containment Plans
- Sediment Quality Management Plans
- Water Quality Management Plans
- Decommissioning Plans
- Waste Disposal Plans


Issue: Ice…

Solution for Ice Damage - Submersible Net Pens
Mike Meeker - Premiers Award for Agrifood Innovation

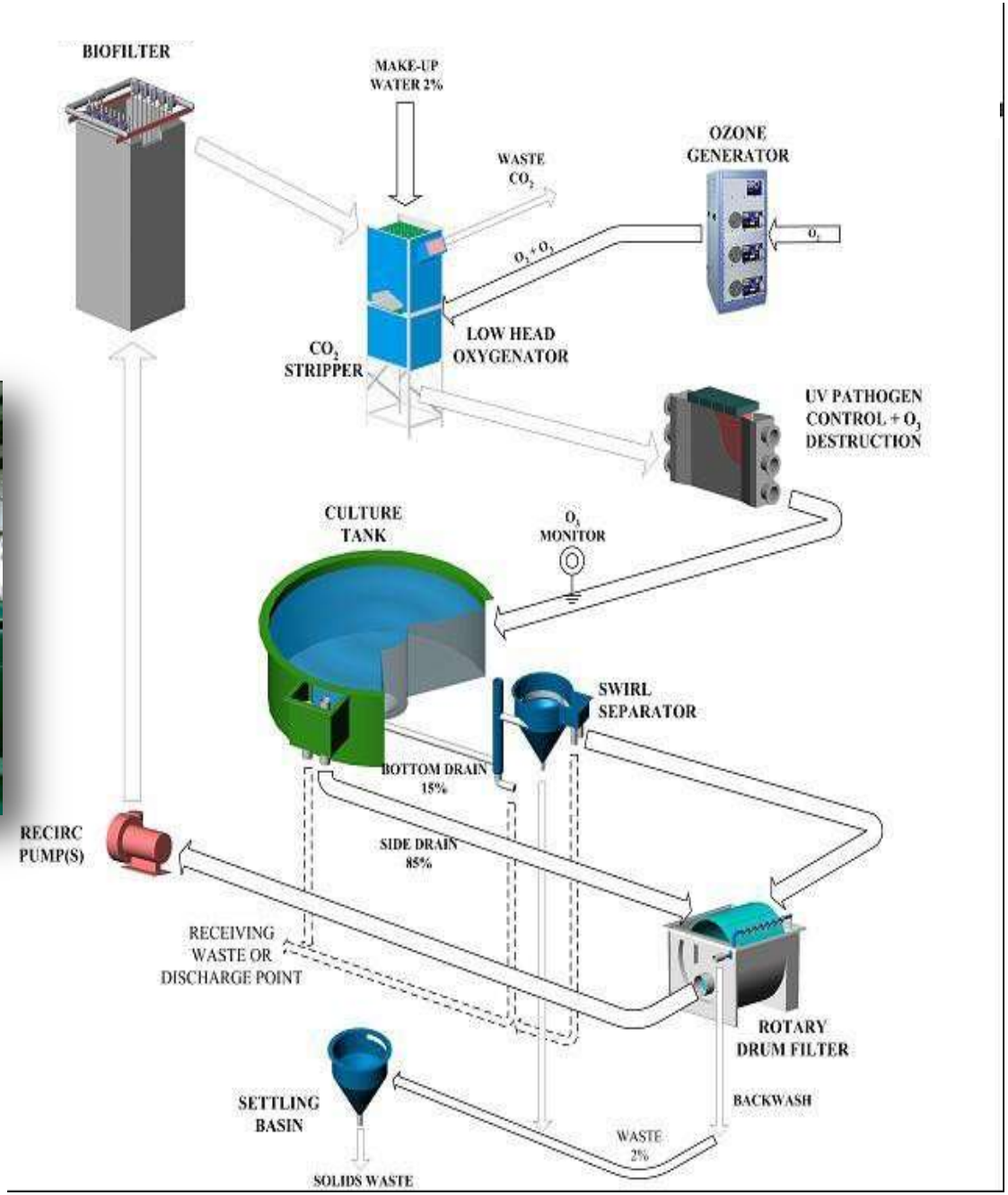
Issue: Higher water temperatures. New technology for high energy environments


SHESHEGWANING
FIRST NATION

Aquaculture – Evolution of RAS

- More sophisticated rearing strategies such as re-circulating aquaculture systems (RAS) have been developed
  - Suited to production of high-value species and juveniles
  - Advantage in areas with limited water supplies
- These systems are expensive (capital and operating costs) and some can be technically complex
- Can be deployed anywhere there is a sufficient supply of water and access to power and other infrastructure
- For the most part, they are isolated from the natural environment

