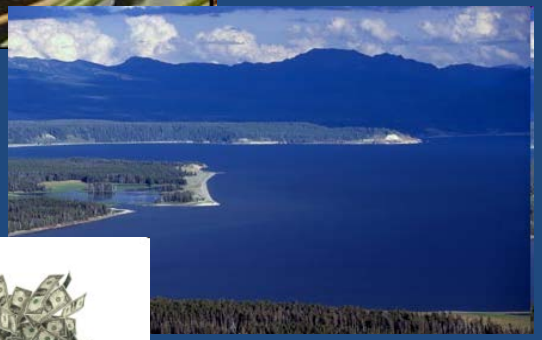
Research and management of invasive species: on the road to ecological recovery.

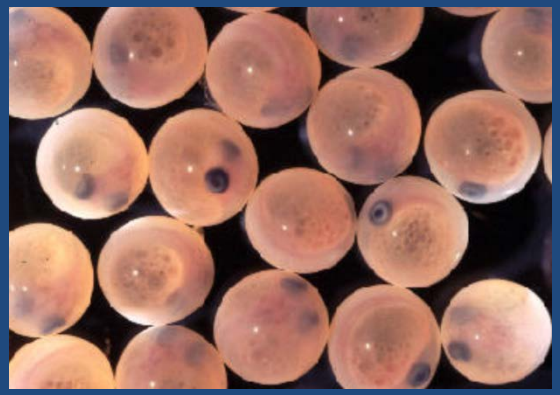
Jackson Gross MSPH PhD
Smith – Root Inc

Many invasive aquatic species, but few management methods proven to be successful.



Innovative Conservation Technology

- Current methods primarily targets adult fish
- Objectives:
  - Specific life stages
  - Lethal and nonlethal
  - Critical periods of susceptibility
  - Dose response



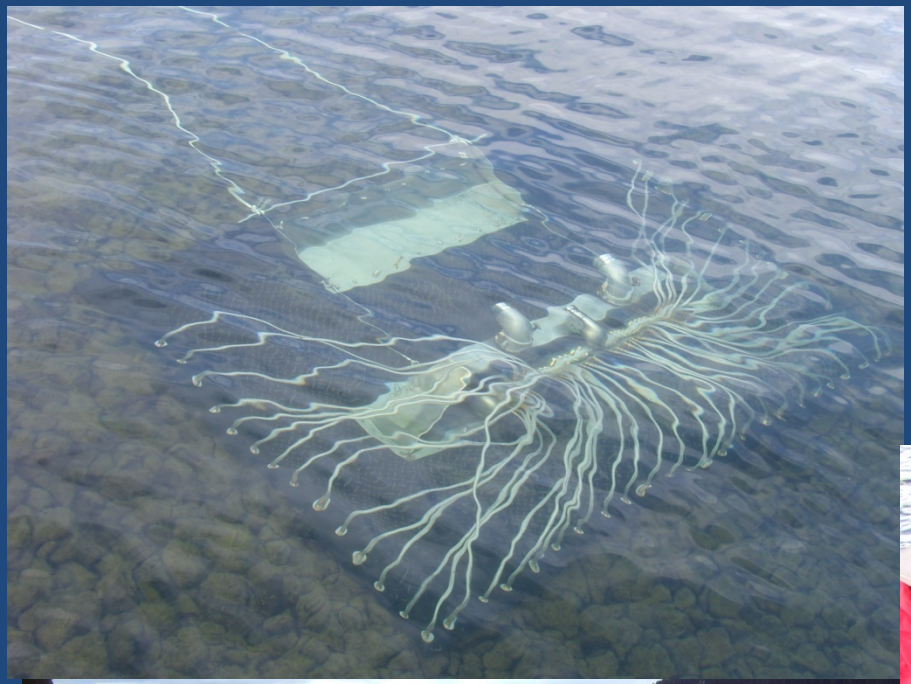
Management vs. Research

Since Introduction of Lake Trout, Yellowstone Cutthroat Trout in the Yellowstone Ecosystem have Declined Dramatically.

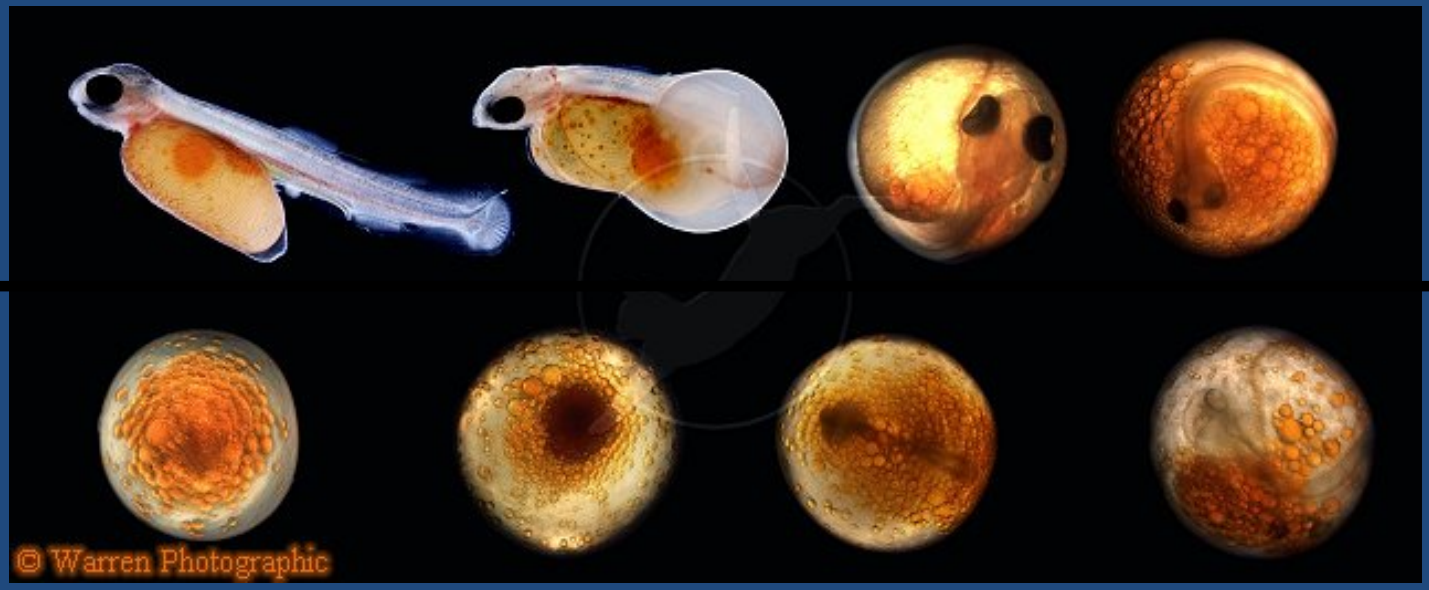
- Ecosystem wide impacts with loss of cutthroat

- Genetics (pure strain)

