

# Crystal Lake and Rainbow Smelt: A Whole-Lake Thermal Manipulation to Eradicate an Invasive Species



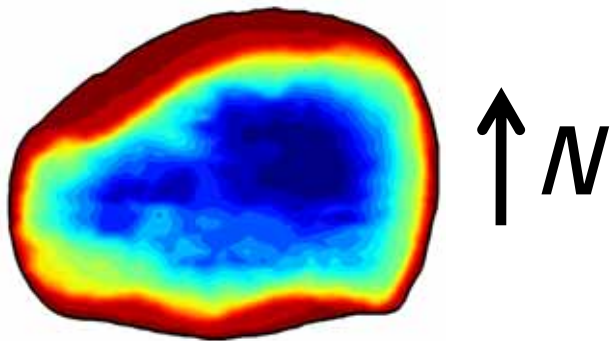
Zach Lawson  
Center for Limnology  
UW- Madison

# Today's Presentation

- Crystal Lake
- Why are rainbow smelt a problem?
- Whole-Lake Manipulation
- Mixing Results
- Questions



# Crystal Lake





# Rainbow Smelt

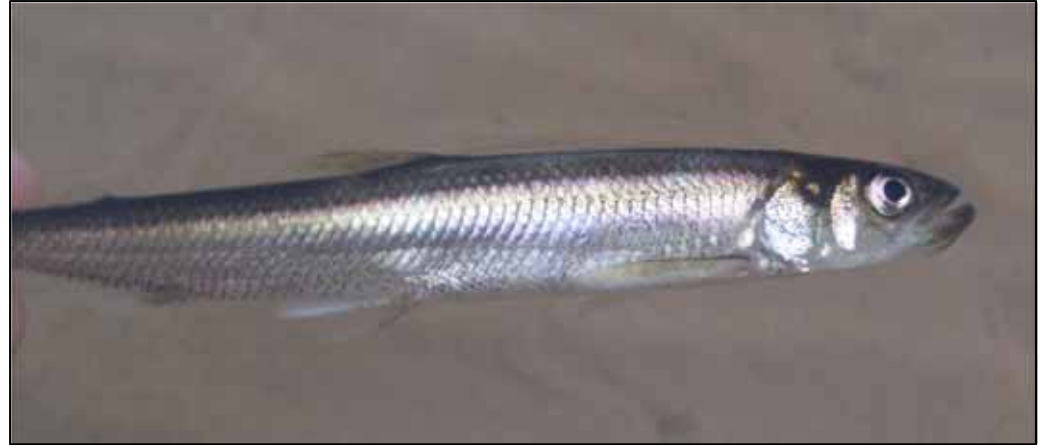
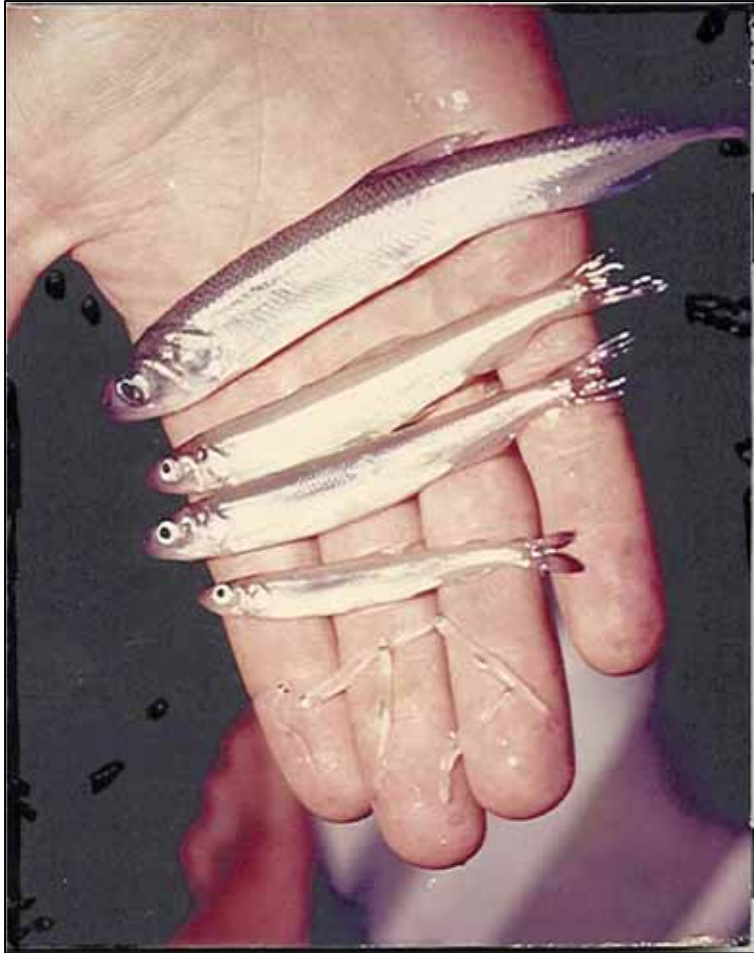
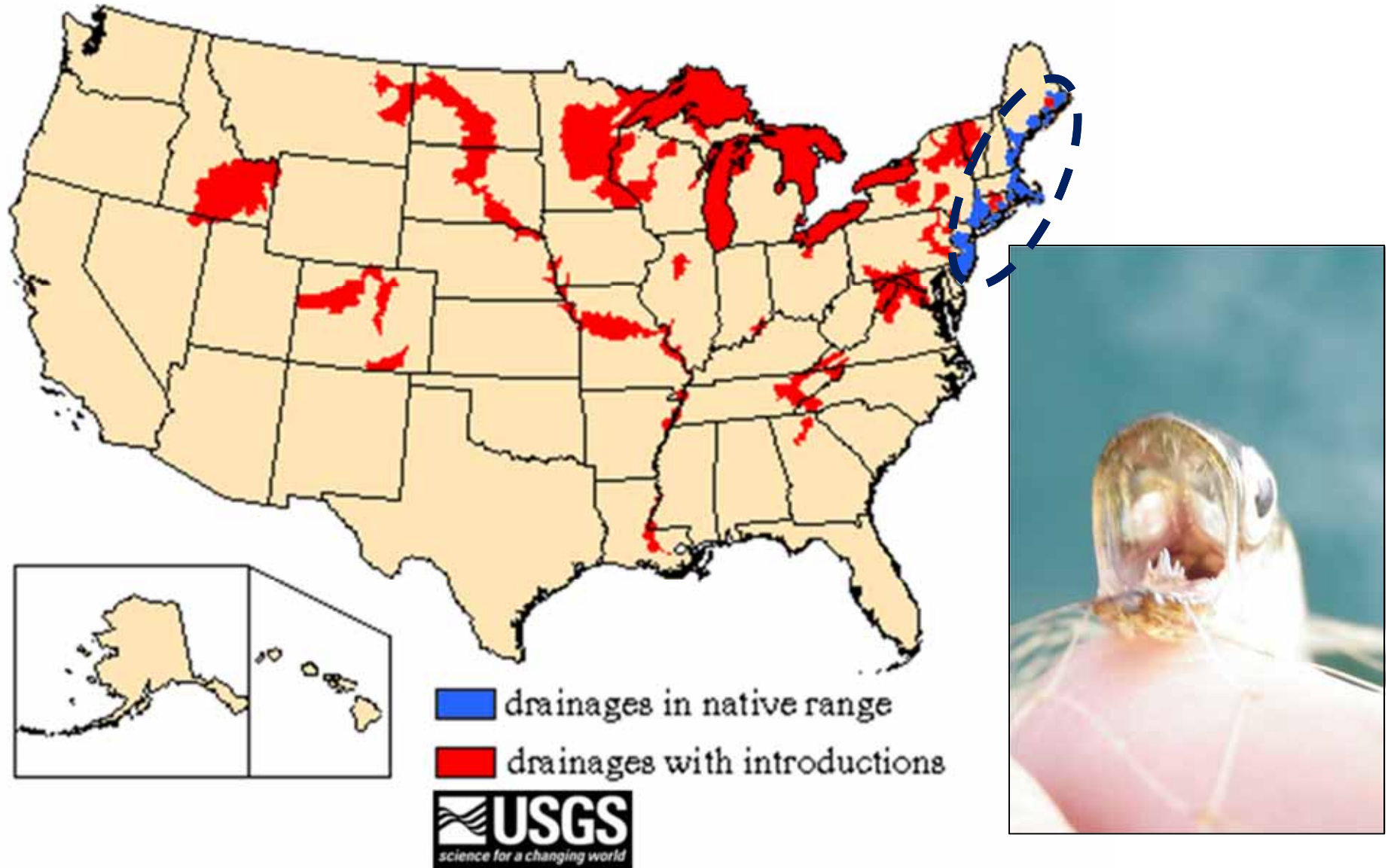
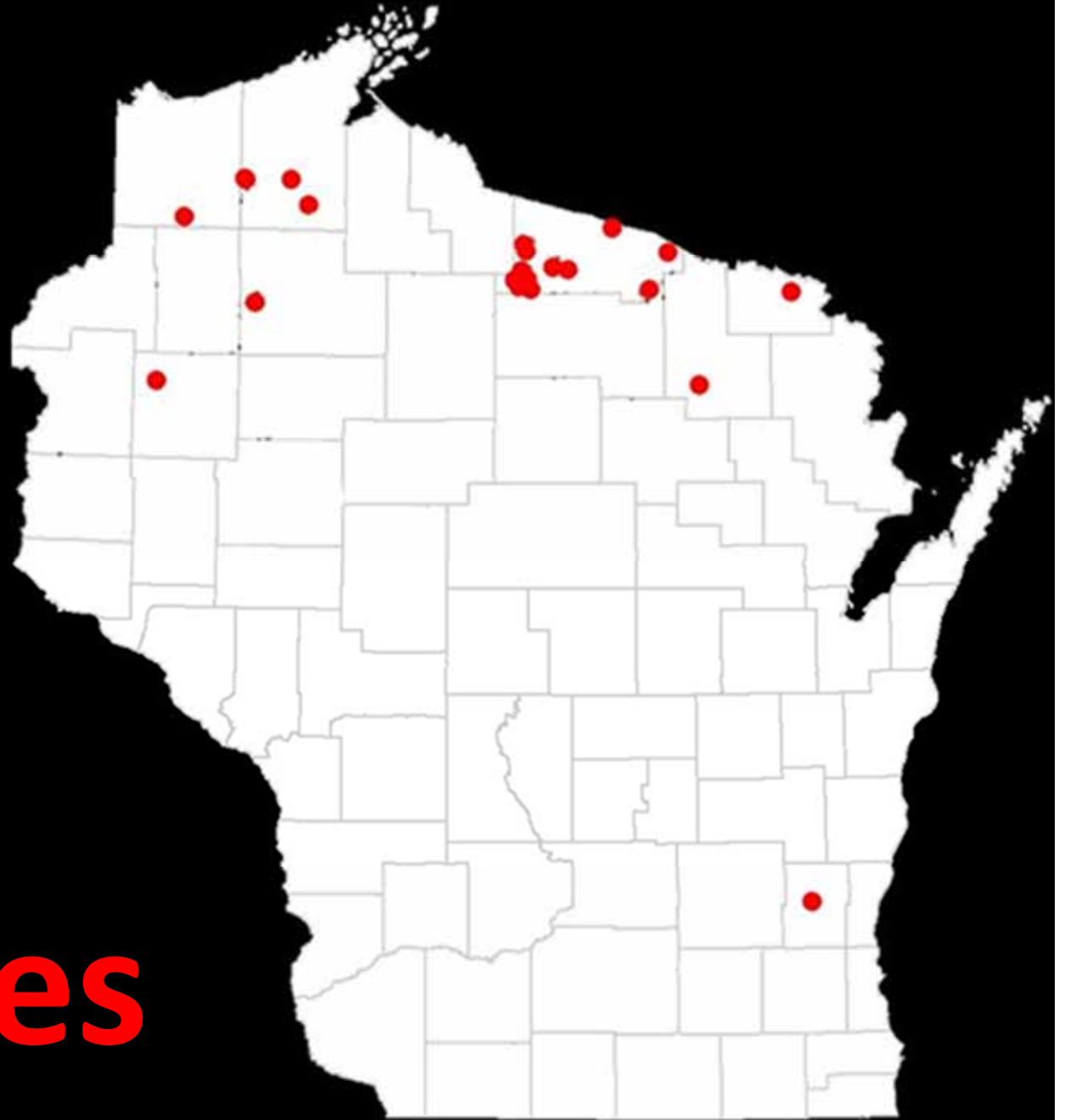


