Biomanipulation Impacts on Gizzard Shad Population Dynamics, Lake Water Quality, and a Recreational Fishery

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-Lake County Water Authority
-Harris Chain of Lakes Restoration Council

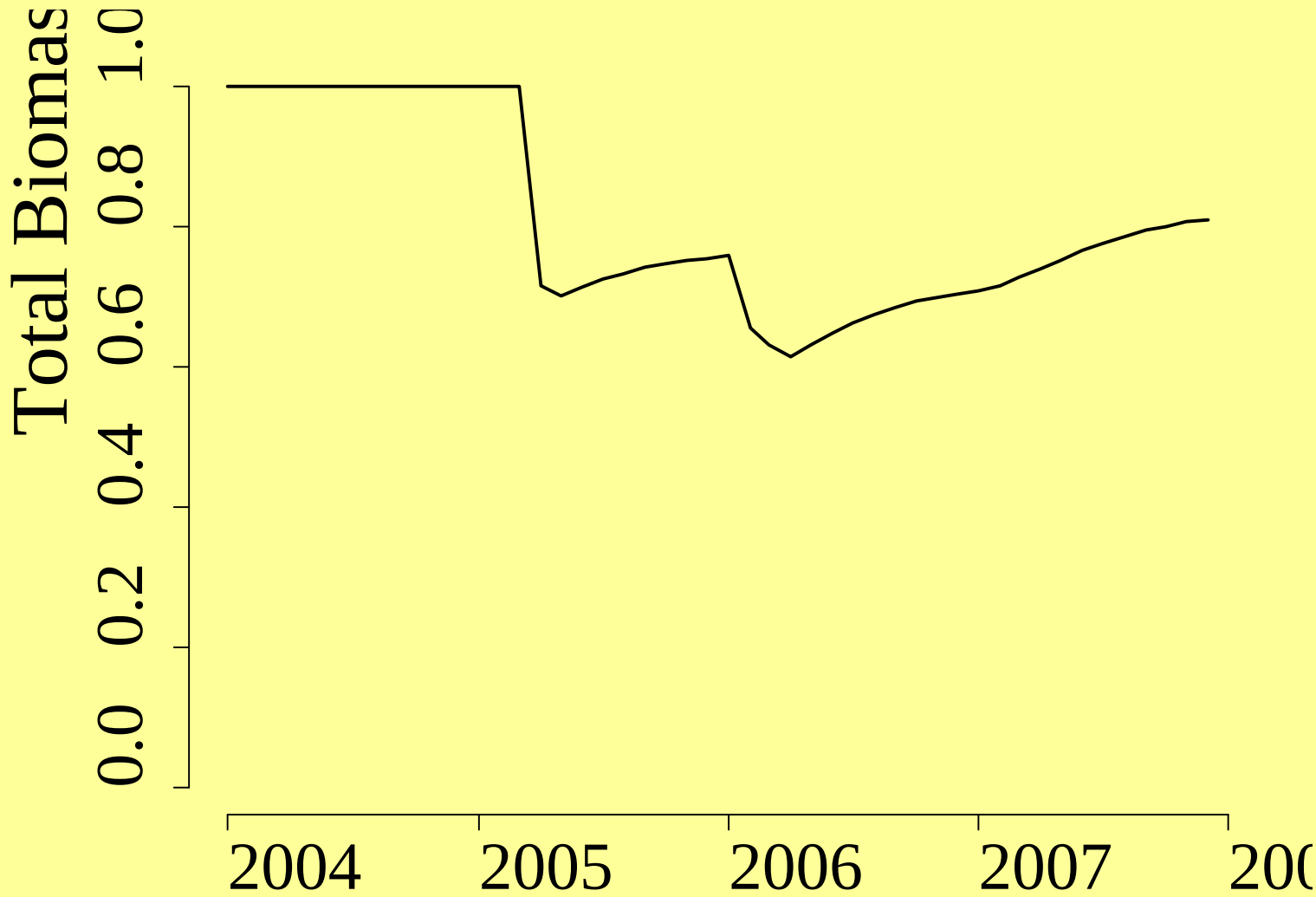
Project Components

1. Gizzard shad population response to harvest
2. Harvest strategies for shad
3. Gizzard shad feeding
4. Changes in water quality
5. Bycatch impacts for black crappie fisheries