Suction / Water Jet Technology



Electricity



Early embryonic stage most susceptible

Electric Barrier:
Fish control and passage

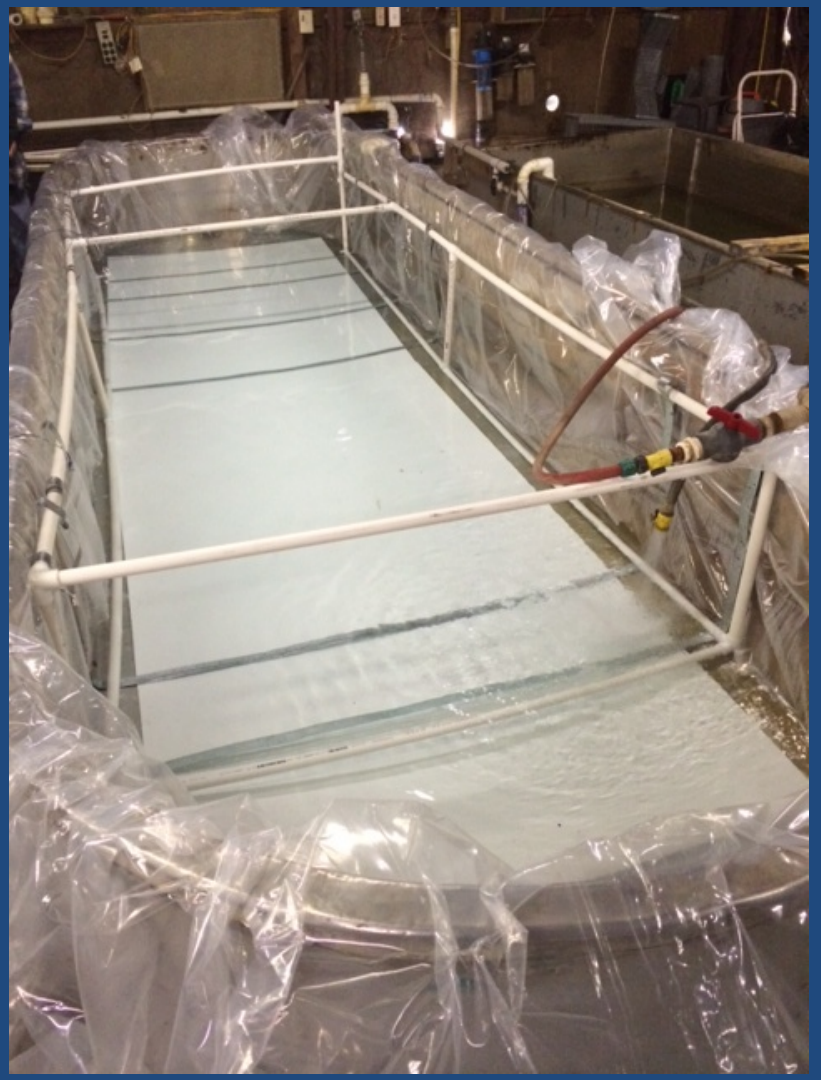
Carp, Carp, Carp and some other stuff

Studies designed to evaluate fish physiology associated with common electric barrier settings to prevent fish passage

- Bighead and Silver Carp, Topeka IL
- Round Goby and Sea Lamprey, Charlevoix MI
- Common Carp, Boulder City NV
- Northern Pike, Grass Carp, Rainbow Trout, Osage Beach MO
- Additional studies for 2016?
  - Sturgeon (Lake, White, Pallid)
  - Paddlefish
  - Walleye
  - Pikeminnow

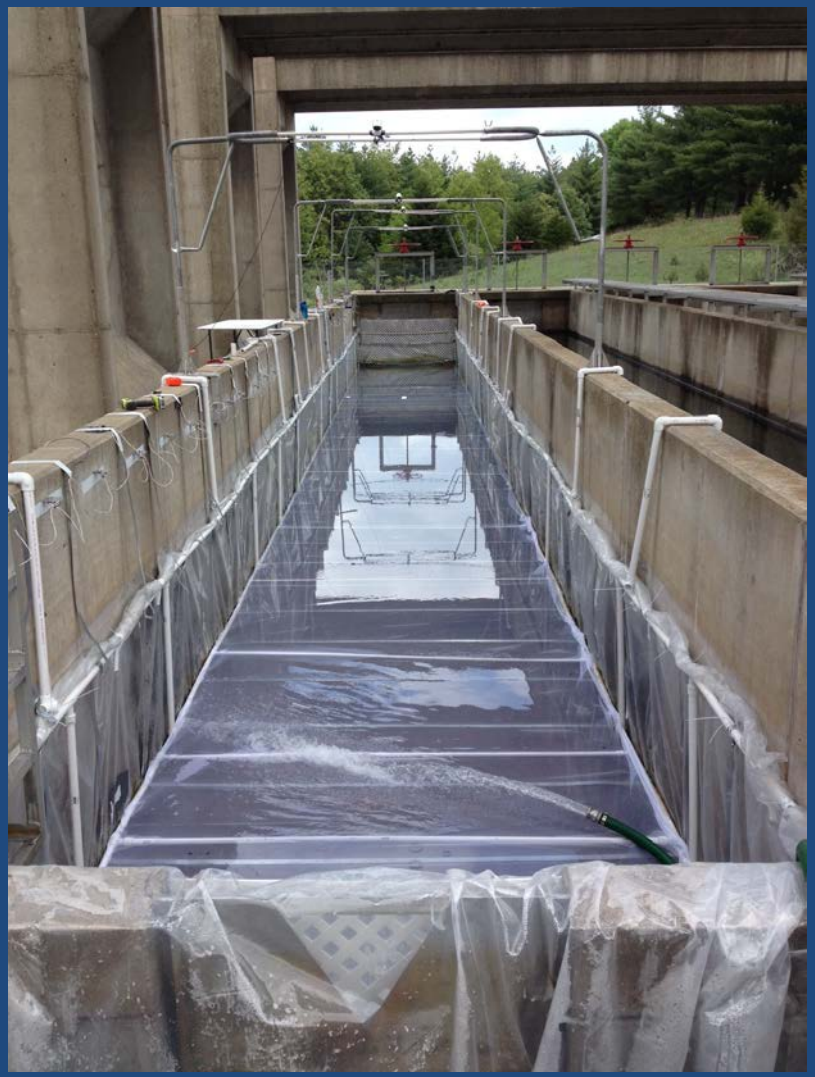
Homogenous Electric Field Gradients

- Electrode types: Bar
- Electrode mounting: U-shaped
- Spacing: 0.66 – 1 meter
- Width: 2 – 3 meters
- Length: 0.33 – 20.1 meters
- Depth: 0.45 - 1.2 meters
- Conductivity: 250-350 uS
- Flow: Static
- Approach electrode: Anode