Photo by: Department of Game, Fish, and Parks, South Dakota

# Rainbow Smelt in the US

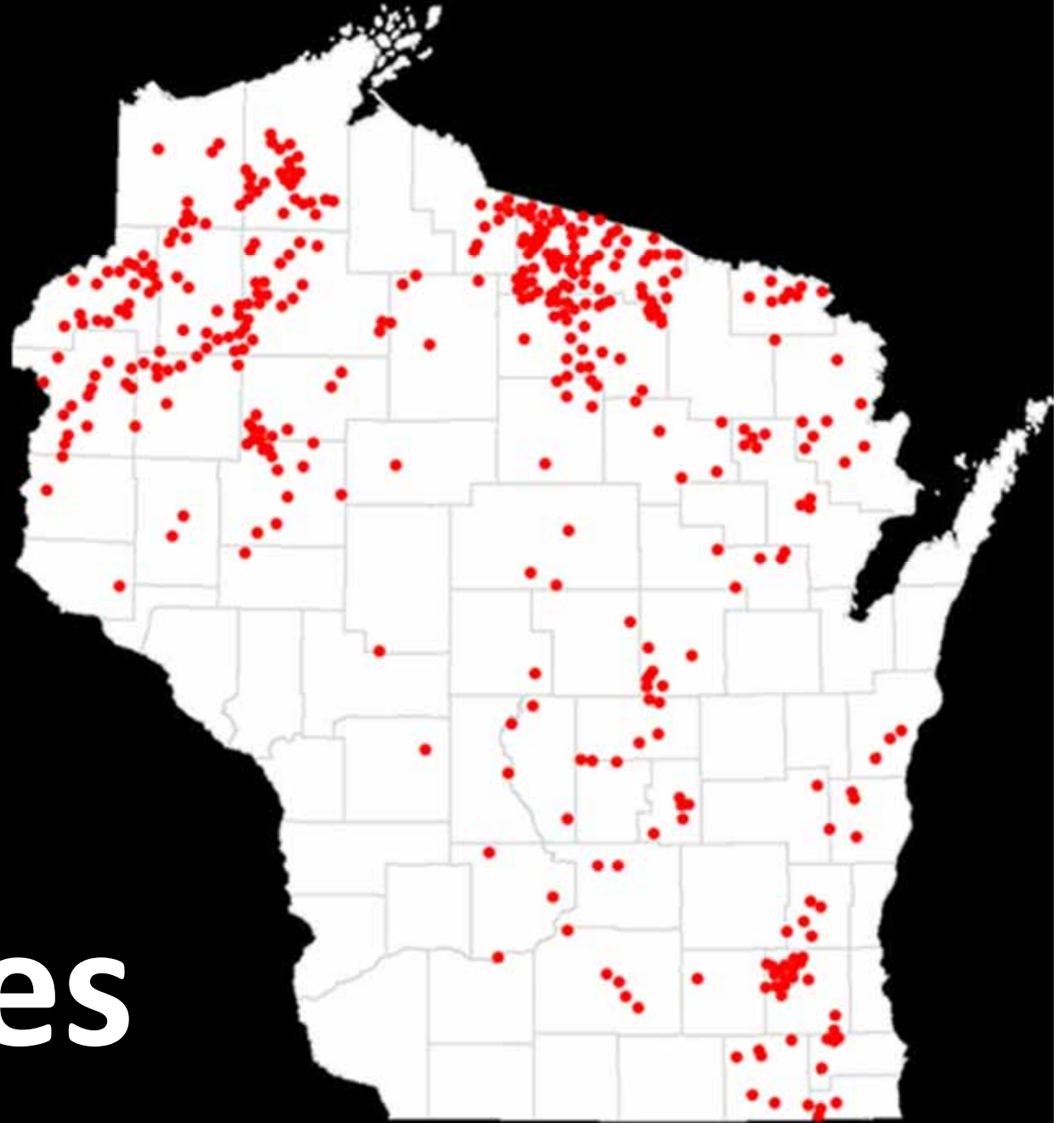


Where are  
smelt now?



**~25 lakes**

How many  
lakes have  
suitable  
habitat?