Lakes: Dora, Eustis, Harris

Commercial Harvest

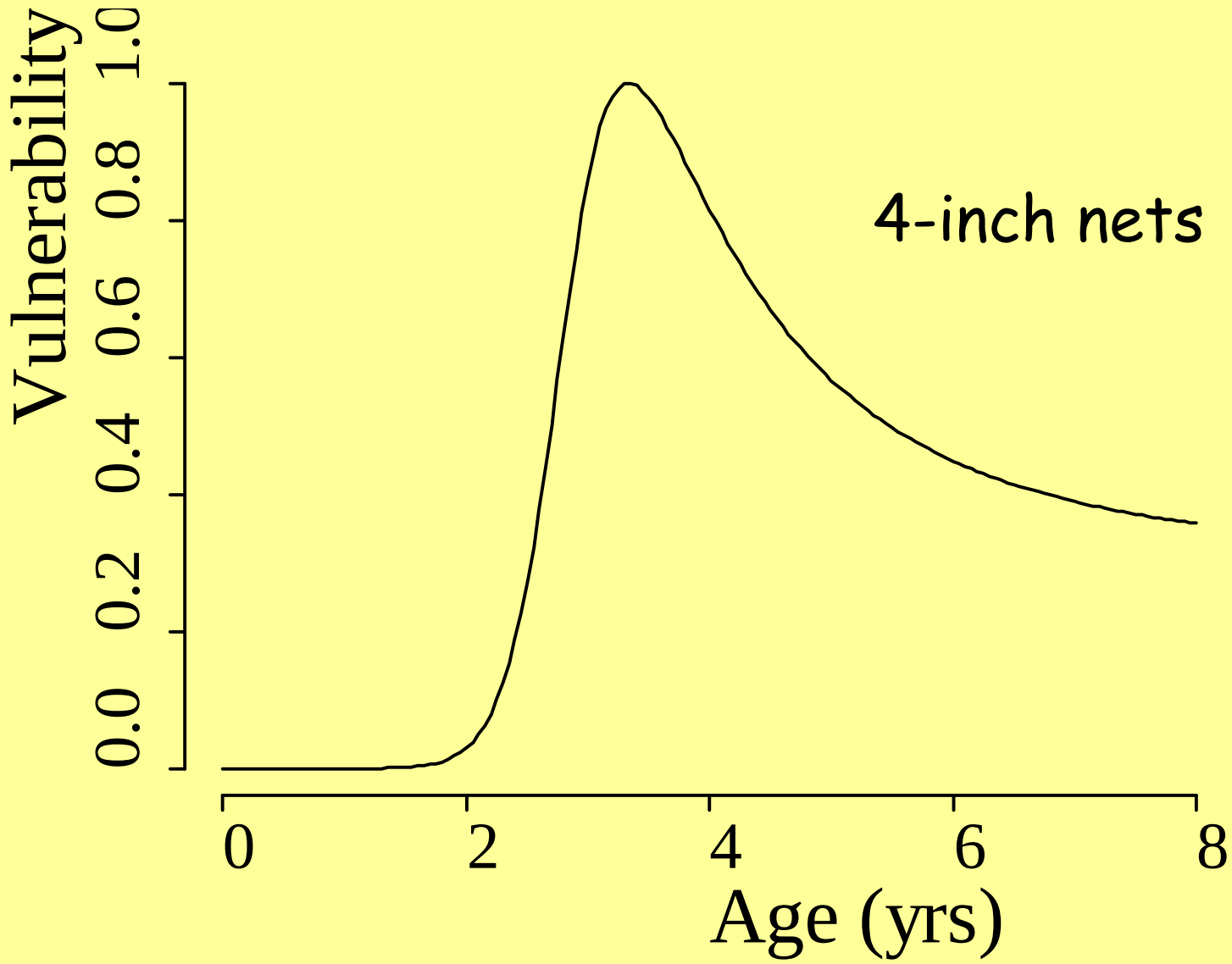
- Two commercial fishing years
- Estimated a 40% reduction in total gizzard shad biomass


Total Biomas
0.0
0.2
0.4
0.6
0.8
1.0
2004
2005
2006
2007
20(

Shad Response to Harvest

- No change in shad growth rates
- Size at maturity declined
- Evidence suggests that recruitment did not decline, but more sampling planned