Recirculating Aquaculture Systems



Land-Based Facility Design

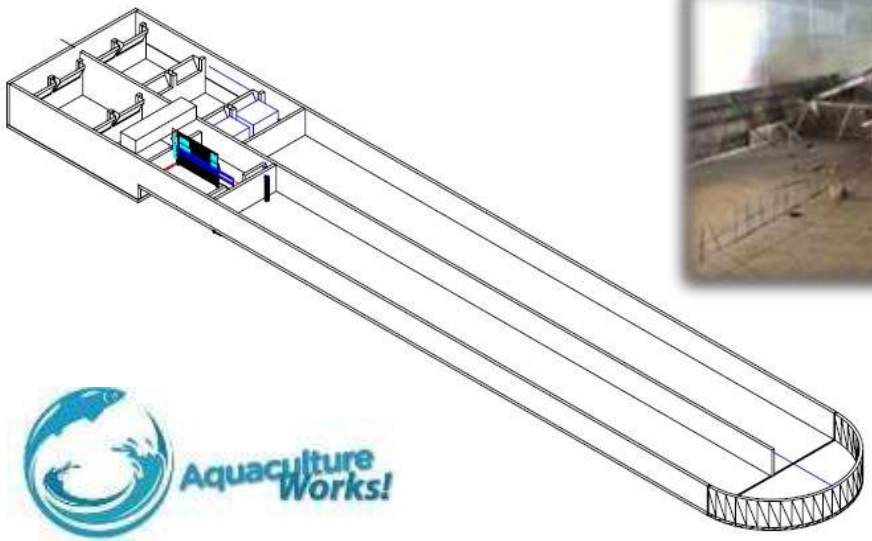
- Unlike in traditional animal production systems and in net pen aquaculture, there is a lack of standardization in land-based aquaculture

Objective is to grow fish …AND make money

Canadian Model Aqua-Farm Program

Production

- 130-tonne rainbow trout farm
- 99% recirculation
- Simple, low-head design
- 430 kg feed / day
- Capital cost = ~$9,000 / mt

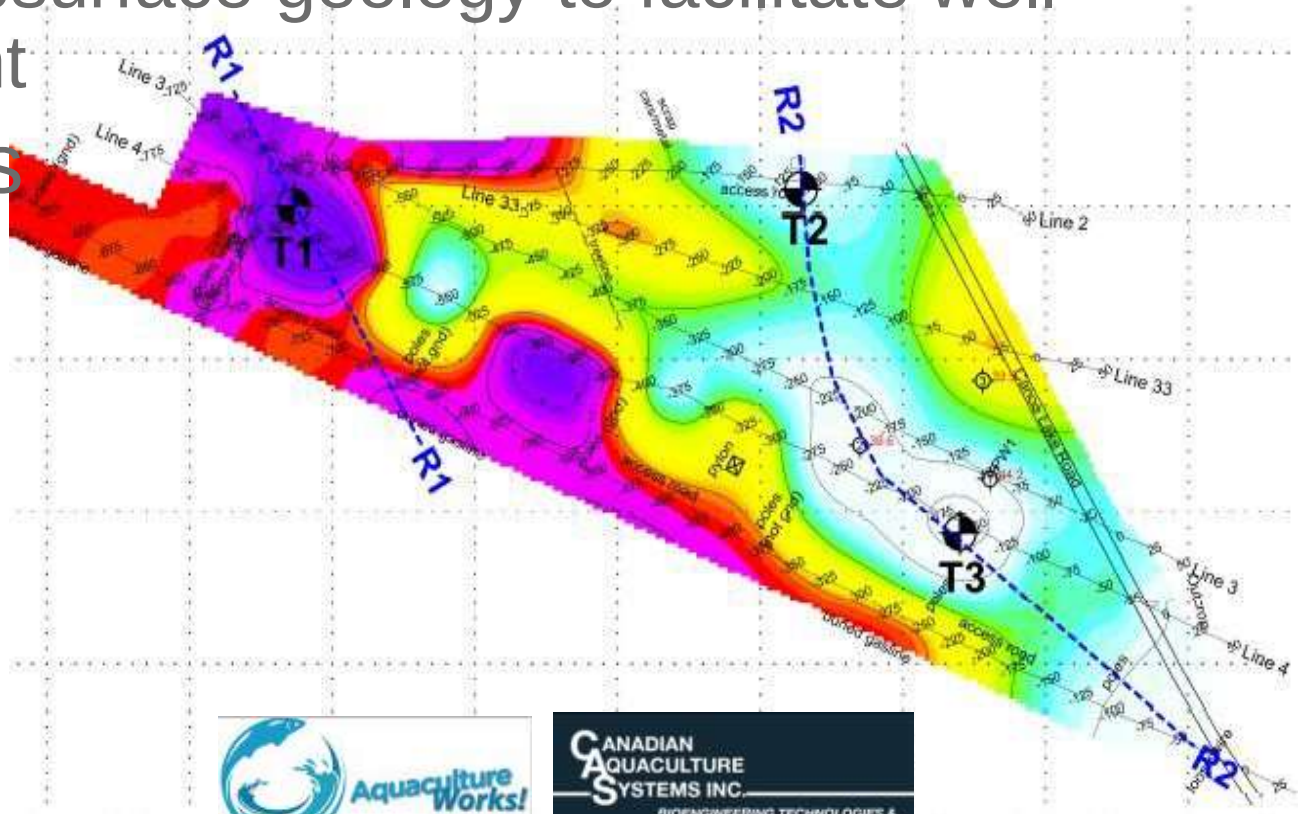



watersongfarms.com

Mississaugi Aquaculture Corporation

Site Development Plan

- Hydrogeological study completed
  - Mapped subsurface geology to facilitate well development
- Multiple wells developed
  - > 200 gpm