**553 lakes**



# Rainbow smelt impacts in our lakes



- Reduce cisco/whitefish populations

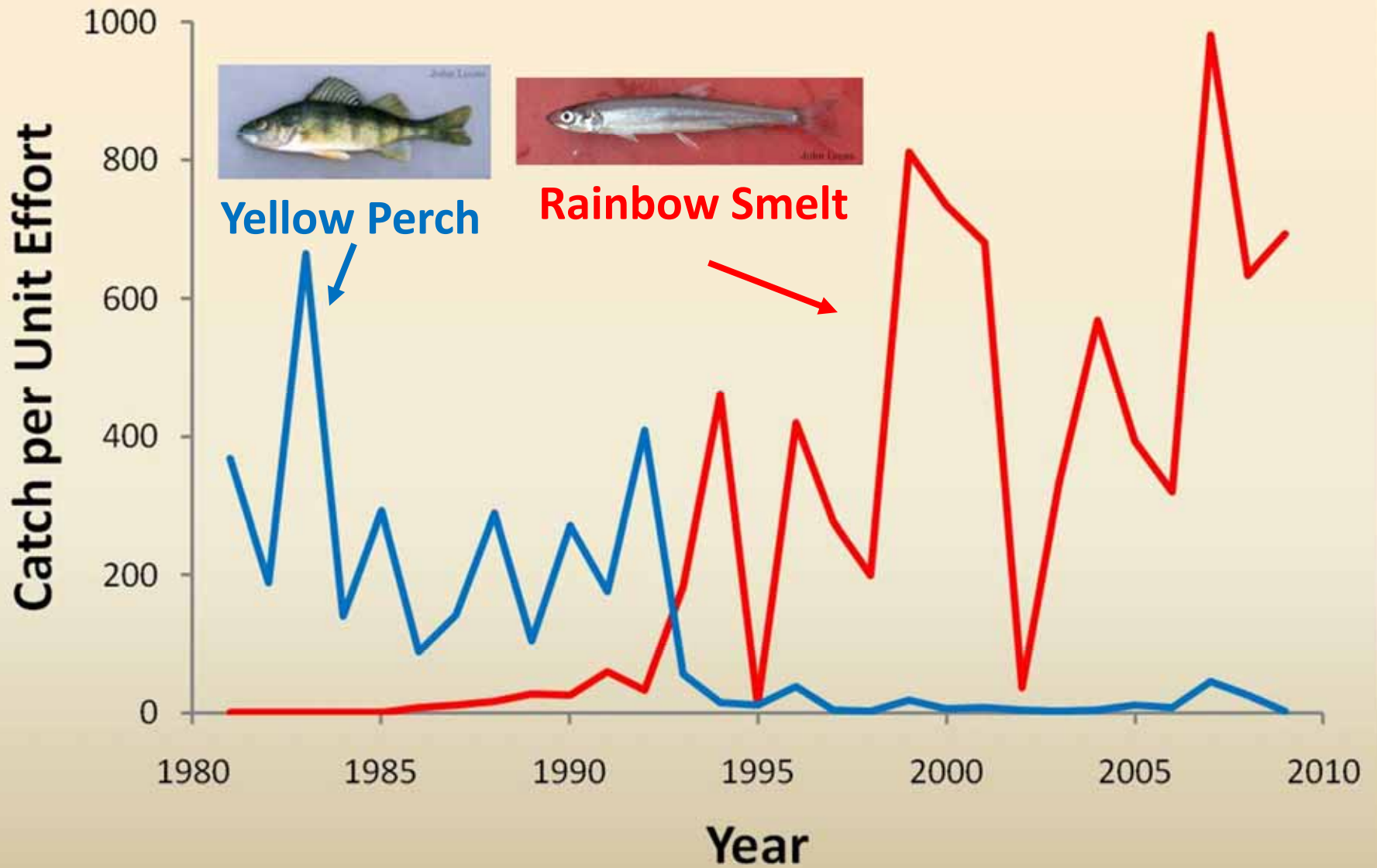


- Reduce yellow perch populations

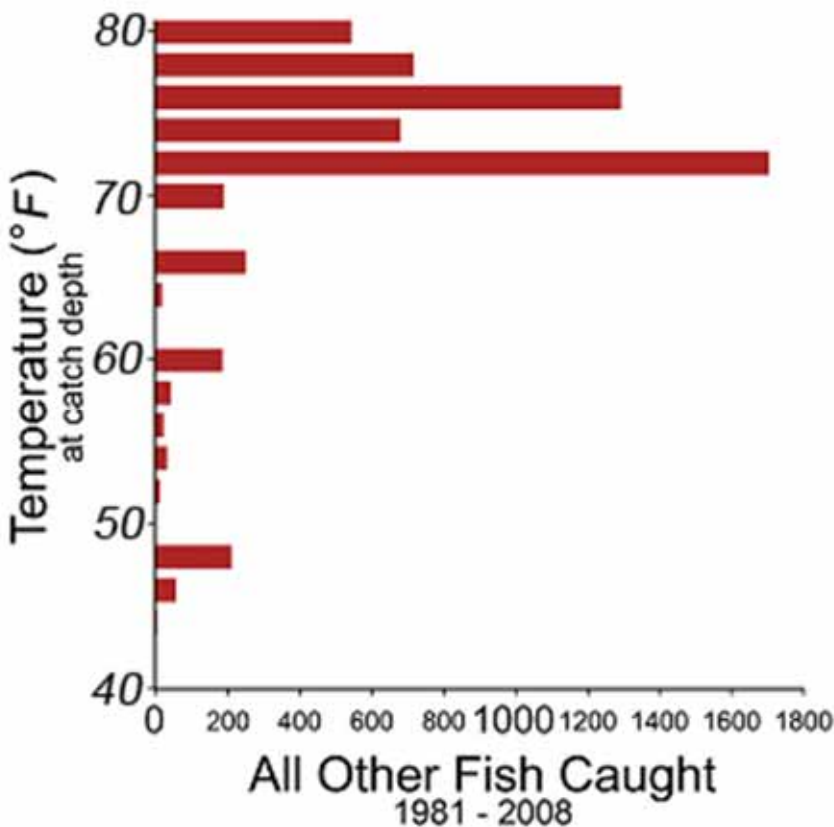
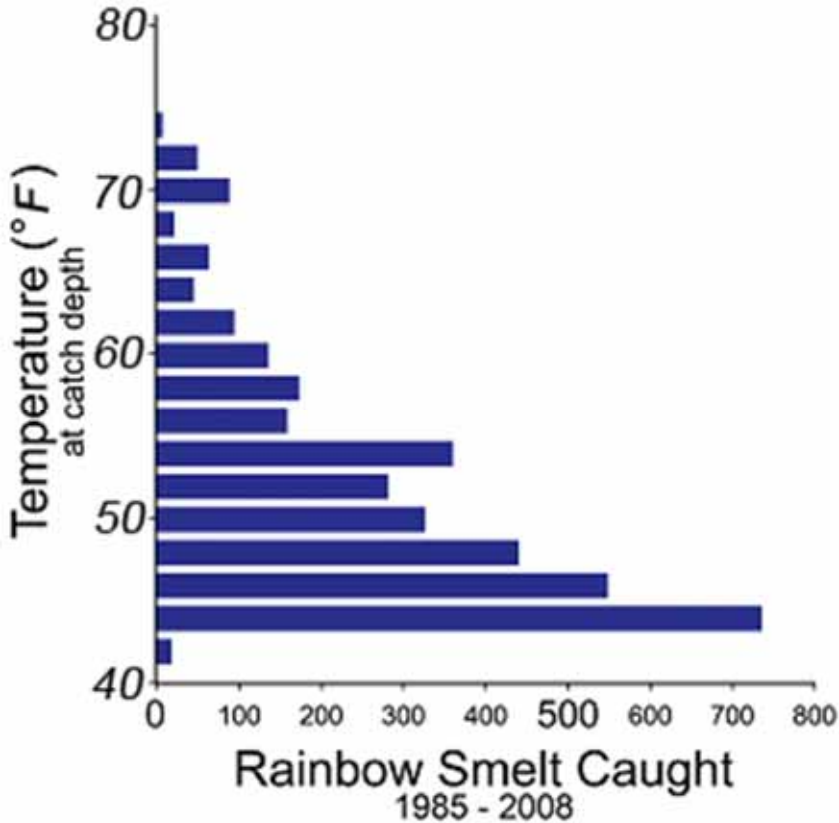