Shad vulnerability to commercial nets

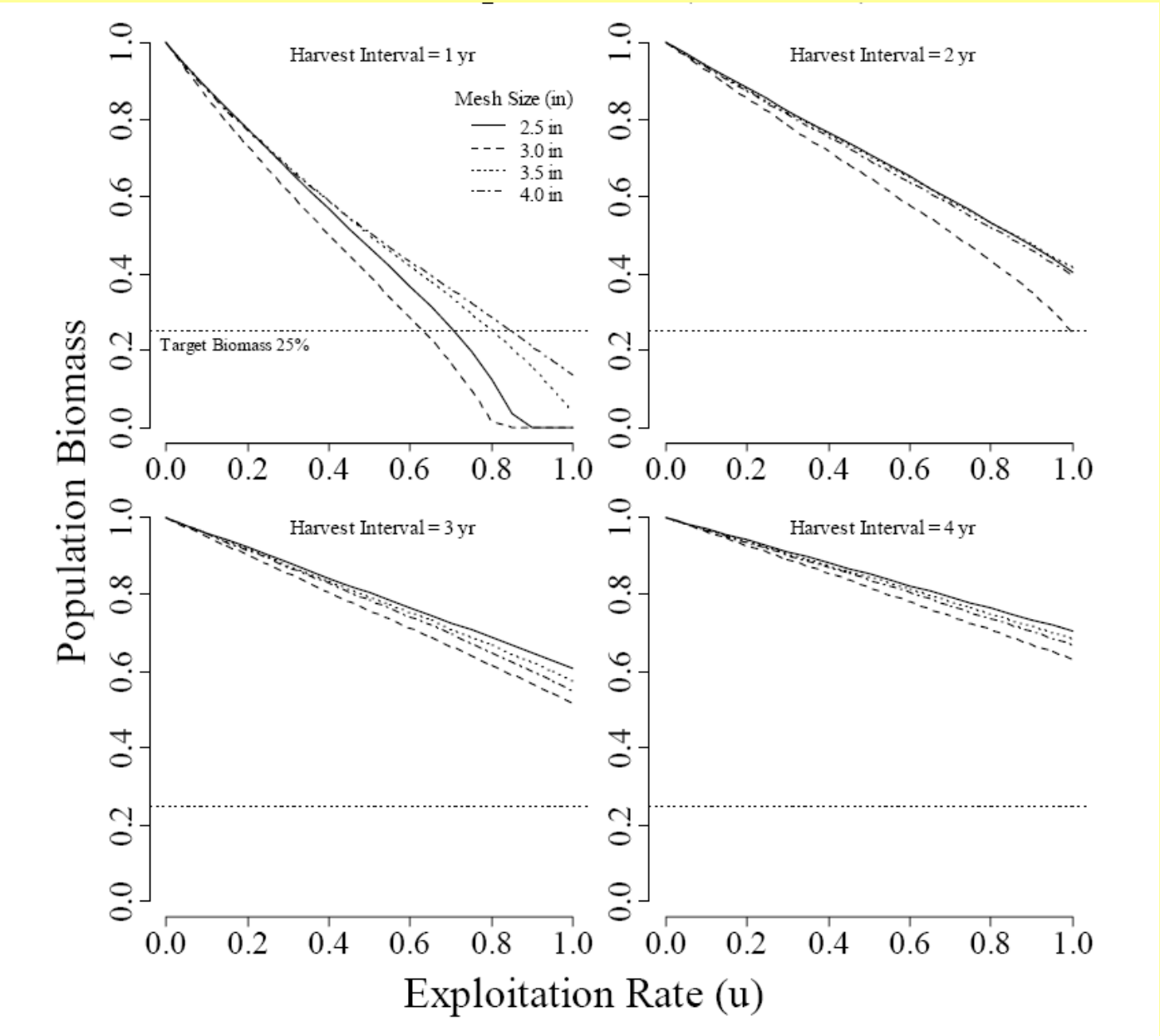

Vulnerability
0.0
0.2
0.4
0.6
0.8
1.0
4-inch nets
0
2
4
6
8
Age (yrs)

Biomanipulation Strategies

Literature suggests that 75-80% biomass reductions are needed to achieve water quality improvements

Using gill net fisheries, such reductions could only be achieved by:

-smaller mesh
-very intensive fishing
-fishing every year

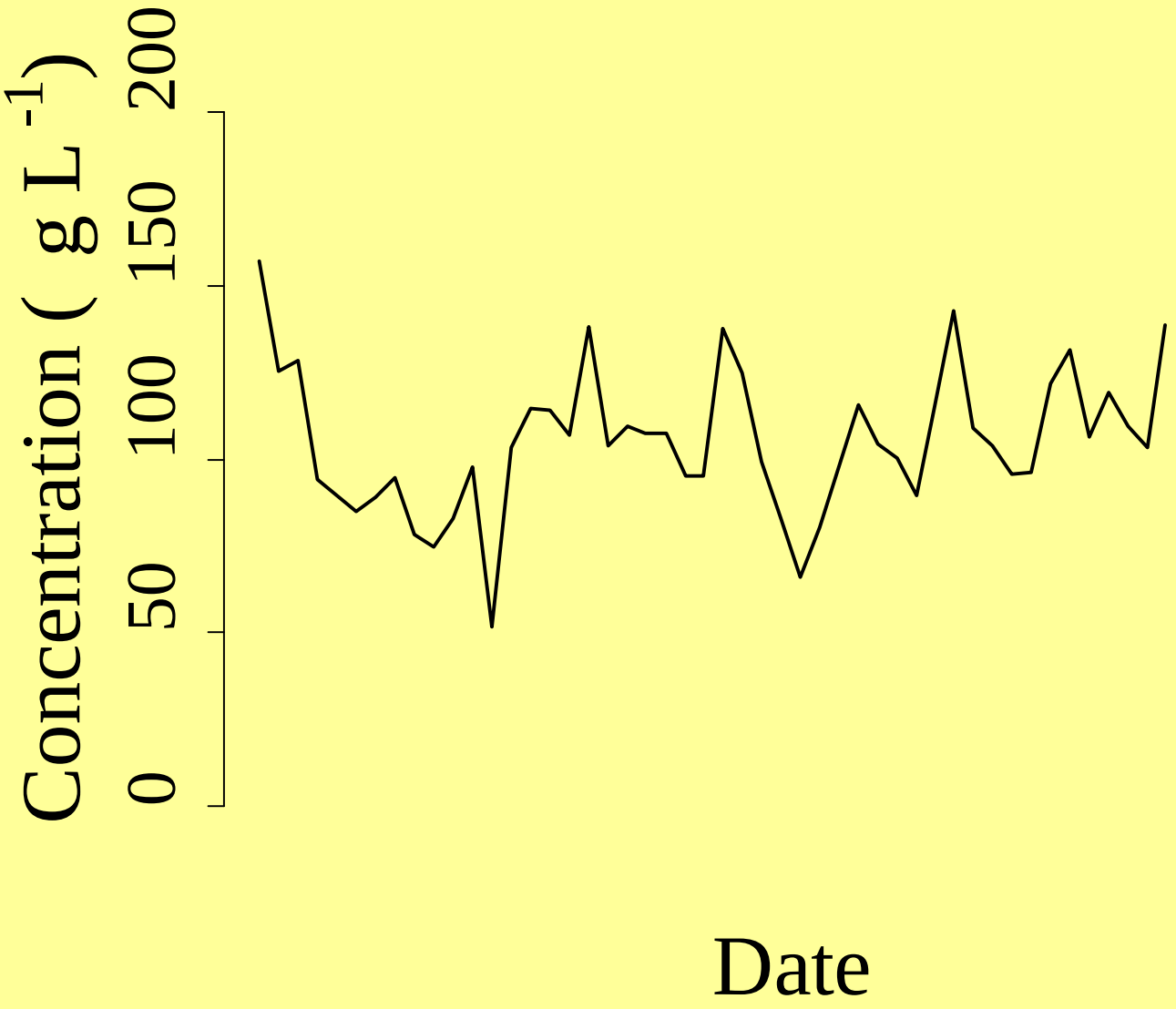

Harvest Interval = 1 yr
Harvest Interval = 2 yr
Harvest Interval = 3 yr
Harvest Interval = 4 yr
Mesh Size (in)
2.5 in
3.0 in
3.5 in
4.0 in
Target Biomass 25%
Population Biomass
Exploitation Rate (u)
0.0
0.2
0.4
0.6
0.8
1.0