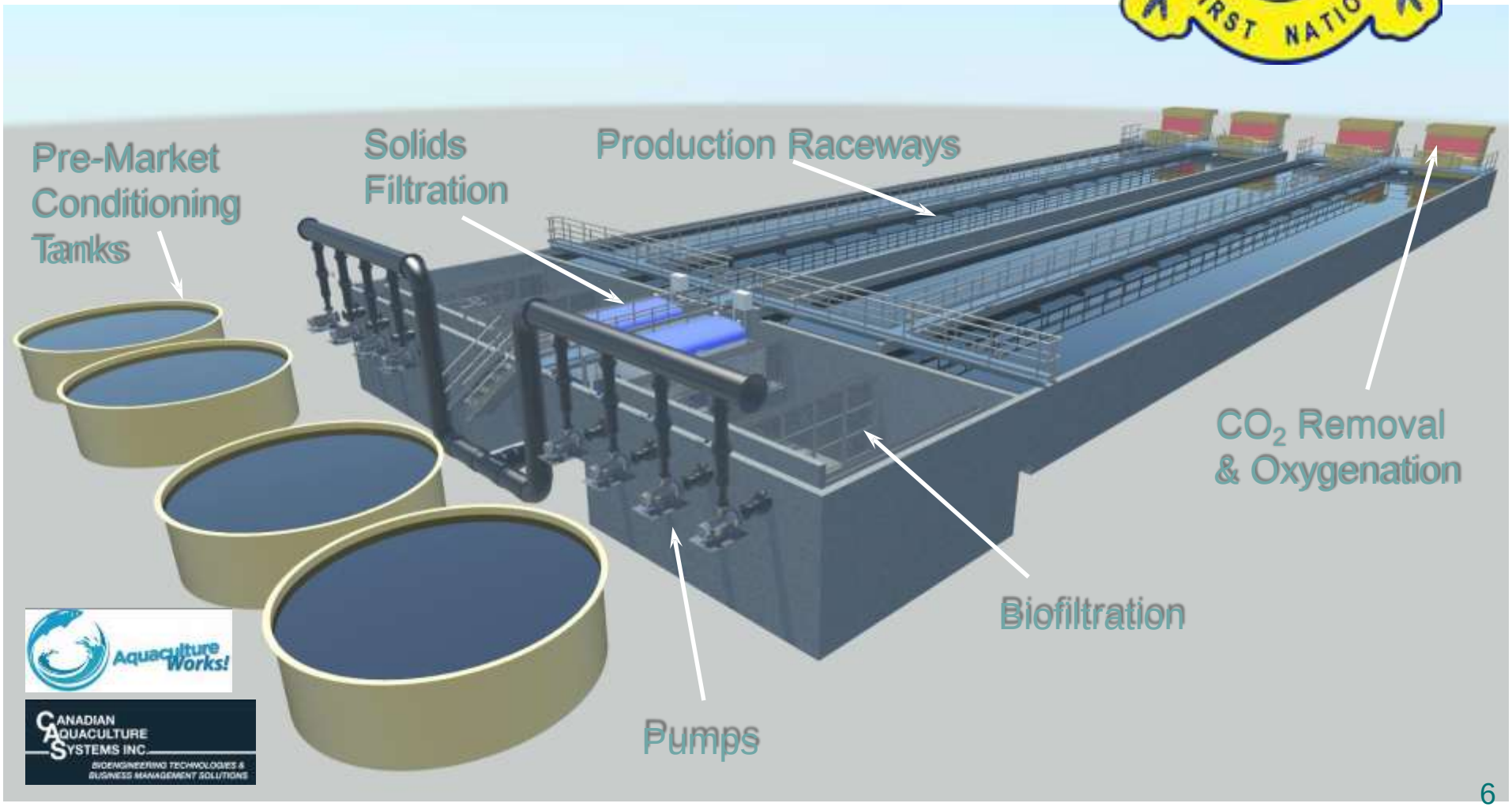
Mississaugi Aquaculture Corporation

Fresh, farmed-raised rainbow trout

- Large fish marketed as steelhead
- ~46,000 kilograms of fish / month
  - 552 tonnes per year
- Average Weight = 2.2 kg (5 lbs)
- Fingerlings produced onsite