- Reduce walleye recruitment

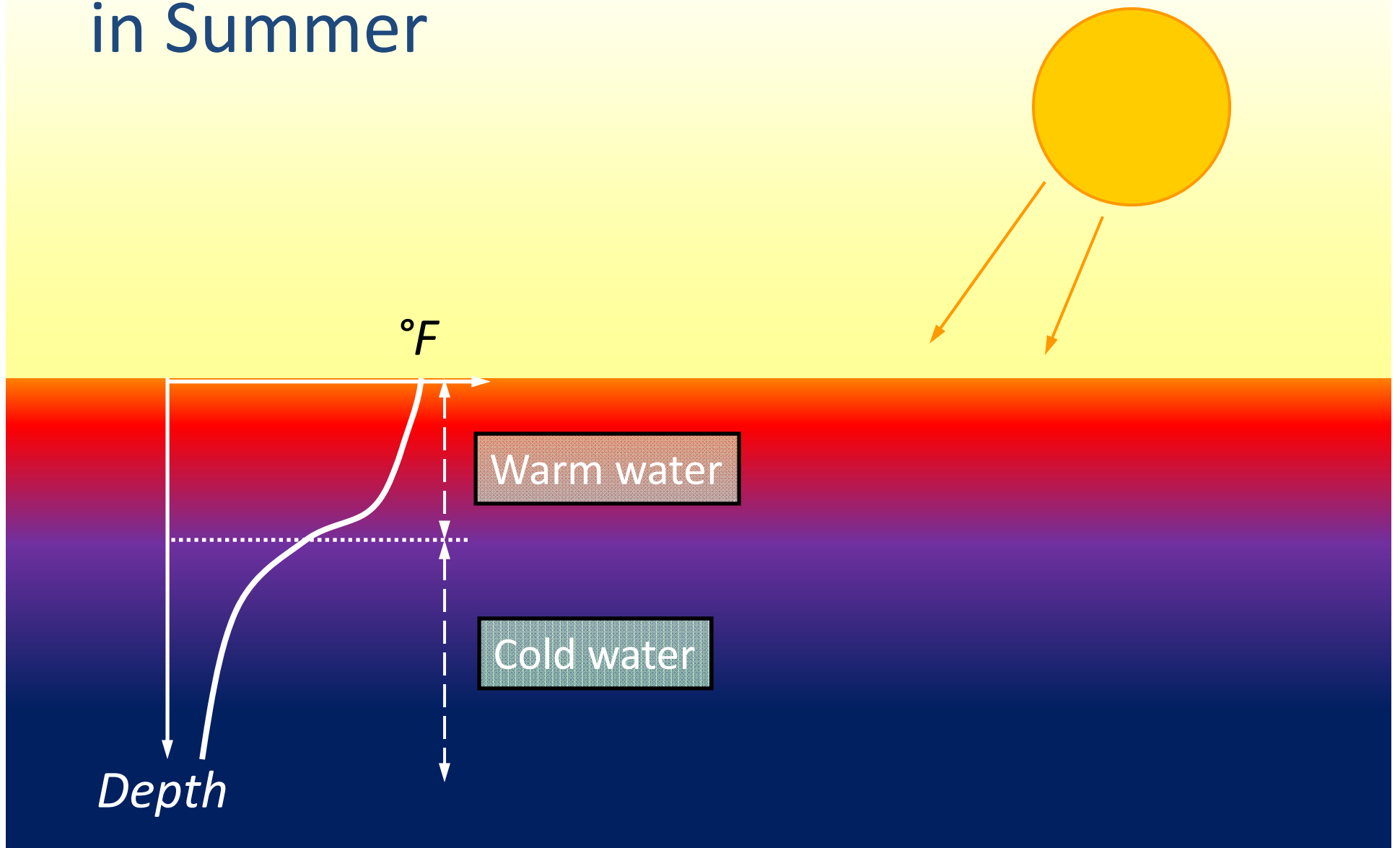
# Crystal Lake



# Smelt Habitat Temperature



# Water Temperature Distribution in Summer

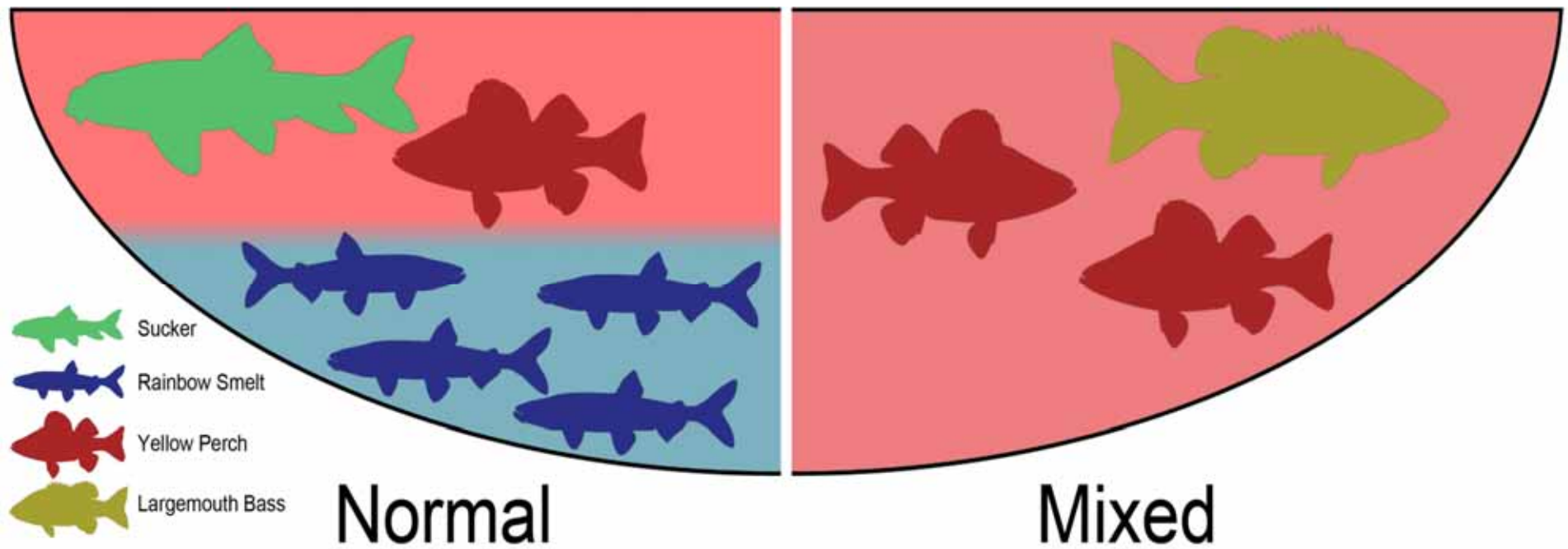


# Removing Smelt Habitat

- Adult smelt grow best at 46°-60°F
- If warmer, metabolism increases, and food intake can't keep up
- Fish lose weight and eventually die



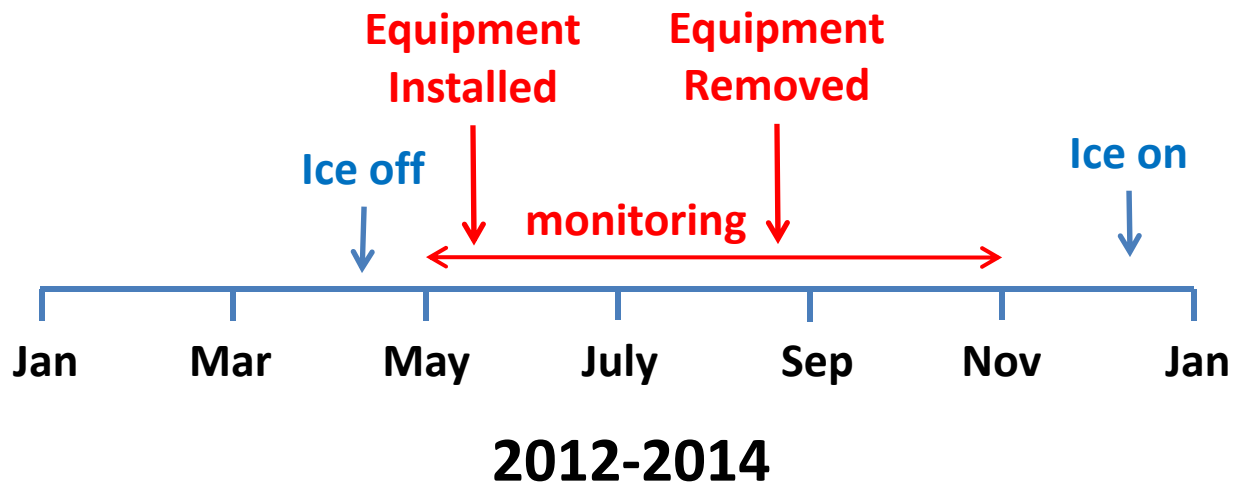
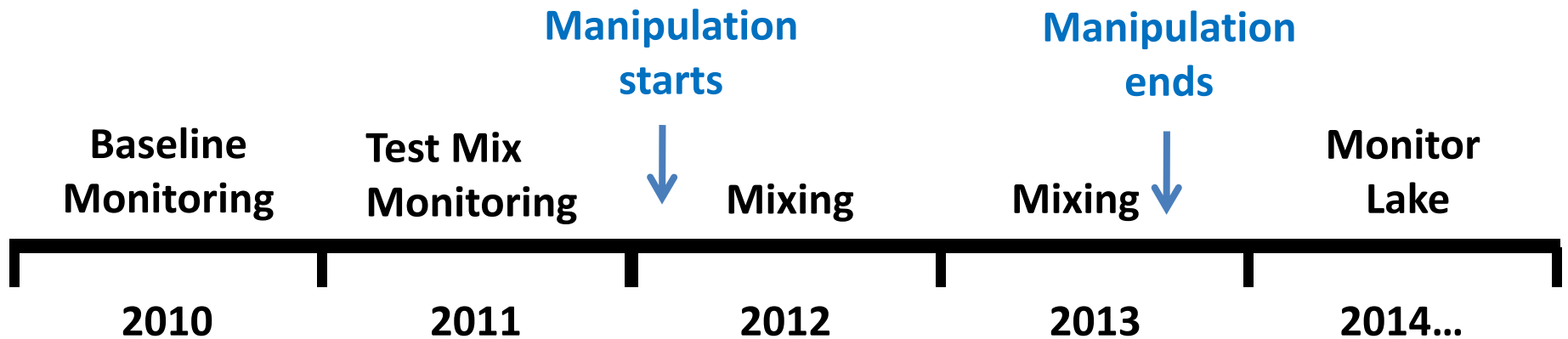
# Available Smelt Habitat



