



Great Lakes Invasive Carp Challenge

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CARP TANK



GREAT LAKES VS INVASIVE CARP

Thanks to:

Michigan Carp Team:

- Angela Ayers (Gov's office)
- Seth Herbst (DNR)
- Aaron Parker (DEQ)
- Nick Popoff (DNR)
- Sarah LeSage (DNR)
- Tina Stojakovich (DNR)
- Katy Till (MEDC)
- Trevor Pawl (MEDC)
- Ed Golder (DNR)
- Beverly Maddox (Detroit CoC)

External Experts:

- John Goss (ACRCC)
- Nick Frohnauer (MNDNR)
- Phil Moy (ret SeaGrant)
- Duane Chapman (USGS)
- John Dettmers (GLFC)





Challenge and Process

- 353 solutions; 27 countries
- Internal and external expert judges – blind process
- Prevention of movement, not control
- 4 finalists; 6 runners-up





Carp Tank Event

- March 27 and 28
- Port Authority, Detroit
- Carp Tank
- Research and Development Symposium
- Great Lakes Carp Summit



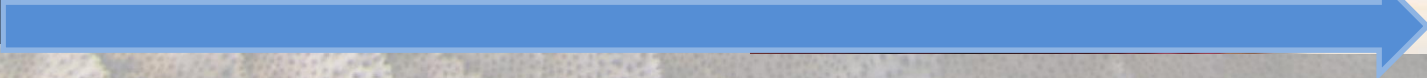
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GREAT LAKES

VS

INVASIVE CARP



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DNR Director Creagh



John Frederickson,
Innocentive



Governor Snyder





Judges: Governor Snyder, Dr. Denice Shaw, Mr. Jeff DeBoer, Dr. David Lodge



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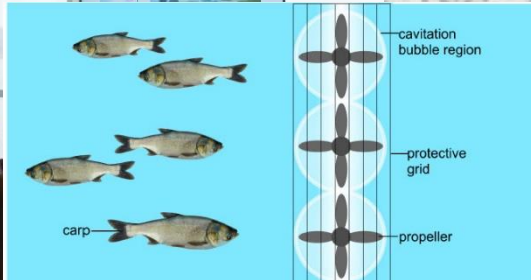
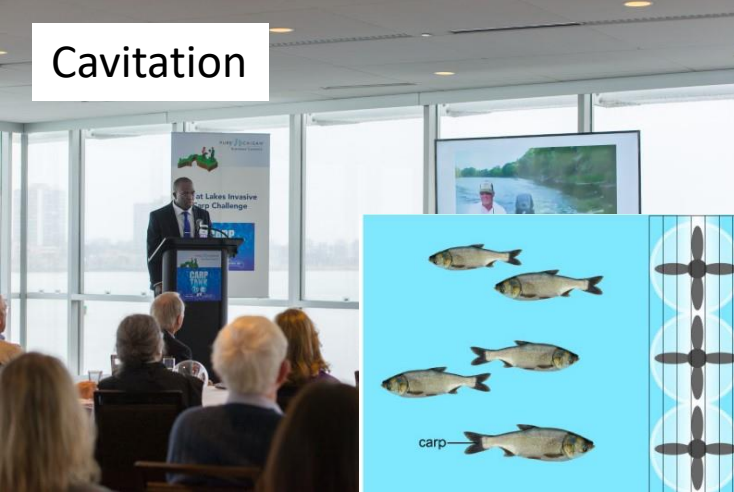


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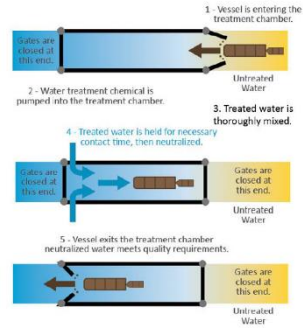
Cavitation



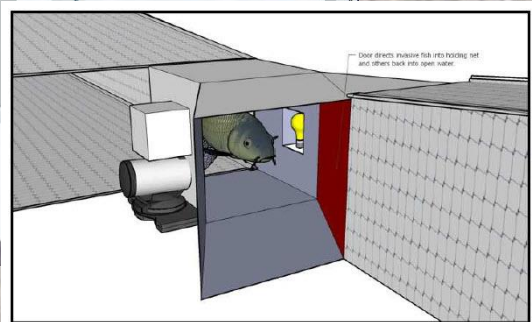
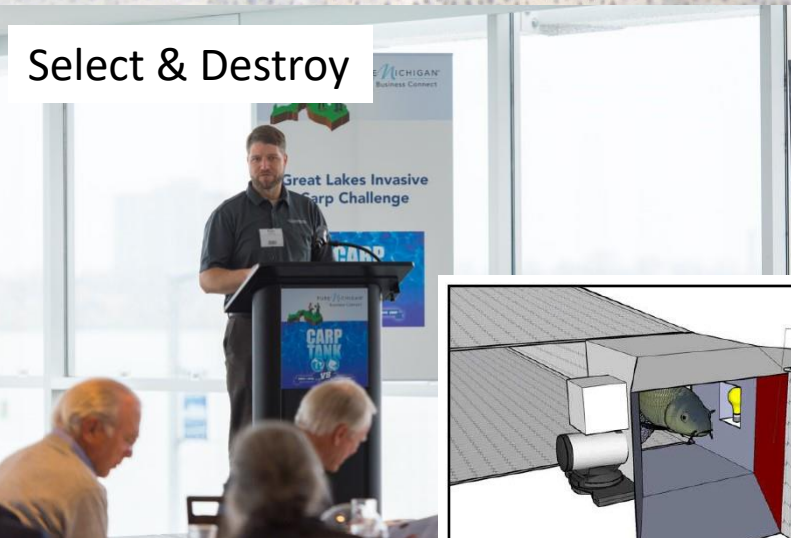
Lock Treatment