Mississaugi Aquaculture Corporation

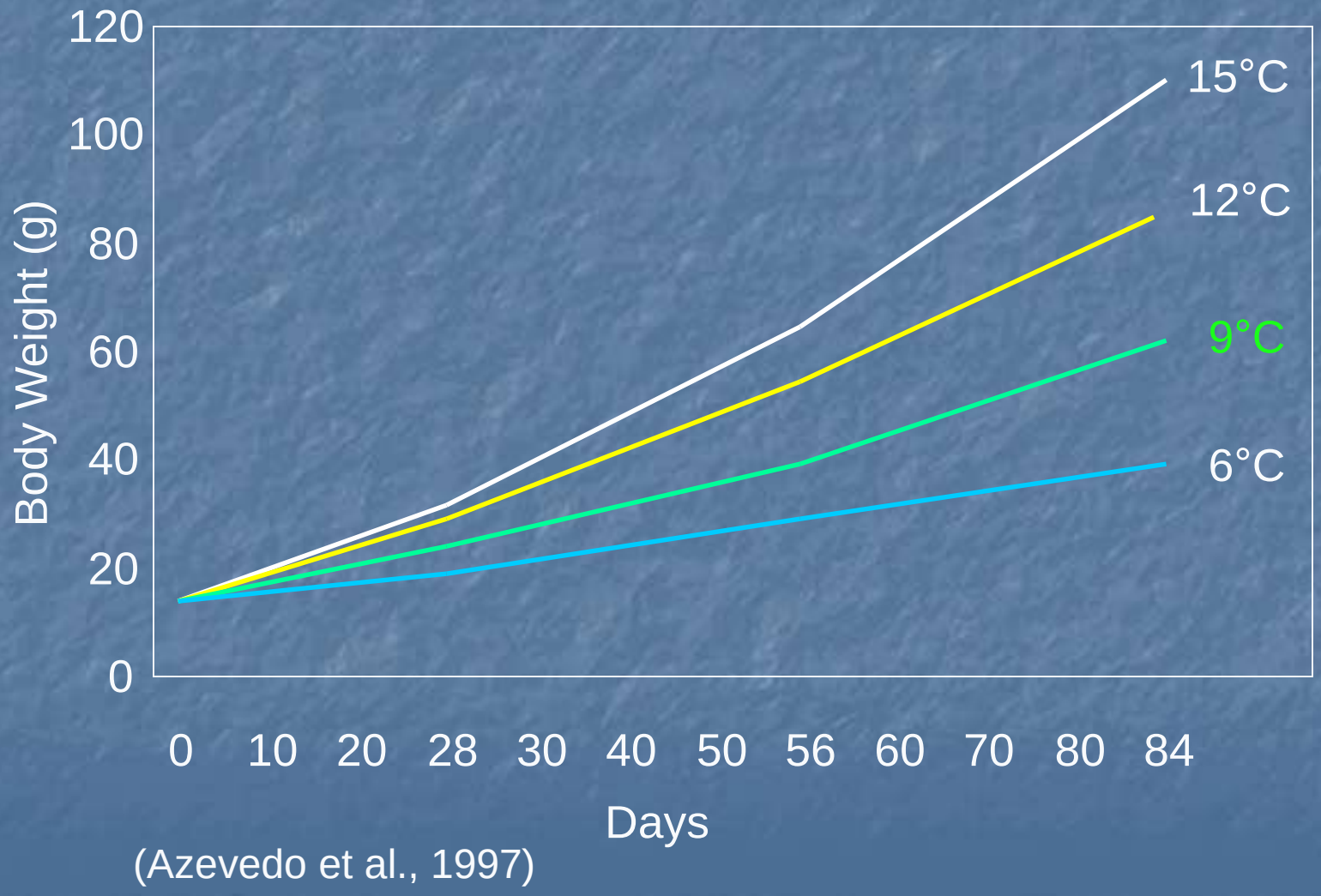
- Recirculating Aquaculture System
  - 99.5% water recirculation



Key Factors in RAS

- Capital cost matters
  - These vary widely according to design and location
- Maximum daily feed ration is fundamental
  - RAS units are designed to process metabolic by-products
- It really doesn't really matter what kind of fish you're feeding
  - FCR
- Inventory turnover does matter
  - Time to reach market size
  - Number of cohorts per year
- Average annual selling price does matter
  - Atlantic salmon
  - Rainbow trout
  - Salmon smolts