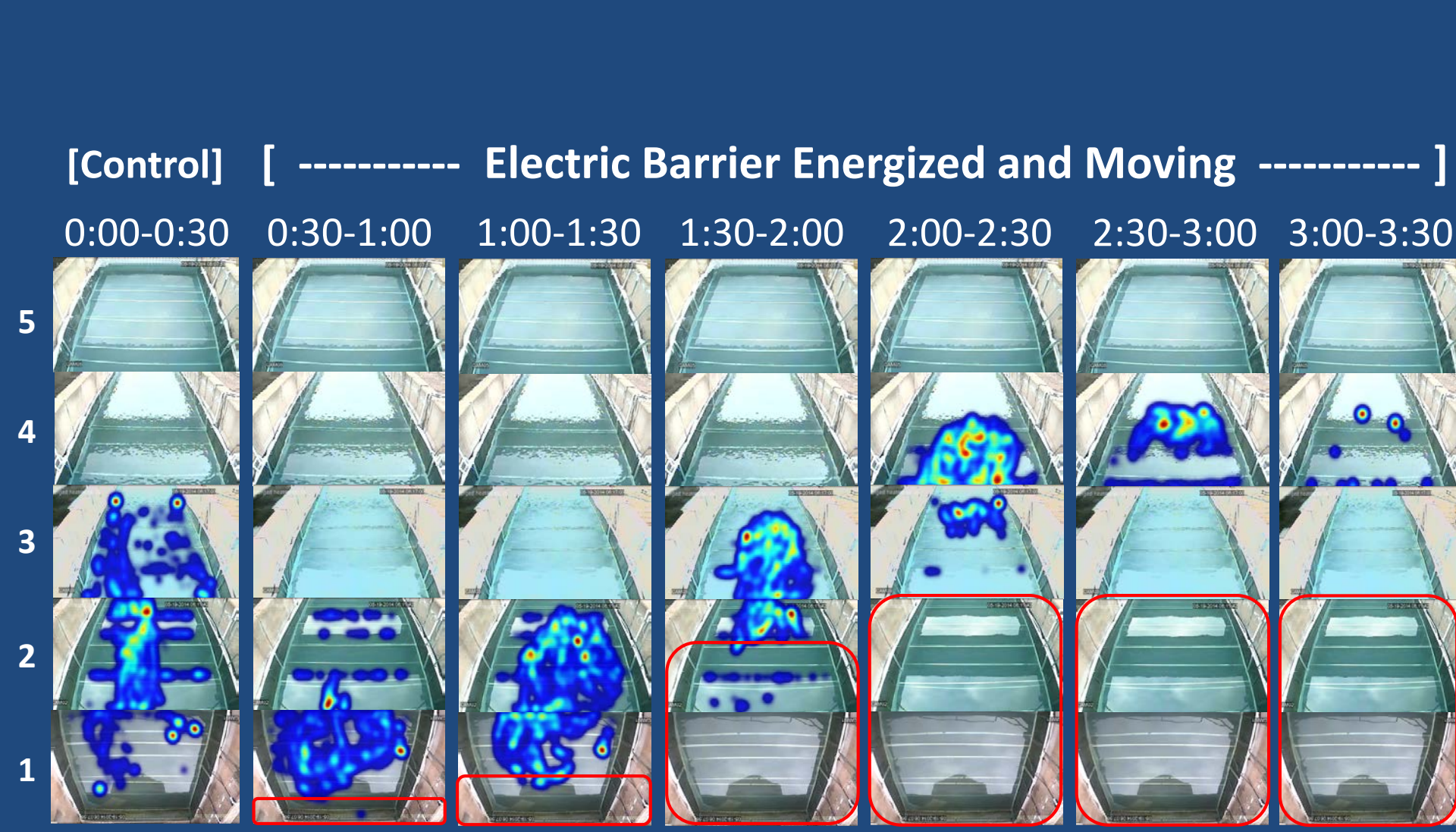
Sea lamprey and Round goby

Tested the ability to move and incapacitate bighead and silver carps



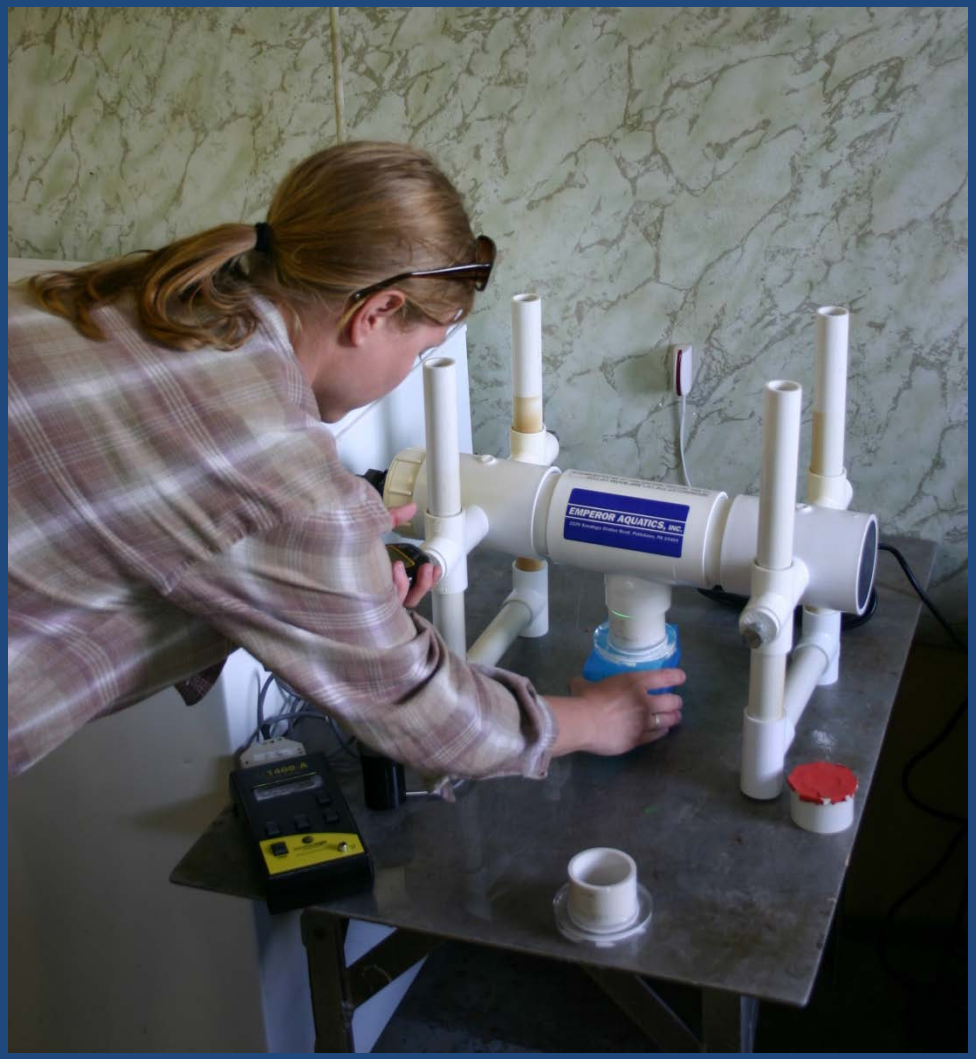
Jake Wolf Memorial Fish Hatchery IDNR

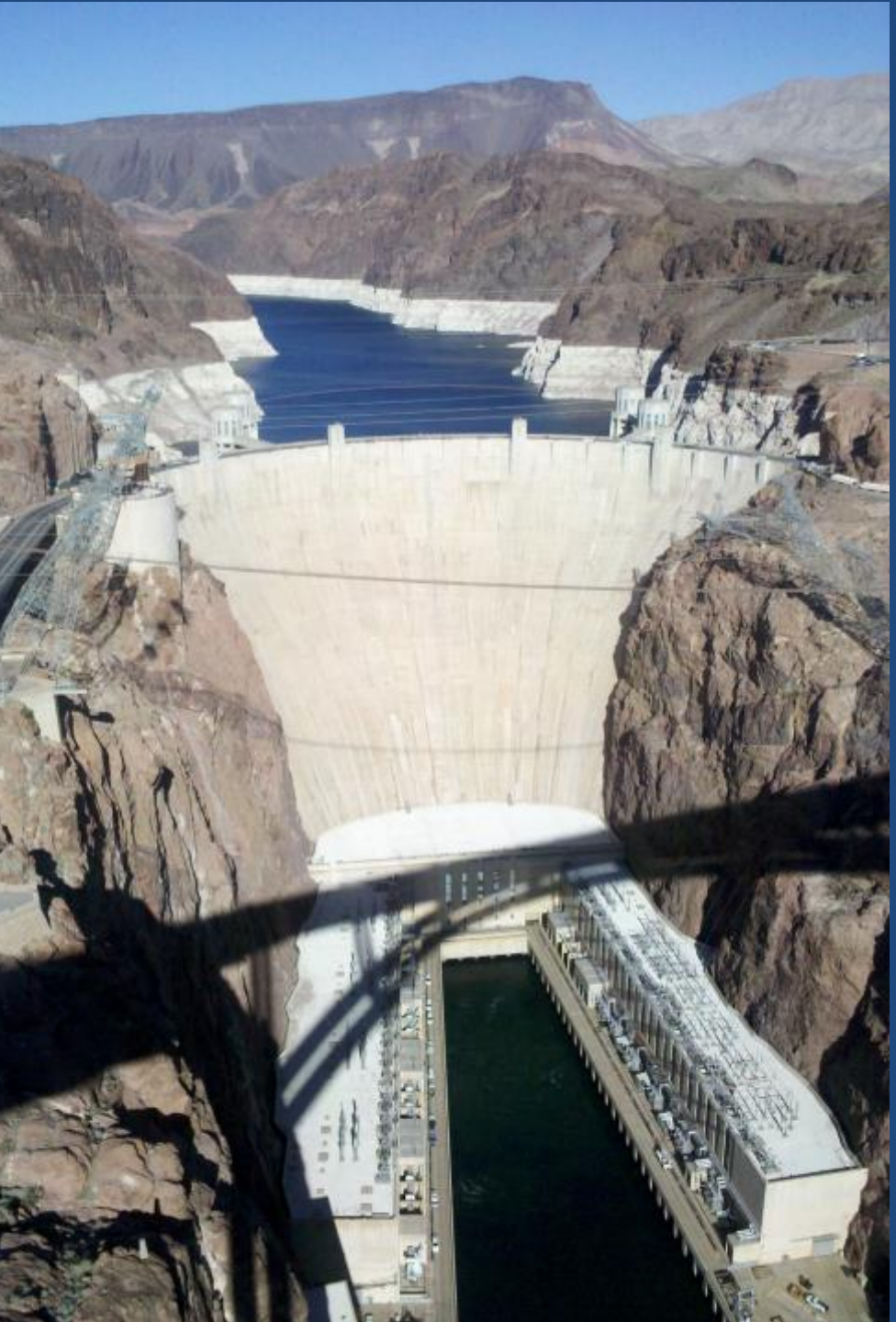
- 23 x 2.4 x 1 m deep raceway
- 1 Static 4.9 m terminal field
- 2 Dynamic 8 m sweeping fields
- 3 sizes of bighead
- 1 size of silver
- Video surveillance