# Mixing Design (GELIs)

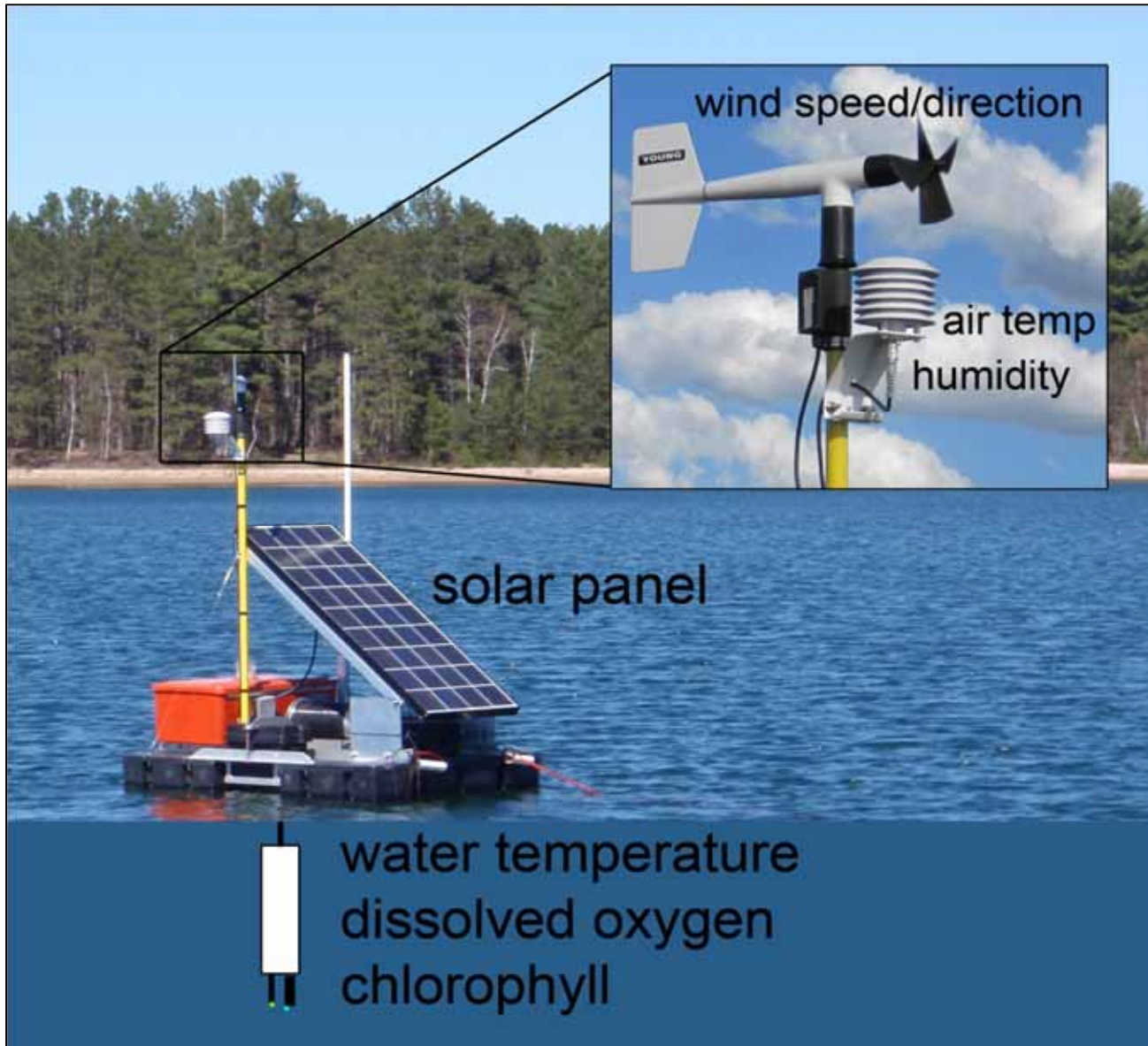


# Timeline





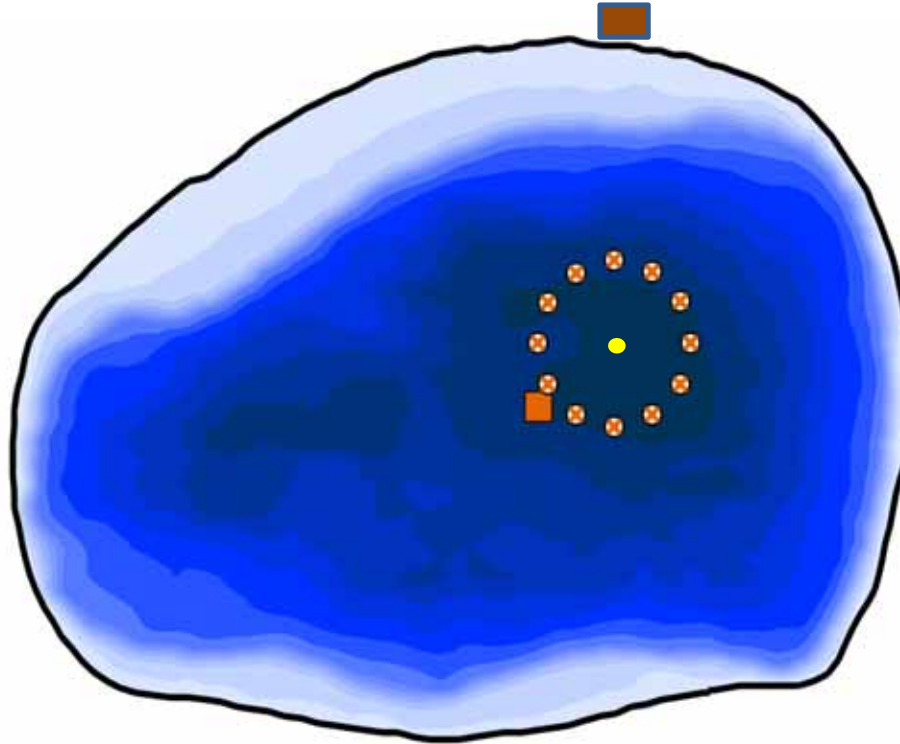
# Water Quality Monitoring



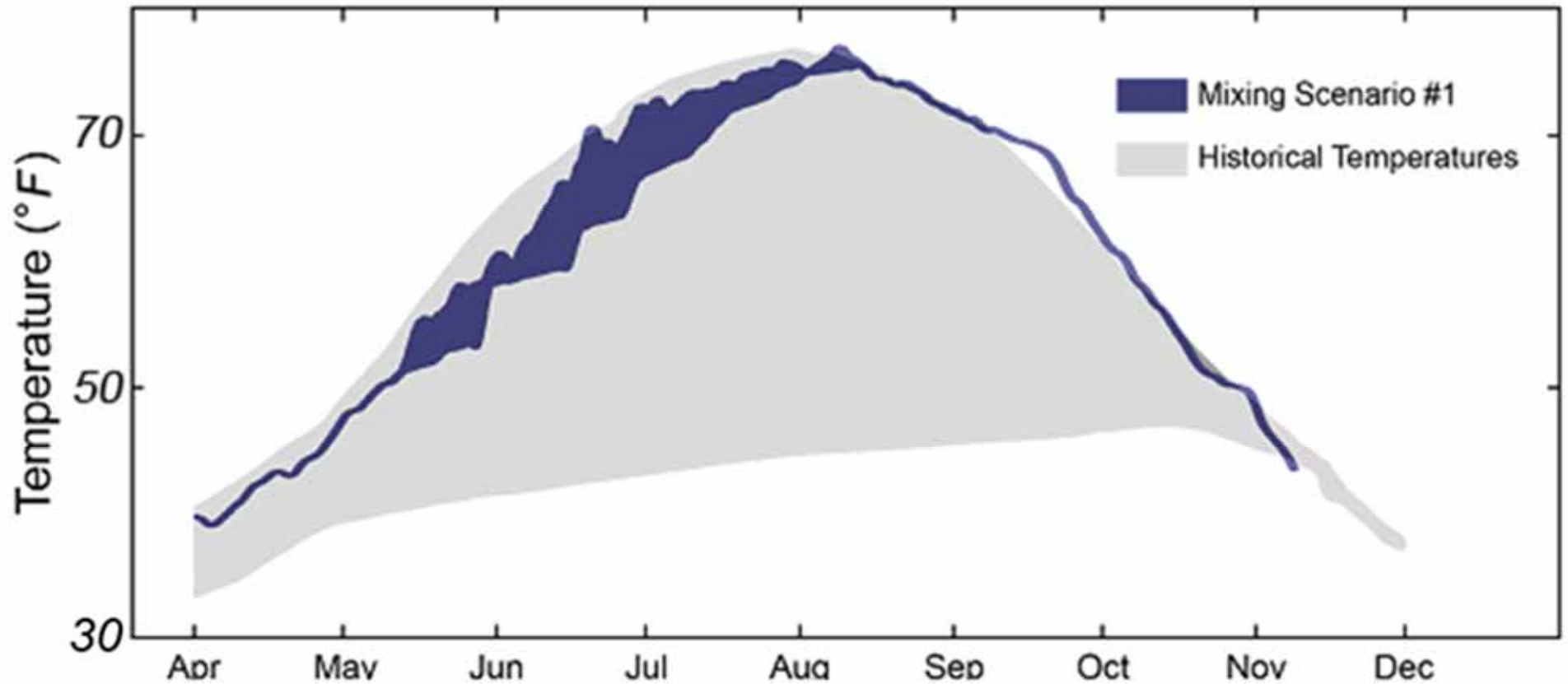
# Biological Community Sampling



# Deployment

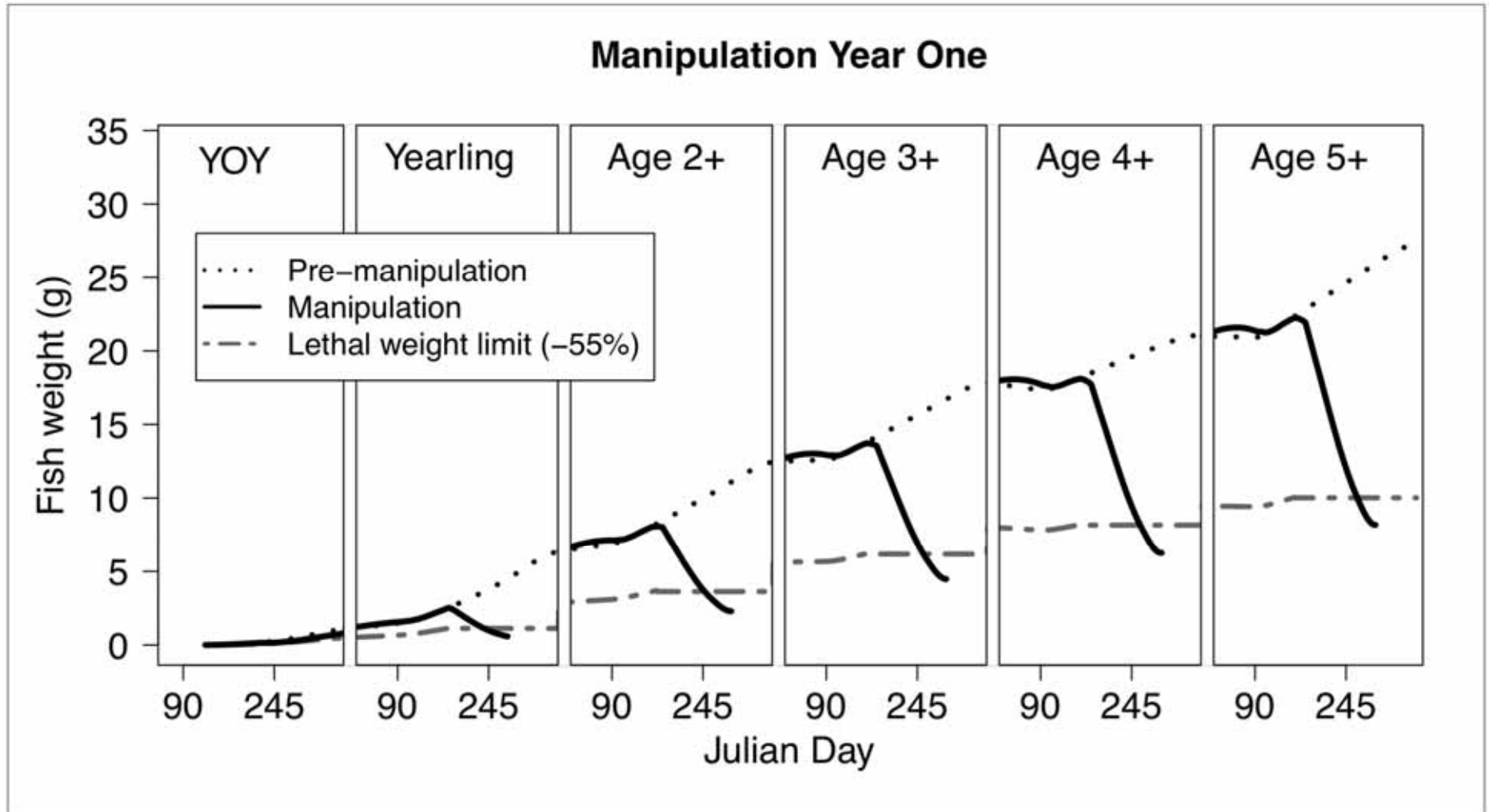