Trout Growth v. Temperature



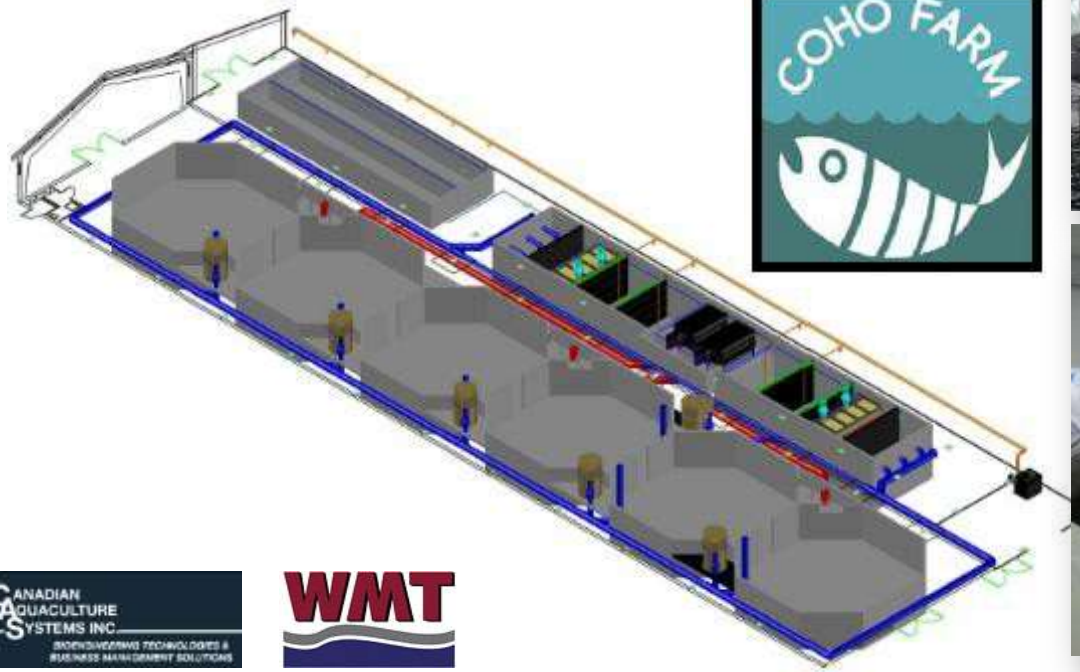
(Azevedo et al., 1997)

Sand Plains AquaCulture

Coho Salmon Farm

Production

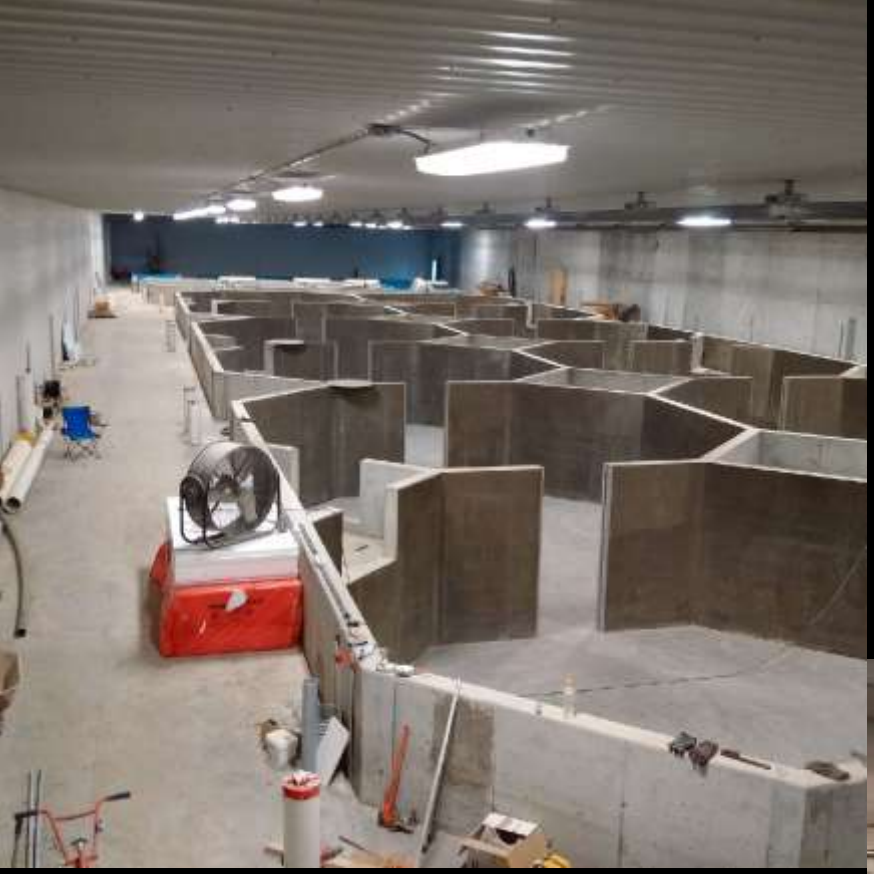
- 200 tonnes coho / year
- 725 kg feed / day
- Capital cost = ~$13,000 / mt
  - Includes land, hatchery and 2 staff apartments



COHO FARM

CANADIAN AQUACULTURE SYSTEMS INC

WMT



Ridgeland Arctic Char Farm
200 tonnes/yr - RAS

Pacific White Shrimp

planet shrimp

First Ontario Shrimp

GOOD4U shrimp

Moose Cree Aquaponics

Moose Cree First Nation

Nutrient Film Technique (NFT)