Large bighead carp (TL mean 51.3 cm, range 45.3-58.5 cm)

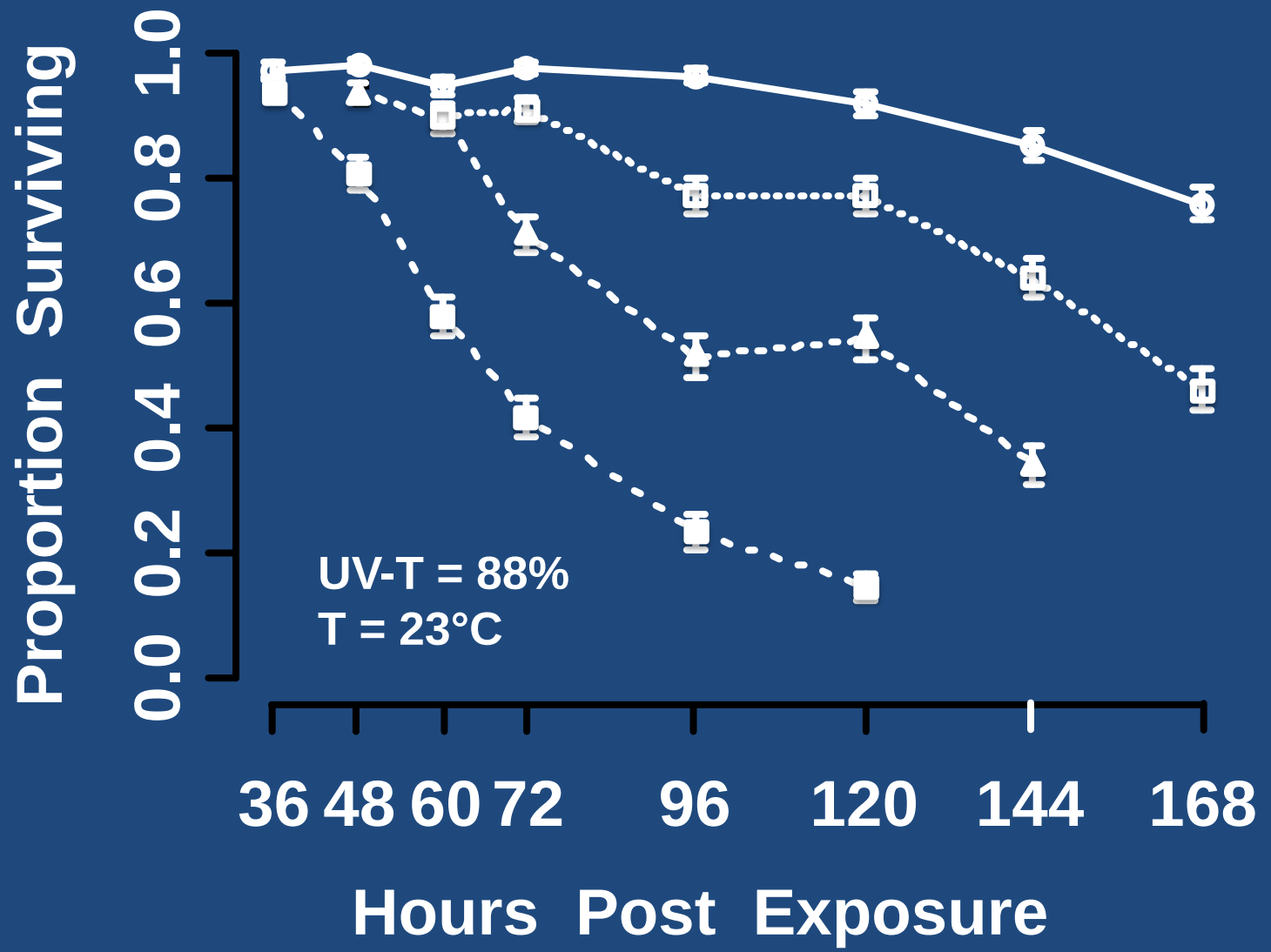
Effects of light radiation





UV light and seismic technology as potential control strategies for Dreissenid mussels