# Expected Mixing Results

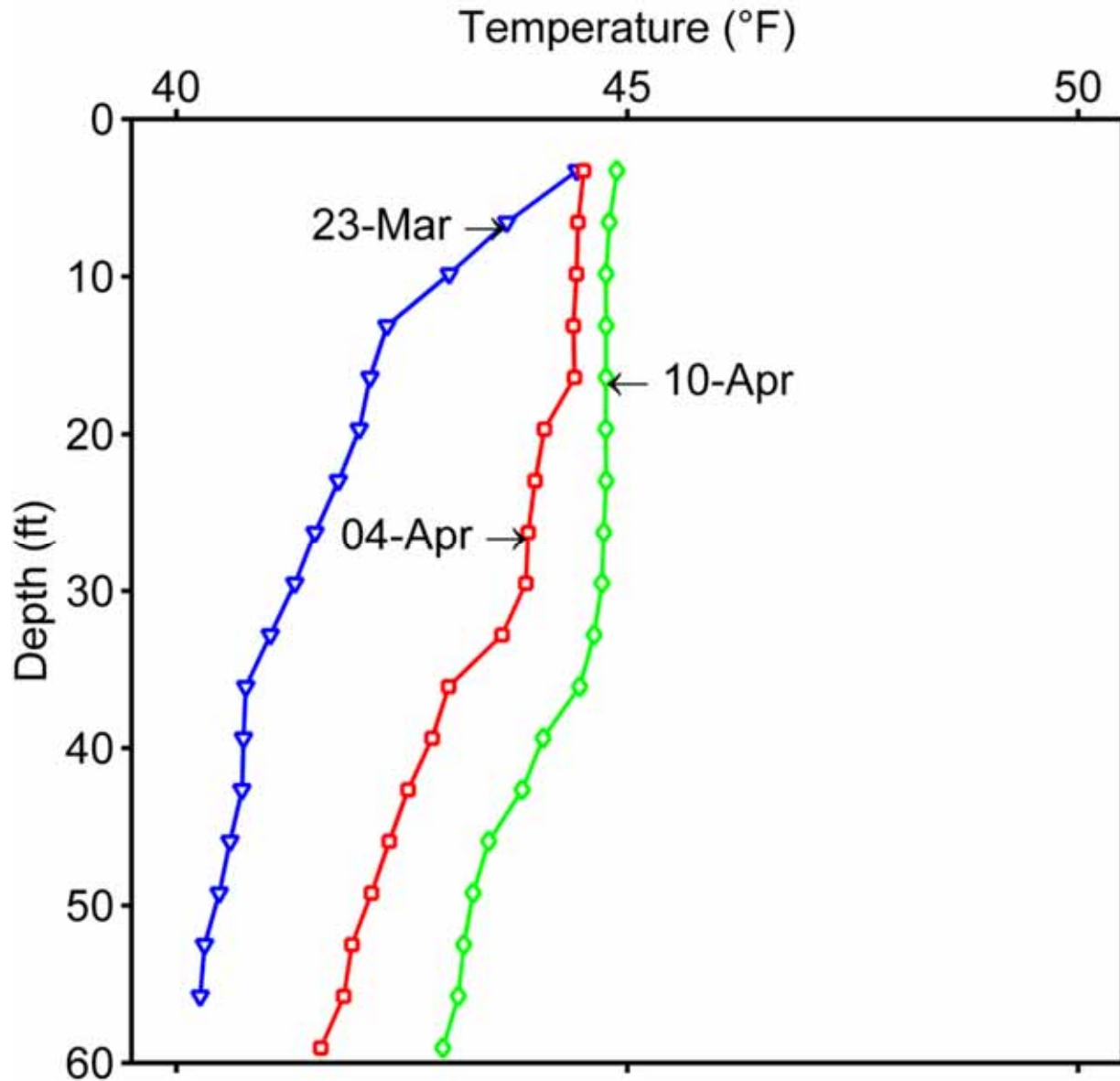


Mixing should eliminate thermal habitat of adult smelt

# Expected Mixing Results on Smelt



# 2012 Mixing Results



# 2012 Mixing Forecast

- Increased sunlight and warmer air temperatures
- Add 1 more GELI to mixing fleet
- Decrease cycle times