- 3 beds at 12 ft W x 60 ft L
- 90 NFT channels per bed

Deep Water Culture

- 8 ft x 60 ft

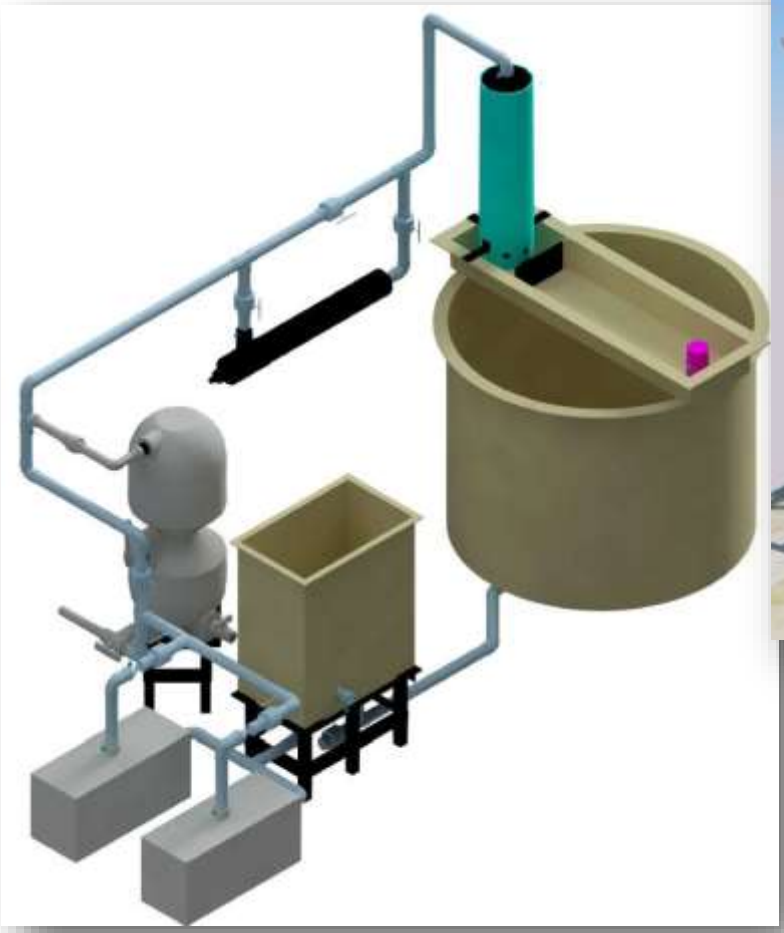
Aquaculture Works!

Canadian Aquaculture Systems Inc.
Bioengineering Technologies & Business Management Solutions

Moose Cree Aquaponics Demonstration System

Moose Cree First Nation

Aquaculture System



Hydroponic System

CANADIAN AQUACULTURE SYSTEMS INC
BIOENGINEERING TECHNOLOGIES & BUSINESS MANAGEMENT SOLUTIONS

Aquaculture Works!

Moose Cree Aquaponics

Moose Cree First Nation

Fresh, farmed-raised fish and vegetables

- Fresh rainbow trout
  - ~1,000 kilograms of fish / month
  - 250 kg per week
- Leafy vegetables
  - ~68,000 heads per year
  - Lettuces, basil, chard, kale, herbs
- Specialty Crops (in future)
  - e.g. strawberries

Deep Water Raft Culture

Nutrient Film Technique

Aquaculture Works!

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Moose Cree Aquaponics Community Model

Moose Cree First Nation

- Developing a related curriculum for implementation at the Delores D. Echum Composite School is a key part of this initiative

Aquaculture

- Students will produce juvenile trout for on-growing in the venture
- Key curriculum components:
  - Biology
  - Environment
  - Mathematics
  - Chemistry

Hydroponics

- Students will propagate seedlings for on-growing in the venture
- Key curriculum components:
  - Biology
  - Environment
  - Mathematics
  - Chemistry

Culinary Arts

- Students will prepare meals using fish and vegetables from the venture
- Key curriculum components:
  - Food Preparation
  - Health & Nutrition
  - Food Safety

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Aquaculture Works!

Walleye Culture

- In the last decade techniques have been developed to successfully raise walleye to market size in recirculation systems - from eggs to 1 kg in about a year.

- No longer need a fingerling pond production phase.

Shawanaga First Nations have been involved in walleye culture since the late 1970's

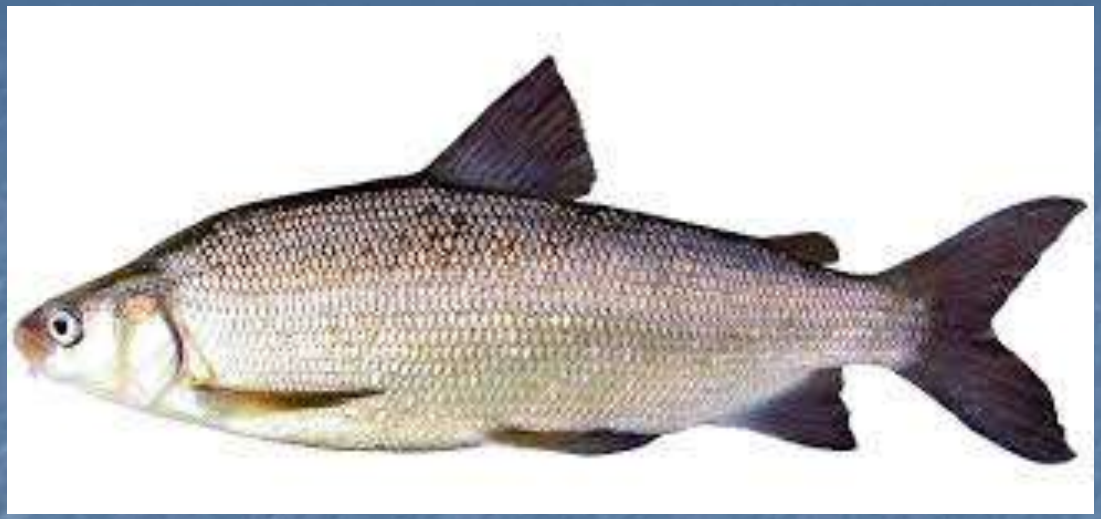
- Constructed a Walleye hatchery in 1996 which has been releasing 3 to 5 million walleye fry annually and millions of fertilized eggs being stocked into the river.