Delayed Mortality for QM Veligers

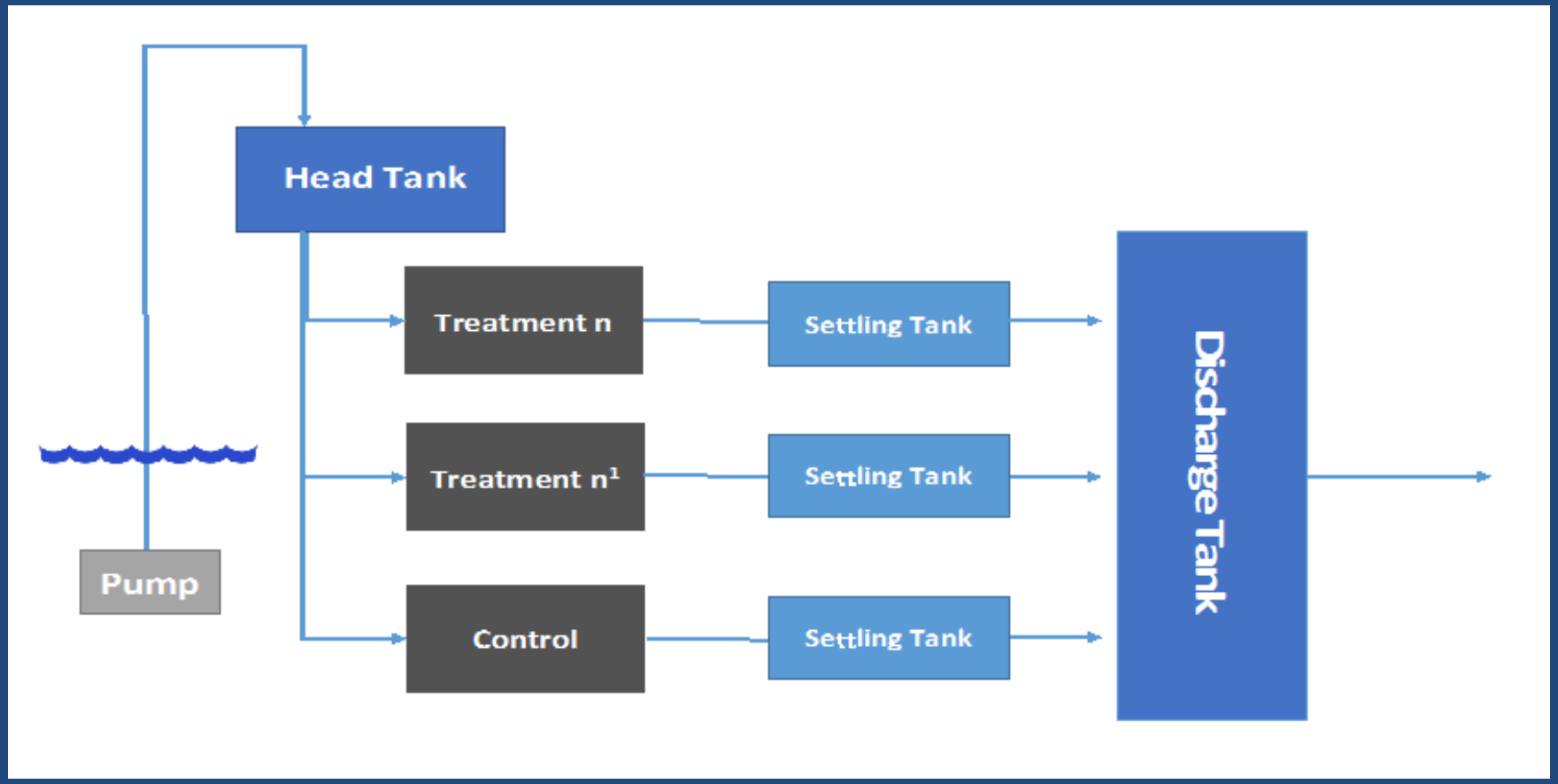


Lake Mead, Nevada

2 year study: October 2015 – October 2017

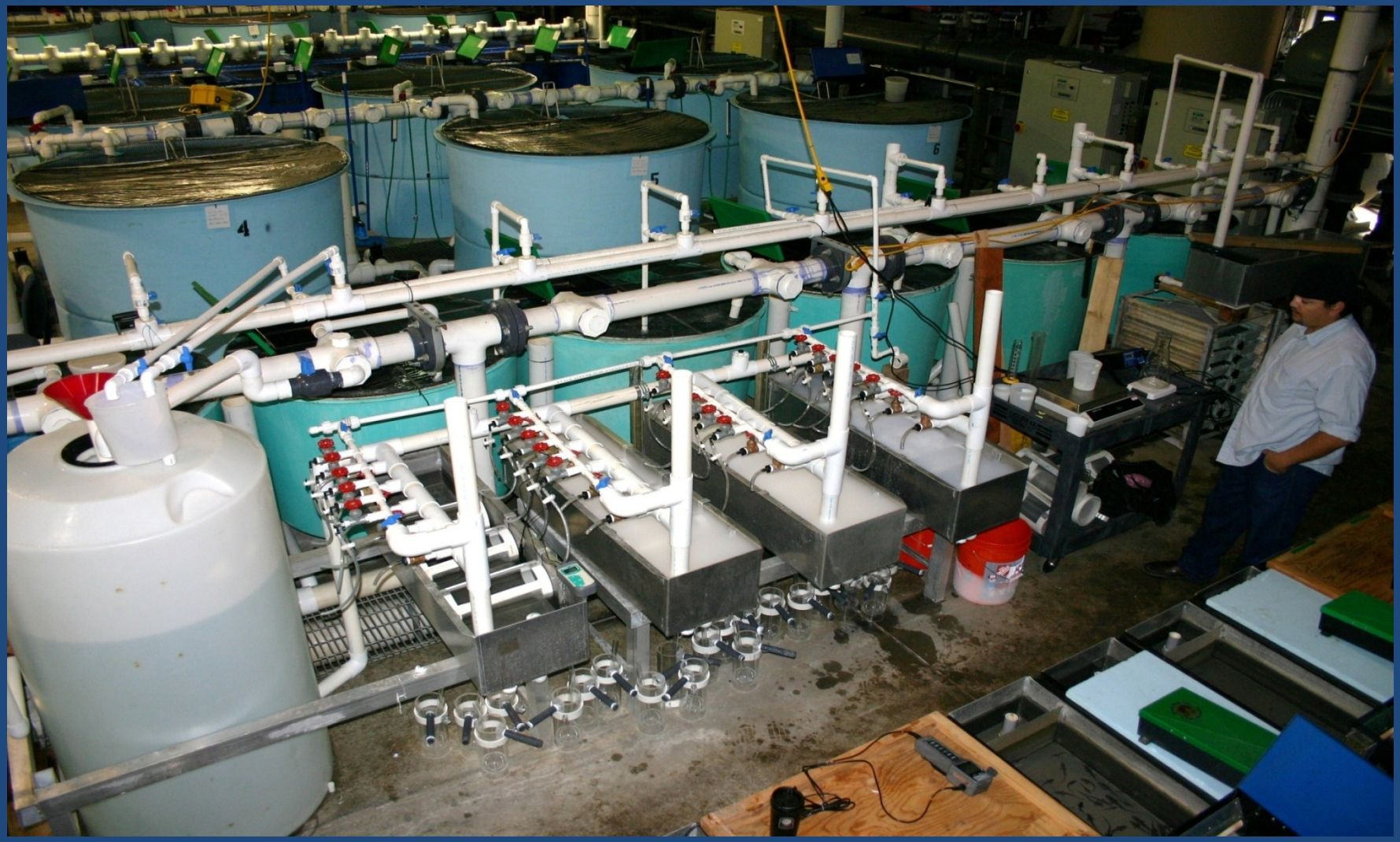
Determine the dosage of UV to *prevent settlement* in a flow through system and at variable transmissibilities