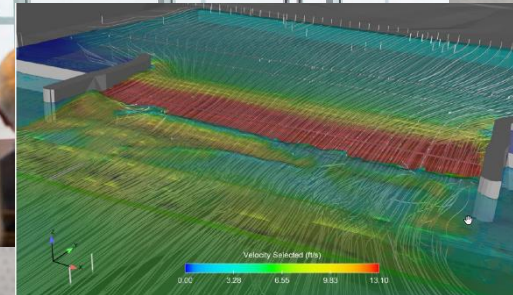
AIS Treatment Chamber Concept



Select & Destroy



Velocity Barriers



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Cavitation Barrier to Deter Asian Carp – Dr. Edem Tsikata

- Wall of cavitation bubbles
- 34 propellers to span the width of the lock
- Restrict movement upstream or downstream & barge voids
- No adverse impacts
- Low energy consumption and low equipment investment
- Can be modeled with computational fluid dynamics software
- Compares this approach with the BAFF in that cavitation will provide better protection, more simply
- Estimates 1.5- 2.0 million to install in structured channel.
- Estimates electrical costs to be about \$316,000 per year.



Recognition and Removal of Invasive Fish – Dr. D. J. Lee

- Guiding all fish through an automated imaging and sorting system
- The imaging system utilizes recognition algorithms to identify fish as they pass through the sorting system. Fish identified as invasive carp will be diverted to a holding area for harvest, and all other fish will be allowed passage through the waterway via a one-way fish gate.
- The solver has deployed a similar device to monitor Chinook salmon populations at a fish ladder
- No adverse impacts to humans, navigation or the environment are noted
- The solution could be applied to any fish species and sizes 2 inches or greater
- Estimates costs of \$80 -\$200K per unit



AIS Lock Treatment System – David Hamilton

- A gated chemical treatment chamber would be installed in the lock or approach channel
- Chlorine would be injected and mixed into the treatment chamber once vessels had moored and gates were closed
- After treatment, sodium bisulfate would be used to detoxify the water before release
- Requires an increase in depth of 4-5 ft for the mixing equipment
- The solution is designed to be lethal to all fish, including invasive carp 2-inches long or greater
- Estimated costs to construct are \$43.5 million; annual operating costs are \$6-9 million
- Concentration of 10 mg/l was used to evaluate and is the greatest concentration allowed in swimming pools.
- Will require corrosion testing and corrosion mitigation and management for infrastructure and vessels, likely



Adjustable Physical Velocity Barriers -Michael Scurlock

- The velocity barrier would concentrate flow in the lock and channel to a degree that would exceed the swimming capabilities of invasive carp
- Velocity barrier would be activated after vessels have moored, essentially flushing the system before the lock gates are closed.
- Scientifically derived swim speeds for Asian carp leading to a velocity barrier idea
- The velocity barriers would be created within the lock channel
- Contrasts this approach with the flushing lock concept
- Requires refinement of gate geometries, channel geometries, and lock operation to create the velocity barrier configurations
- Estimates costs at about \$33 million
- Low energy consumption is noted



Runners-up

- **Micheal Ahimbisibwe** - *Primary Lock and Barrier Platform*
- **Stephen Walker** - *O2 Removal and CO2 Injection System for Control of Invasive Carp*
- **Philip Doberenz** - *Resonant Ultrasonic Carp Barrier*
- **Thomas Bliznik** - *Mechanical Fish Herder*
- **Matthew Cook** - *Remotely Operated Vehicle Recovery of Asian Carp by Acoustic Detection and Narcotization*
- **Lawrence P. Kearns, FAIA** - *FishFentz*



Specific Installations

Big River

Cavitation
Ultrasonic sound
ROV

Tributary

Cavitation
Select & destroy
Ultrasonic sound
Fishfentz

Locks

Lock treatment
Cavitation
Velocity barriers
Lock and barrier platform
O2 removal; CO2
Ultrasonic sound
Mechanical fish herder
ROV



Next Steps

- Collaboration began at the meeting
- Continued conversations
 - U.S. Geological Survey – general meeting
 - U.S. Army Corps of Engineers – review solutions
 - U.S. Geological Survey – antimycin connection and CO₂

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INVASIVE CARP



Asian Carp

**a pain in the weir.
Protect the Great Lakes
Stop the invasion.**