- Shawanaga First Nation has a huge amount of community support towards their restoration efforts and has all been self funded until recent involvement from the NICFI program.

- NICFI funding was able to support Shawanaga First Nation with the purchase of all equipment necessary to expand their hatchery operation to double the number of fry that can be produced as well as ability to grow on to larger summer and fall fingerlings.

- Overall the purpose of this NICFI project was to enhance and expand fish culture operations at the Shawanaga First Nation walleye hatchery.

Whitefish Culture



- In the last decade techniques have been developed to successfully raise whitefish to market size in recirculation and flow through systems - from eggs to market size.

- Current project looking at open water net pen farming techniques.

New North Fisheries – Lake Whitefish
Henvey Inlet First Nations

1.6 million pounds of Lake Whitefish harvested in 2017 from Lake Huron (Ontario Commercial Fisheries Association).
Equivalent to 1 net pen Lake Whitefish farm

Georgina Island First Nations Walleye Project

- Through Waubetek (AACI), Georgina Island First Nations had a feasibility study conducted looking at potential aquaculture opportunities. Walleye RAS was identified as having the most potential.
- They applied for further funding through NICFI to further investigate the opportunity. Part of their investigation was to tour North America's leading facilities for Walleye culture which found them travelling to Iowa and Vermont. A market study and a feasibility study that specifically focused on all elements of this opportunity was conducted
- Walleye will be grown in a RAS facility for the commercial market. This facility will initially be constructed as a pilot sized scale to prove the model and market and will expand with lessons gained from that experience.
- Georgina Island will be participating in the next round of NICFI funding and will be completing a Business Plan, which will be one step closer to becoming shovel ready.