Determine minimum UV-C & UV-B dose to prevent larval settlement

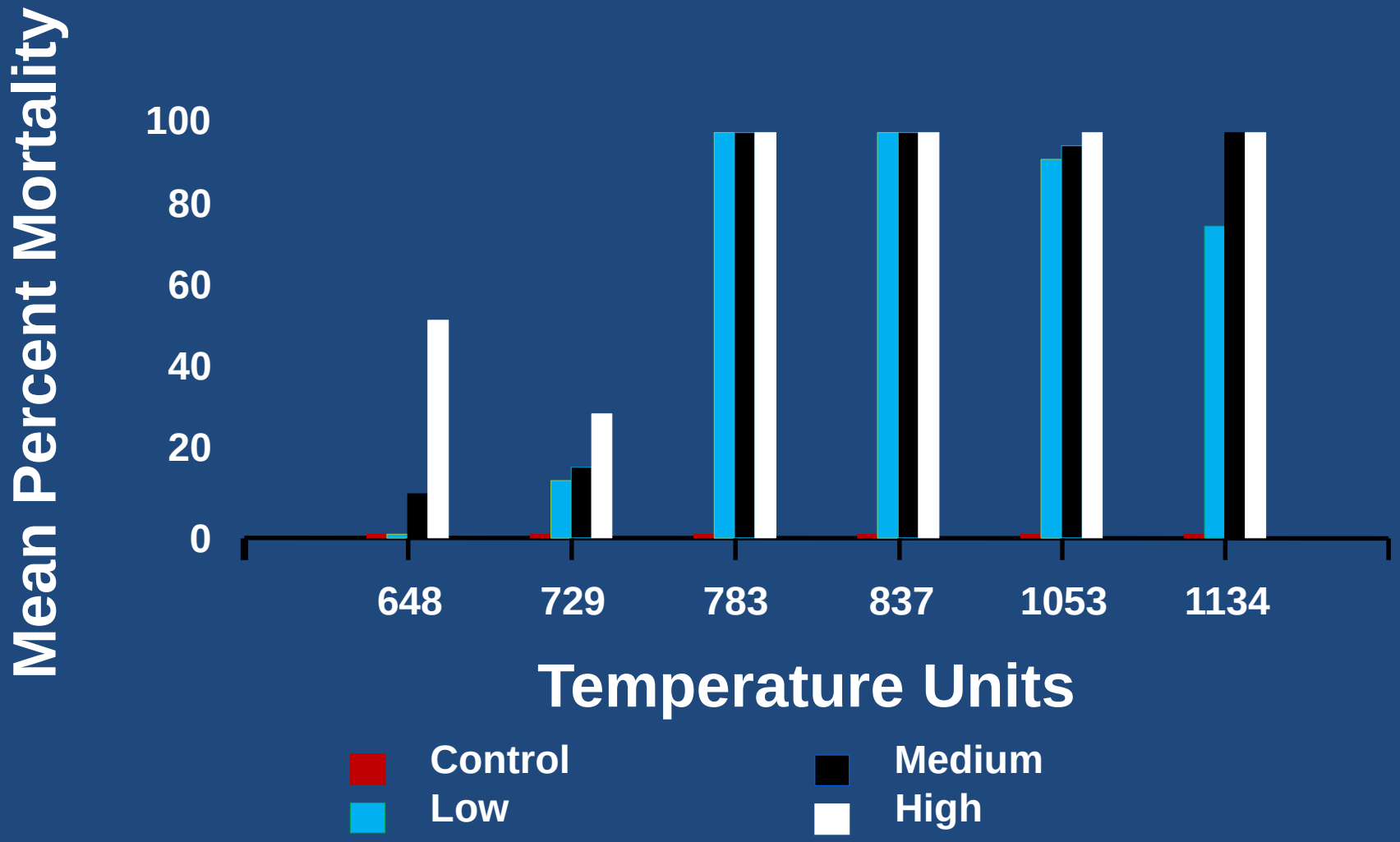


Continuous-flow system

Carbon Dioxide / dCO_2



Little effect of acute dCO2 exposure from fertilization to early hatch



Invasive Amphibian Species

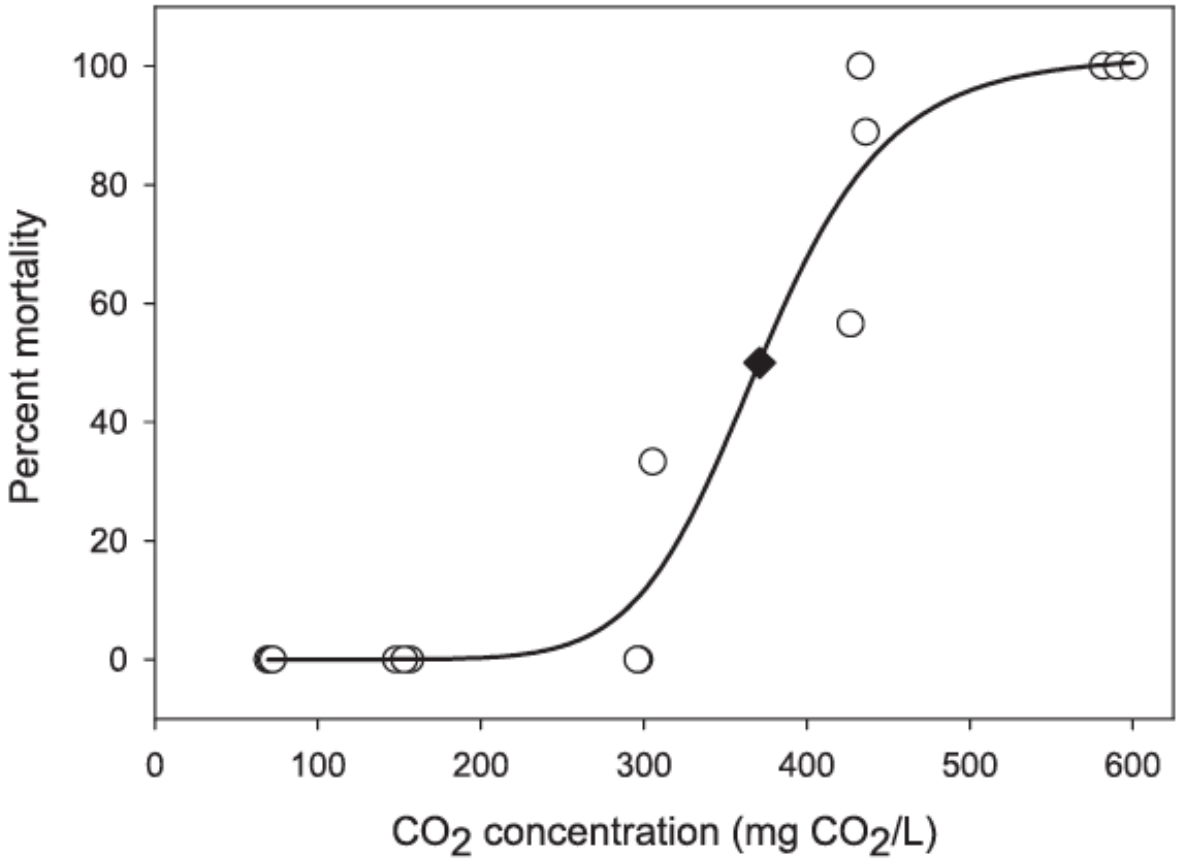
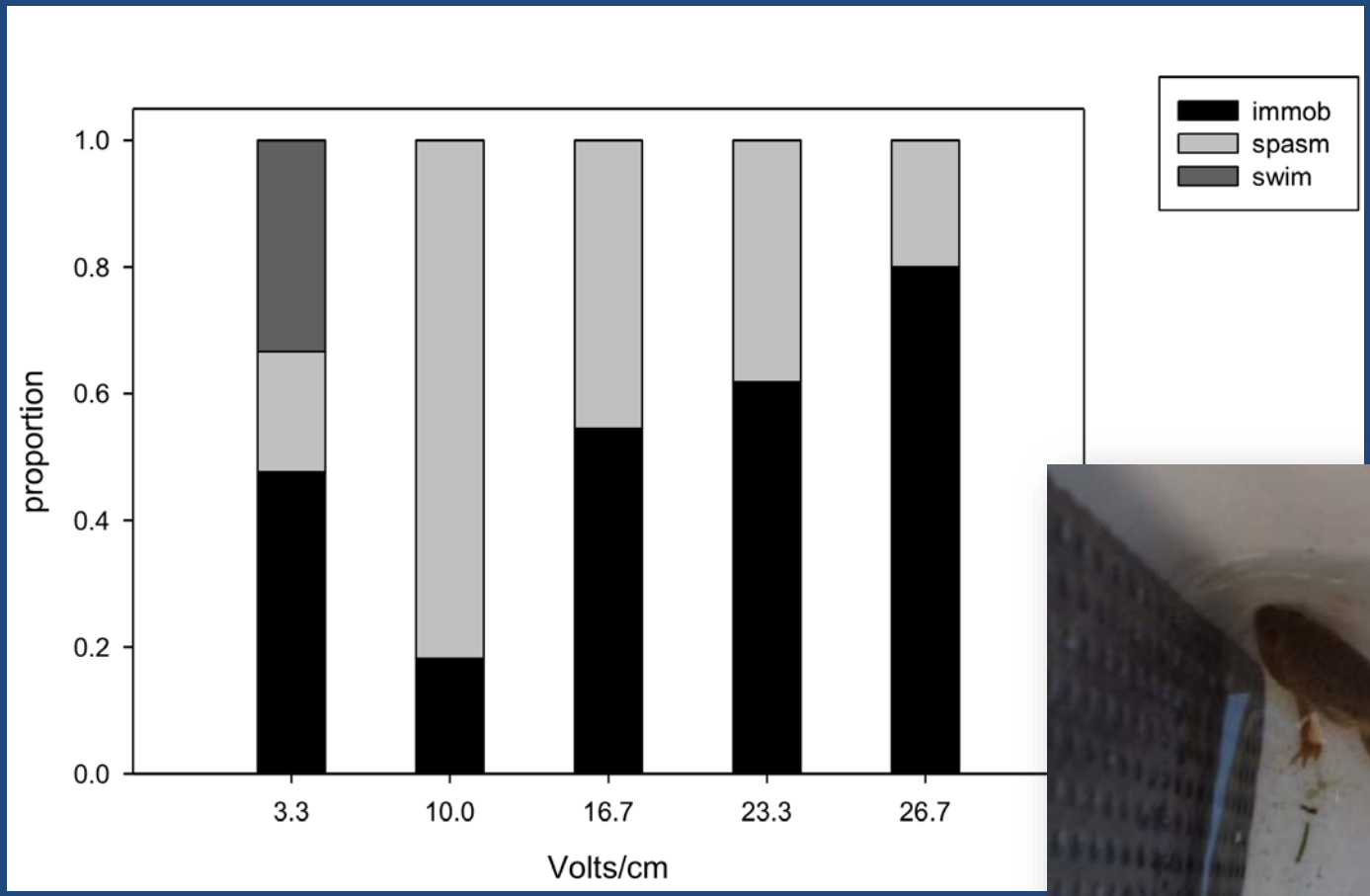