# Acknowledgements



WI DNR

Anonymous donor

Crystal Lake Contact  
Station

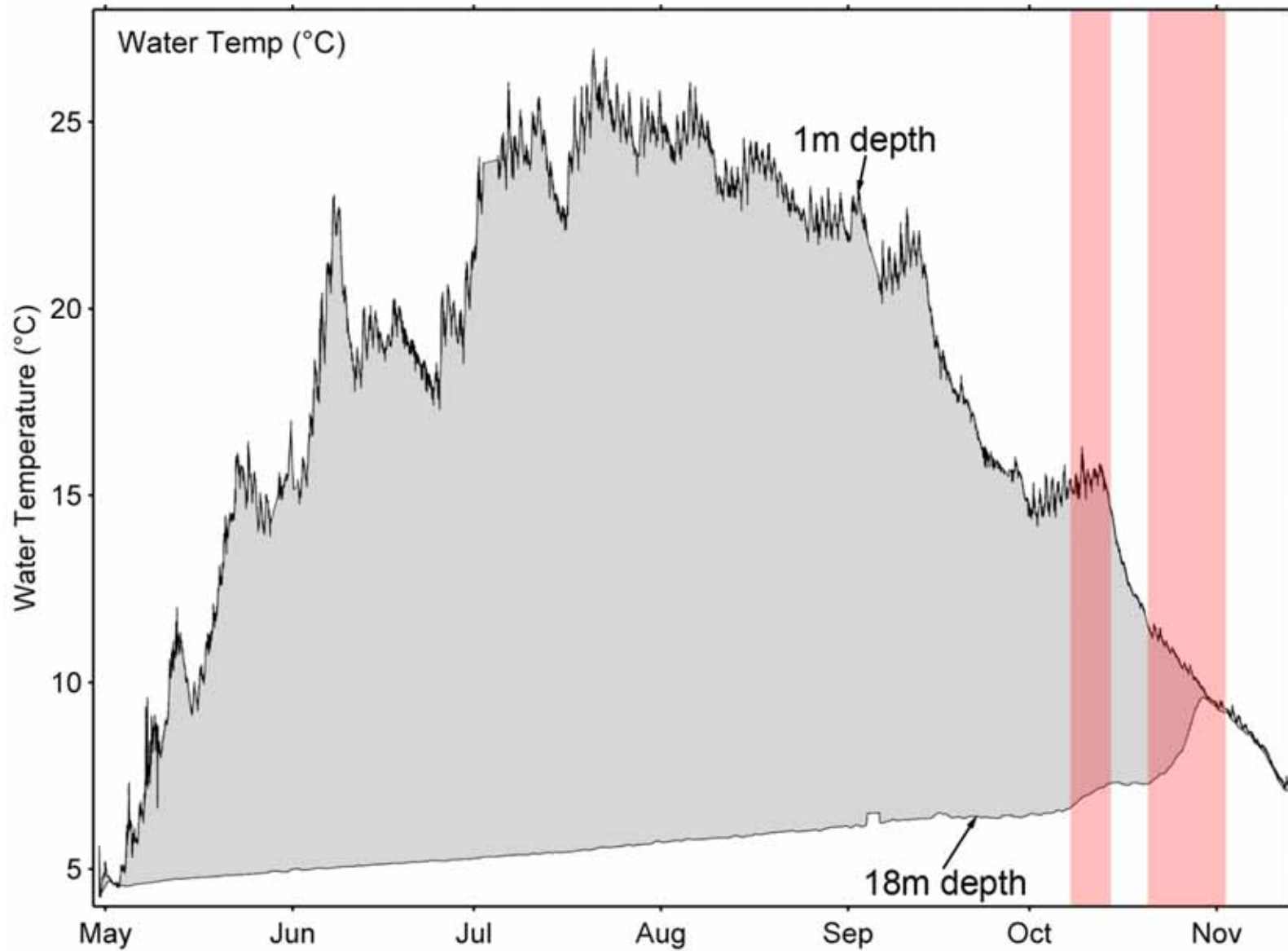
Trout Lake Station



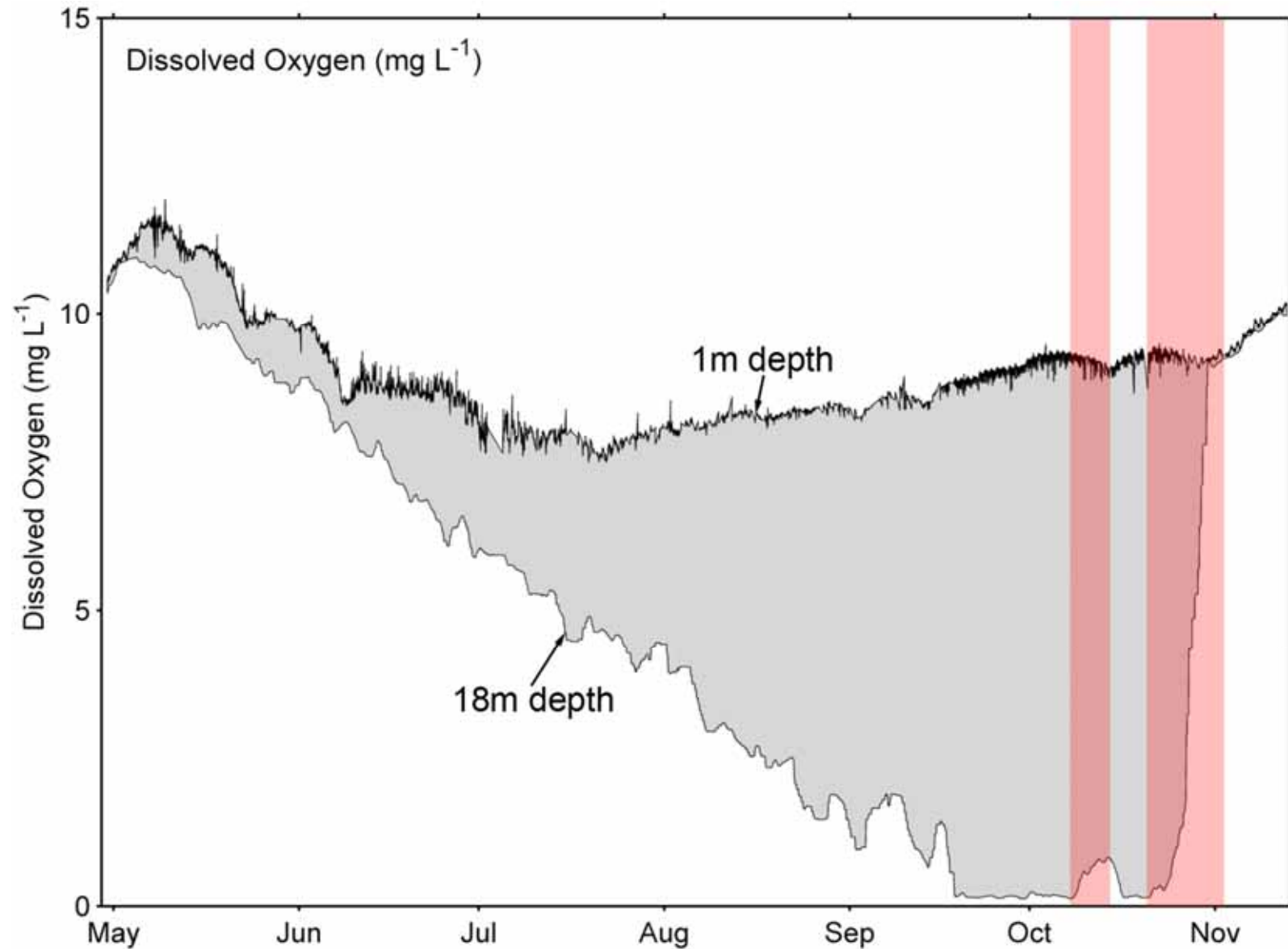
# Questions?