GTA live fish markets

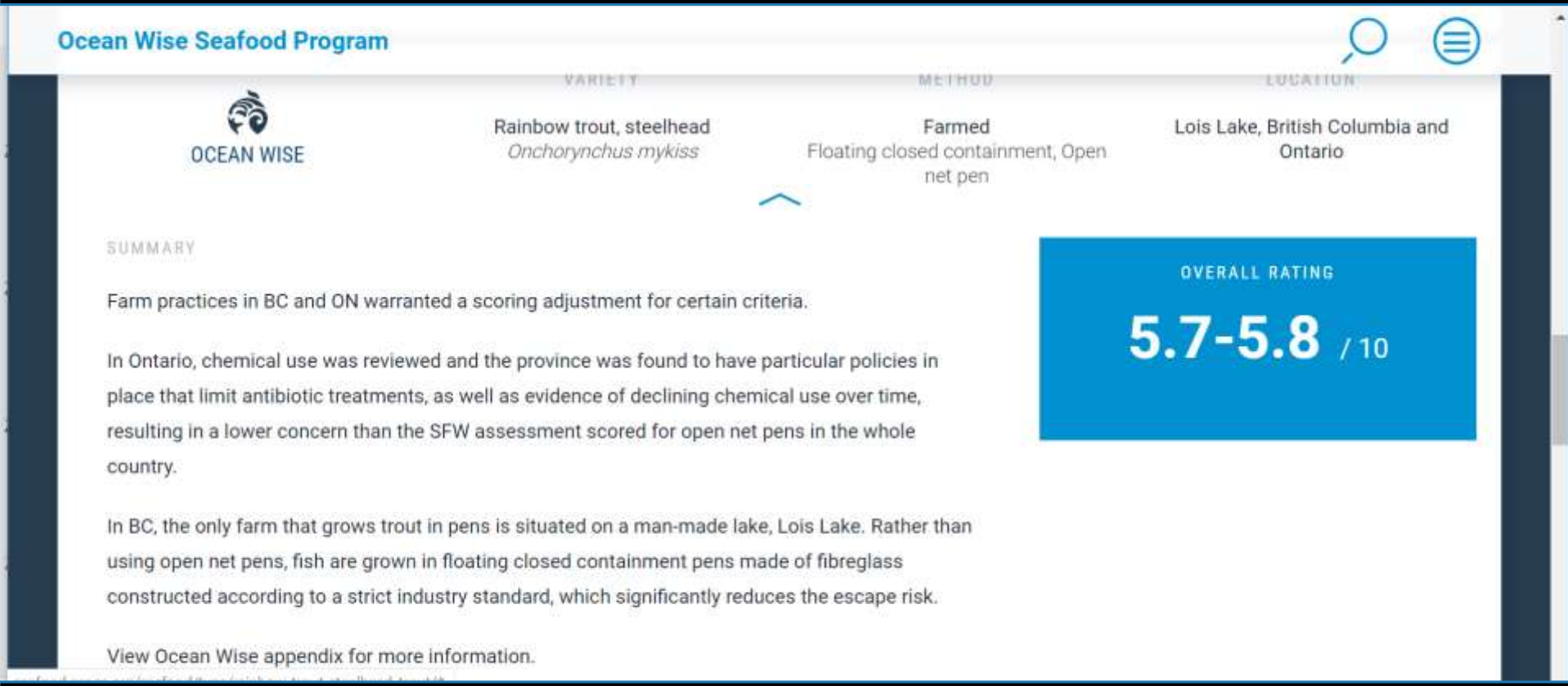

IN-STORE SPECIAL
本店特價
LIVE AUSTRALIA
BARRAMUNDI
游水澳洲桂花魚
7.99
IN-STORE SPECIAL
本店特價


Live Green Bass
游水青斑
$9.99 /LB
AUTHORIZED PERSONNEL ONLY
工作場所 非請勿進

Seafood Certification Programs

Meekers Aquaculture – Organic Certification

Ontario Net Pen sector received Ocean Wise Eco-certification in 2019. Two year review process by Seafood Watch (Monterey Bay Aquarium)



Nicholas Huber

Aquaculture Development Officer

Waubetek Economic Development Agency

WAUBETEK
BUSINESS DEVELOPMENT CORPORATION
A community Futures Development Corporation

NORTHERN INTEGRATED COMMERCIAL FISHERIES INITIATIVE (NICFI)

NICFI has been developed to assist;

- Indigenous groups grow self-sustaining community-based commercial fishing enterprises.
- Create opportunities for capacity building.
- Generate Indigenous employment opportunities.
- Increase long-term Indigenous participation in commercial fisheries and diversification related activities.

Eligible projects will be aimed at communal commercial fishing enterprises and **aquaculture development** with focus on business development planning, advice and training.

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NICFI AQUACULTURE DEVELOPMENT SOURCE

Under NICFI, the NICFI Aquaculture Development Source was created to provide direct support to Aboriginal Communities and Groups to develop sustainable aquaculture operations.

Project activities eligible may include but not limited to;

- Expansion or upgrades to existing marine finfish, shellfish, or freshwater land-based or open net pen aquaculture facilities.
- Equipment, gear and infrastructure for new or expanded aquaculture operations.
- Acquisition of an existing aquaculture operation.
- Business plans, feasibility studies, environmental assessments and studies.
- Other aquaculture operations start-up costs funded on a one-time basis.

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NICFI AQUACULTURE DEVELOPMENT SOURCE

Project activities that are **not eligible** for NICFI Aquaculture Development Source funding;

- Working capital projects.
- Scientific studies.

NICFI AQUACULTURE DEVELOPMENT SOURCE

- Officially launched and established in April 2019. 5 year program.
- Funded & administered by Fisheries & Oceans Canada.
- Facilitated and co-delivered by Waubetek for Central Canada (Ontario, Manitoba, Saskatchewan and Alberta).
- Aquaculture development support and expertise will continue through the Aquaculture Development Officer.
- NICFI has its own pool of funds to draw from, the East and West coast have their own.

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MAIN FOCUS

- This program is designed to allow the Aquaculture Development Officer to be a resource, asset and ally which can provide support for nearly any aquaculture related activity within any stage (pre-development to post operational).
- Main focus is to ensure the best interest of the community is always acknowledged and to ensure all projects are feasible and sustainable.
- Nick is a free resource for the Communities, Individuals and Groups.

NICFI AQUACULTURE DEVELOPMENT SOURCE

ACTIVITIES SUPPORTED

- Equipment & Infrastructure
- Expansion of existing operations
- Feasibility studies
- Detailed designs
- Community engagements
- Business plans
- Partnership developments
- Facility tours and travel

RANGE OF SPECIES

- Rainbow Trout
- Arctic Charr
- Walleye
- Lake Sturgeon
- Lake Whitefish
- Pacific White Shrimp

WAUBETEK'S AQUACULTURE SERVICES

- Assist in identifying new or expanding opportunities.
- Identify new innovations, best practices and approaches.
- Advisory on the implementation of early-stage aquaculture business development plans.
- Identify joint venture opportunities and partnerships.
- Advisory services specific to aquaculture related fisheries and support.
- Assist with flagship business development projects.
- Assist with business improvement projects.
- Host and participate in Aquaculture workshops.

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INDIGENOUS COMMUNITIES ARE POISED FOR GROWTH IN AQUACULTURE PRODUCTION

- The Indigenous aquaculture sector in Central Canada is ready for expansion and it's happening now.
- Aboriginal Communities are in a unique position to benefit from sustainable aquaculture development due to their aquatic resources, rights, and special access to aquaculture development sites.

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