FIG. 2. Larval mortality (expressed as a percentage of individuals exposed for 24 h) as a function of dissolved CO_2 concentration. Each point represents the mortality documented using nine tadpoles per CO_2 concentration trial. The 24-h LC_{50} is denoted by a black diamond at 371 mg CO_2/L.

Conservation of Leopard frogs

Lethal and sublethal effects of electricity on Ranid larvae (American bullfrog)

Dose dependent decrease in behavioral response in tadpole larvae associated with increasing voltage



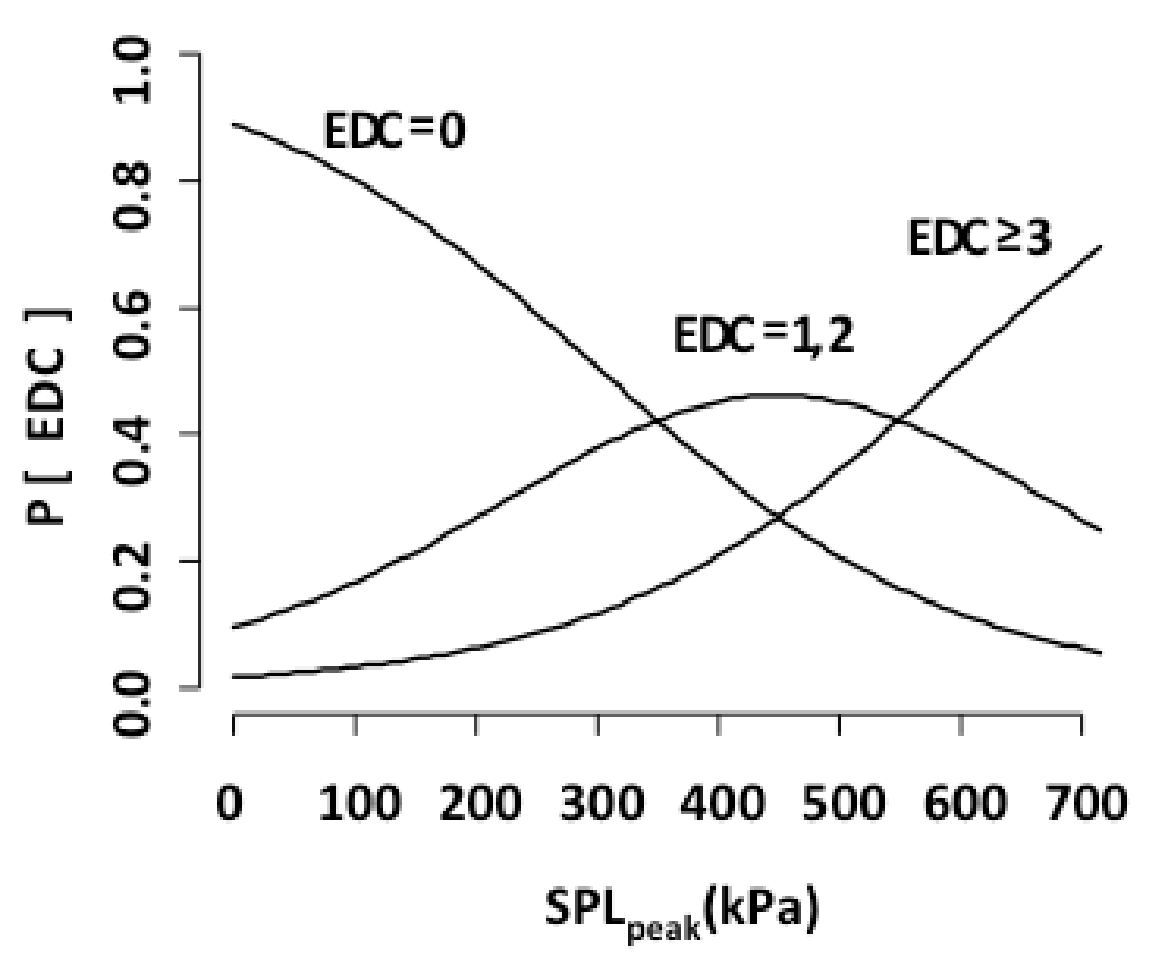
Use of Electricity to Control African Frogs


U.S.
FISH & WILDLIFE
SERVICE

Initial Testing

- Dose Response
- Fish Behavior
- Barriers
  - –Static
  - –Mobile

The Effects of Pulse Pressure from Seismic Water Gun Technology on Northern Pike



Use of seismic technology to divert or eradicate Asian carps

Suppression and Deterrence: Successful fish clearing in electric barrier, Oct 2011 and May 2012

Use of acoustic pulse pressure technology for fish deterrence

The Effects of Pulse Pressure Water Gun Technology on Rusty Crayfish and Round Goby, Non-native Egg Predators in Lake Michigan

Randall M. Claramunt , Fisheries Division, Michigan Department of Natural Resources, MI