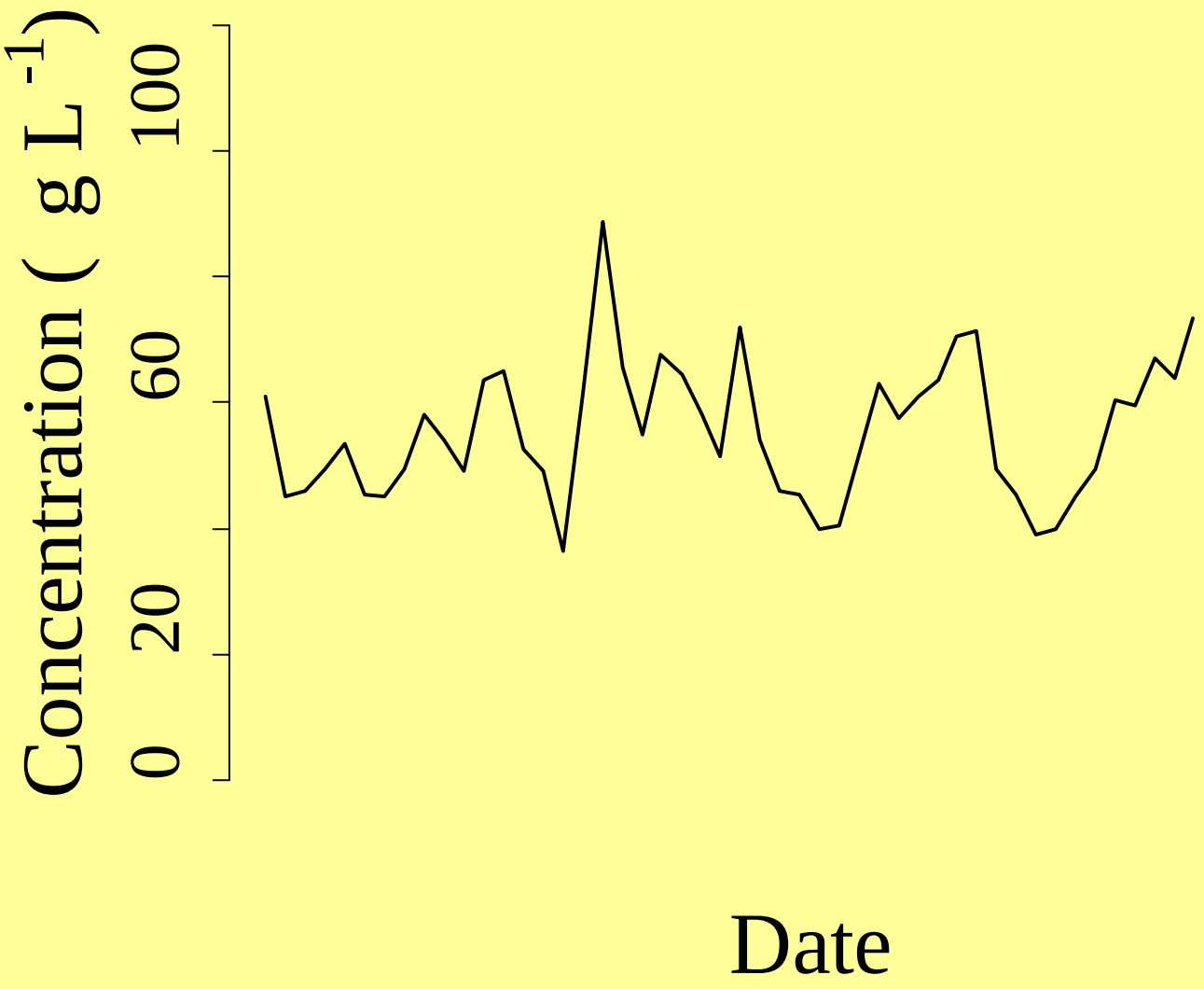
Gizzard Shad Feeding

- Shad are omnivores
- Clearly shad feed in the sediment
- All gizzard shad showed evidence of feeding in sediments and from the water column

Changes in Water Chemistry

- No change in chlorophyll, phosphorus, or zooplankton at Lake Dora


Concentration (g L -1)
0
50
100
150
200
Date


Concentration (g L -1)
0
20
60
100
Date

Changes in Water Chemistry

- 40% reduction over two years had no impact at Lake Dora
- Could require a stronger manipulation
- Objective 5…

Black Crappie Bycatch

- Anglers harvested 32,000 to 39,000 fish in 2005 and 2006

Bycatch was:

17,000 in 2005

30,000 in 2006

*bycatch mortality 31-45%

Black Crappie Bycatch

- Lake Dora is a popular black crappie fishery
- Fishing mortality for the recreational fishery was high (42%)
- We estimated 12% additional fishing mortality from commercial bycatch
- Near maximum sustainable fishing mortality rates from both fisheries combined

Black Crappie Bycatch

- Commercial bycatch is a concern for fisheries like Lake Dora, when angler harvest is also high
  - Could harm recreational fisheries
  - Lake Apopka comparison

Management Recommendations

- Literature suggests that large biomass reductions are needed to cause water quality changes
- Our results show that this is unlikely with current fishery configurations
- Biomass reduction needed for FL lakes unknown
- Smaller mesh nets, more intensive fishing needed

Management Recommendations

- Bycatch is an important consideration, would increase with smaller mesh sizes
- Future projects should set biomanipulation as the primary objectives, with fisheries objectives secondary
- Lake Dora experiment did not optimize either objective (biomanipulation or fisheries)

Thank You!