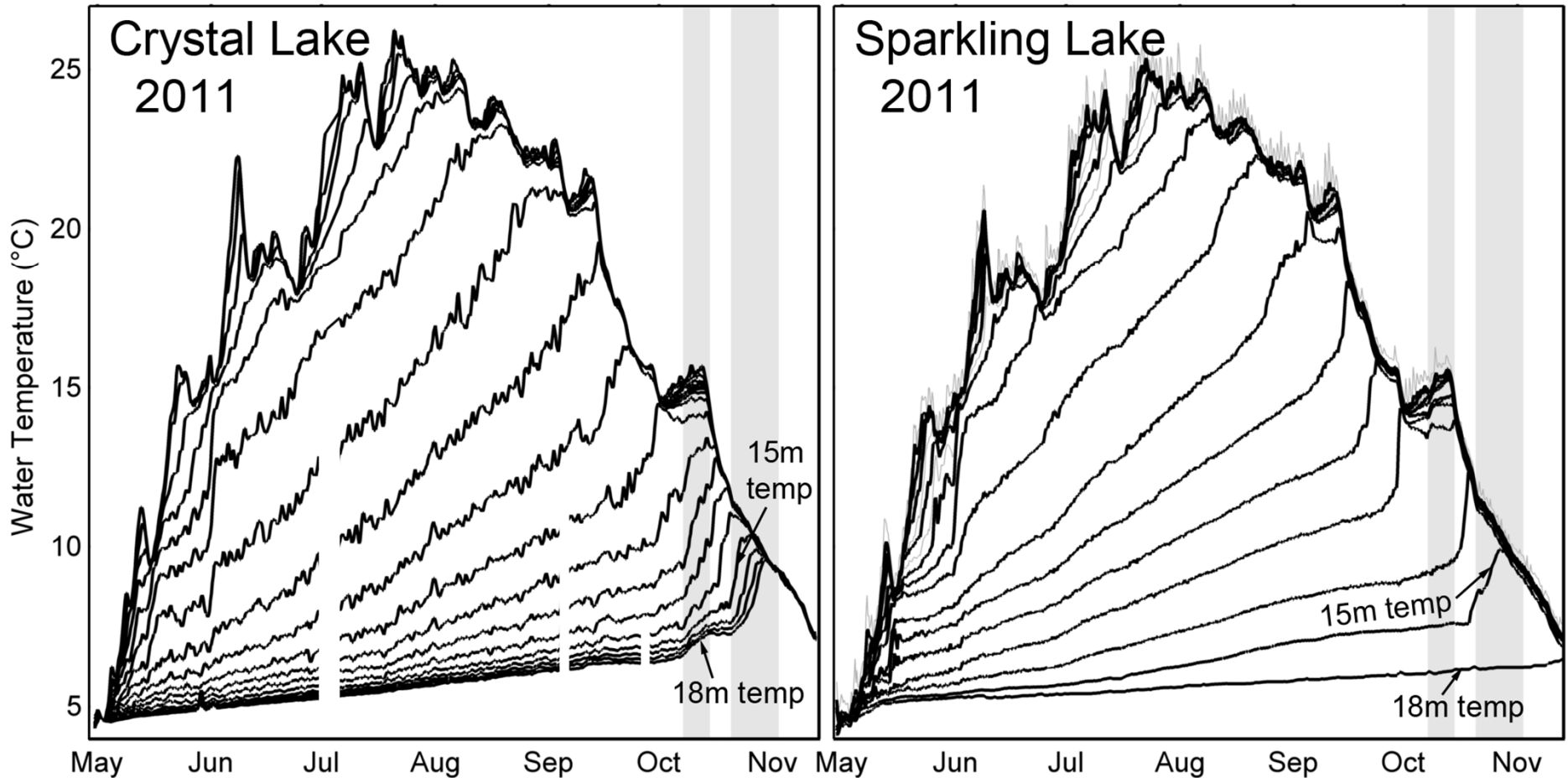
# Crystal Lake Temperature



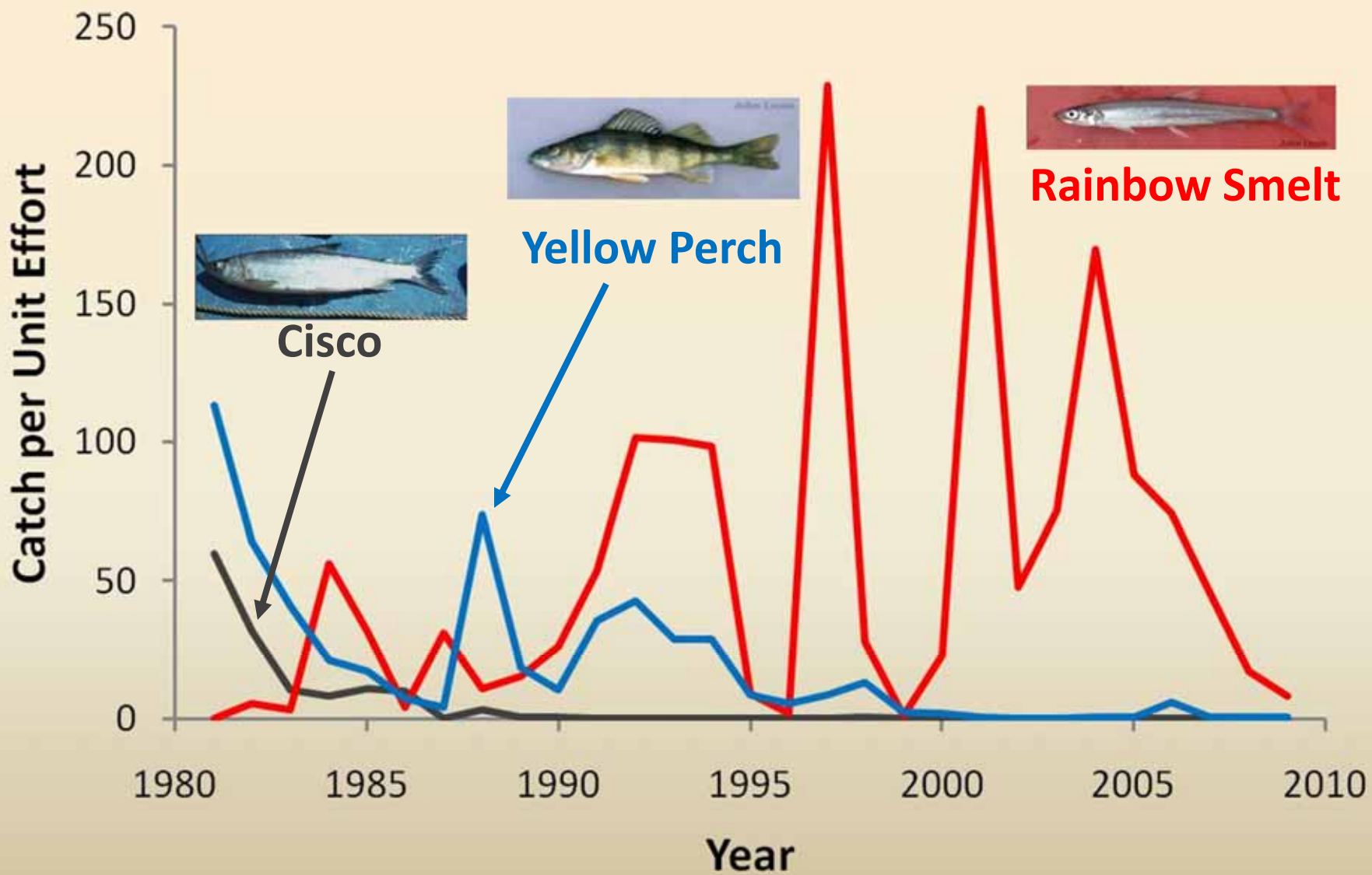
# Crystal Lake Dissolved Oxygen



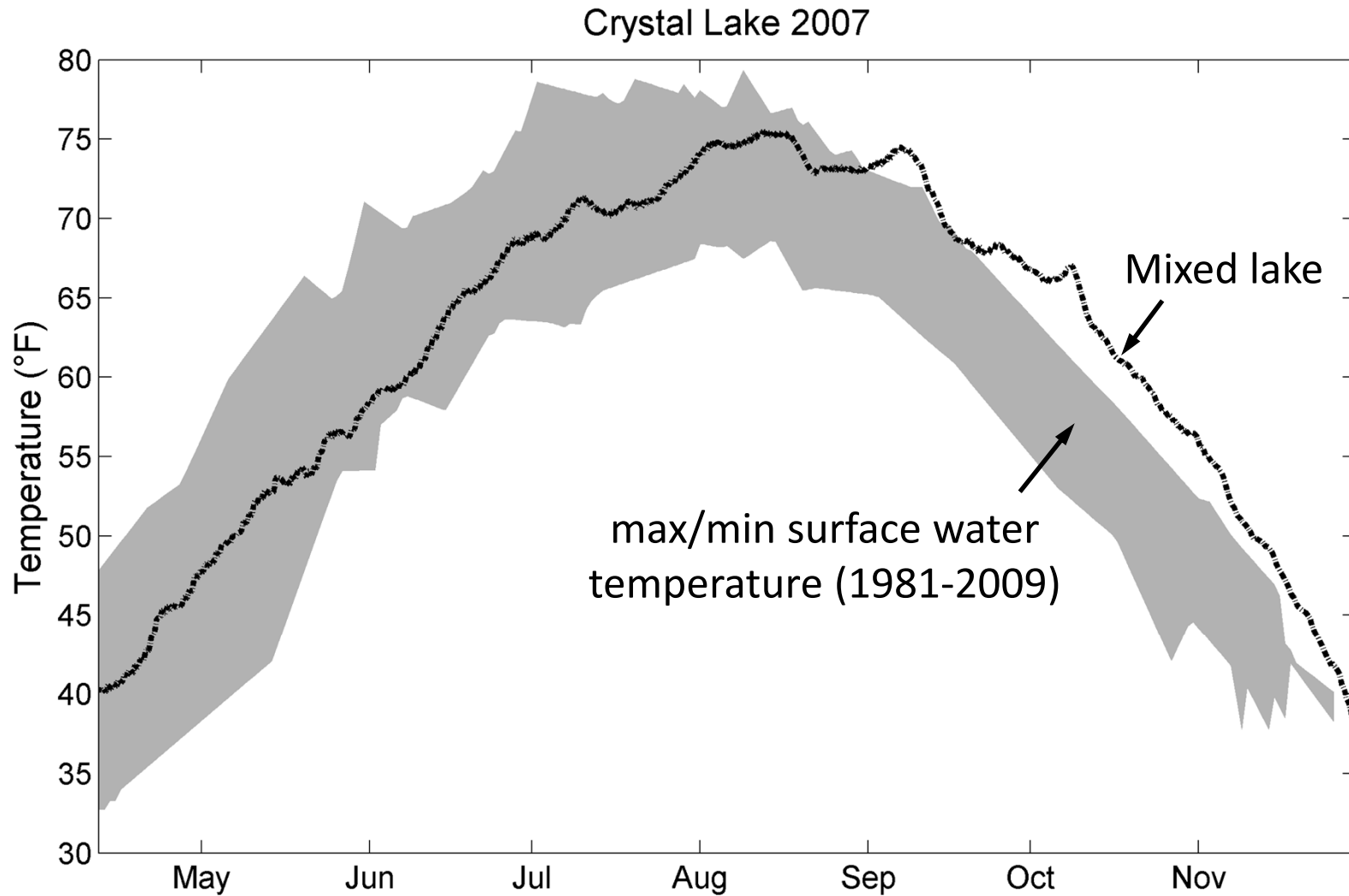
# Crystal vs. Sparkling Temperature



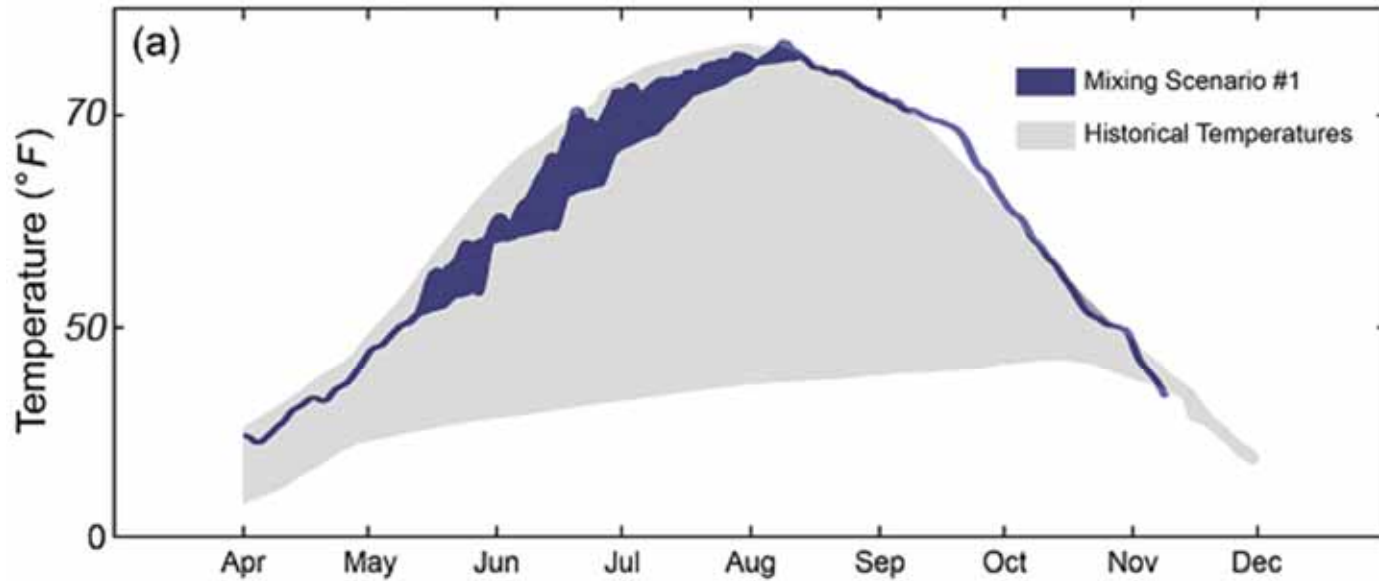
# Sparkling Lake



# Expected surface water temperature

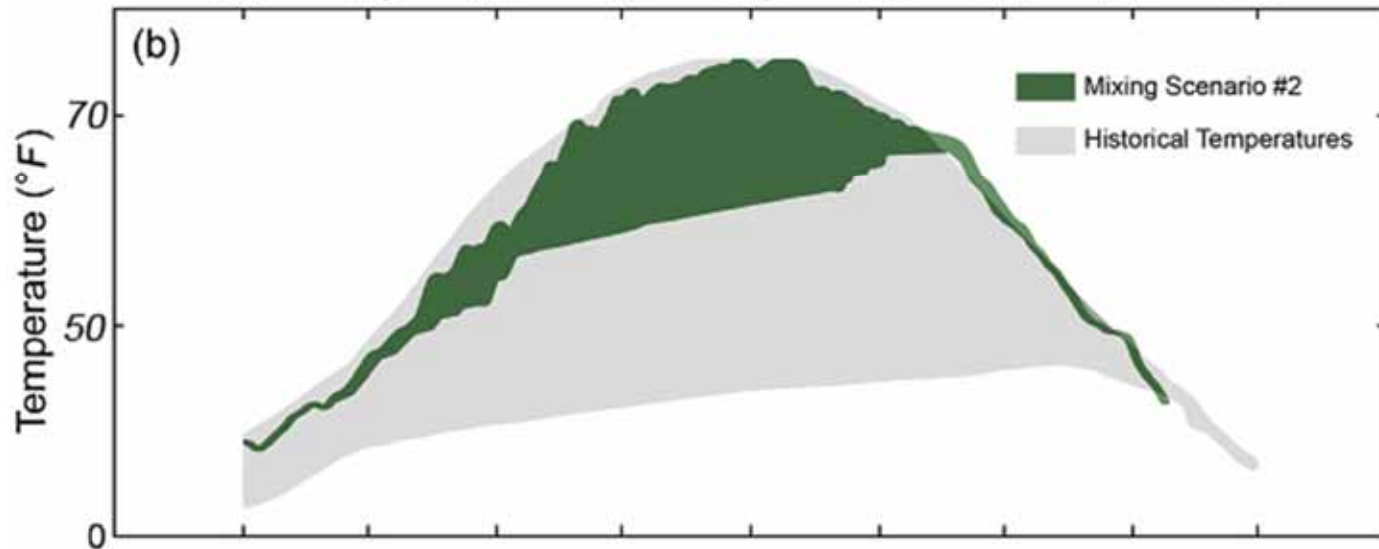


# Expected Results



Modeled temperature range

Elimination of rainbow smelt thermal habitat



Surface water temperatures near historical values

# Testing the System