Matthew E. Herbert , The Nature Conservancy, Lansing, MI

Tracy L. Galarowicz , Biology, Central Michigan University, Mount Pleasant, MI

W. Lindsay Chadderton , The Nature Conservancy, South Bend, IN

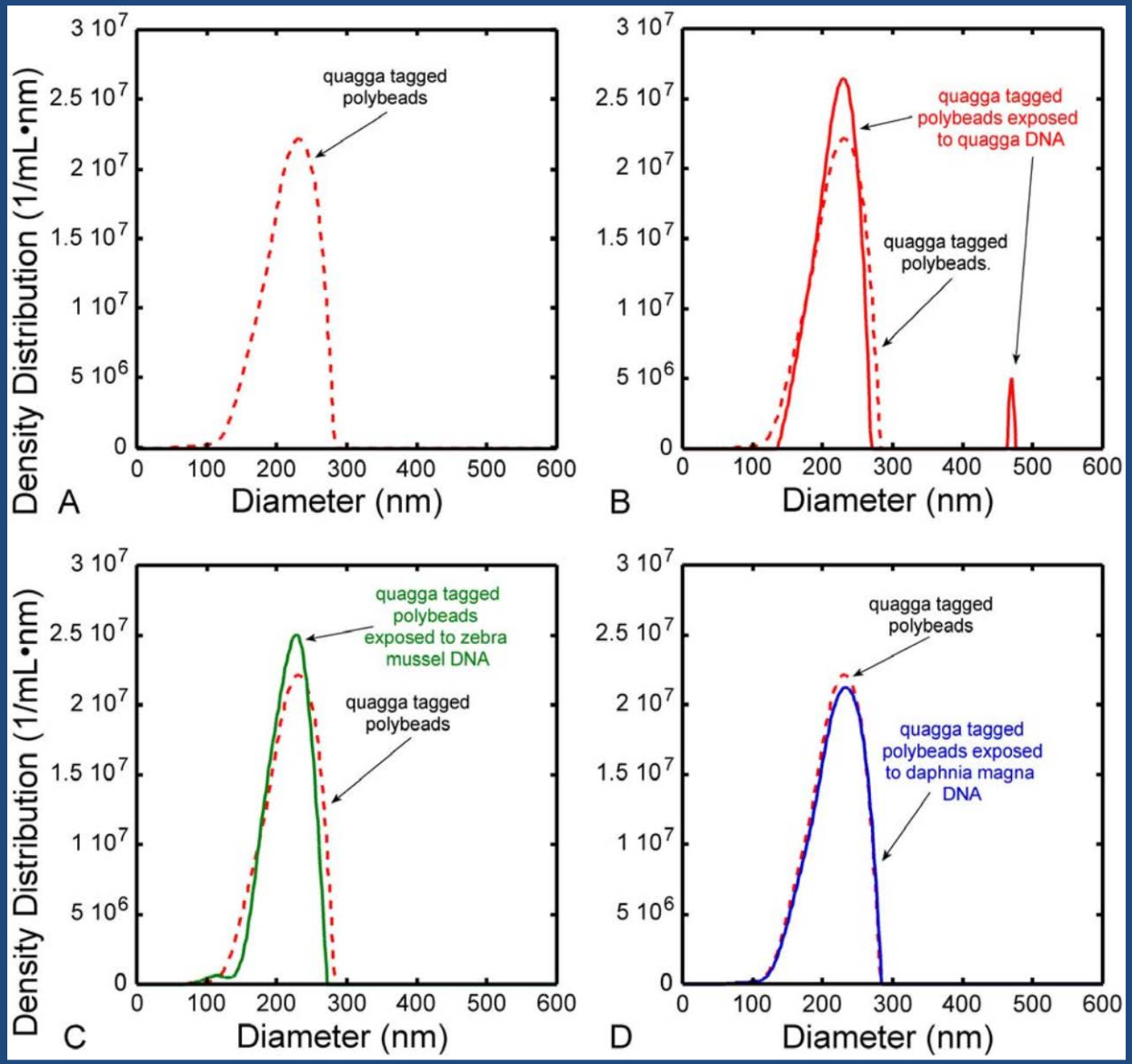
Jackson Gross Smith-Root Inc, Vancouver WA

The Nature Conservancy
Protecting nature. Preserving life.®

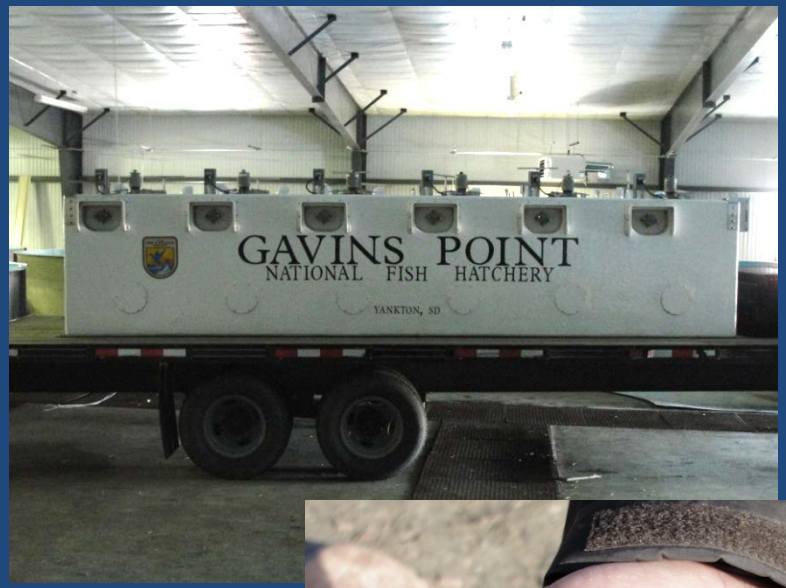
Great Lakes RESTORATION

Other stuff

Laser Transmission Spectroscopy: High sensitivity with ability to detect differences between similar species



Control of Asian clams

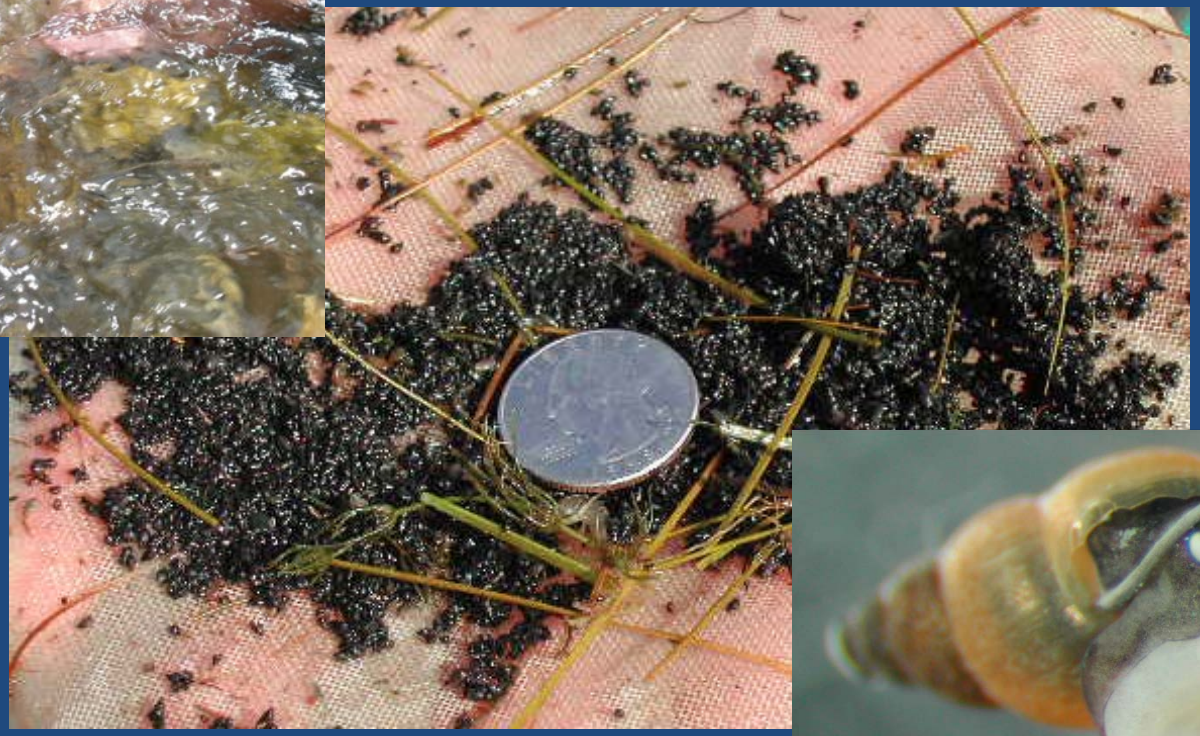


Dietary Modulation

Bruneau Hot Spring Snail

Habitat Erosion, Bear River ID

Bonneville Cutthroat Trout



New Zealand Mud Snail

Sand Wand, Streamside Systems

Human – Wildlife Dimensions