

How Hydraulic Connectivity Drives Water Quality, Habitat, and Fish

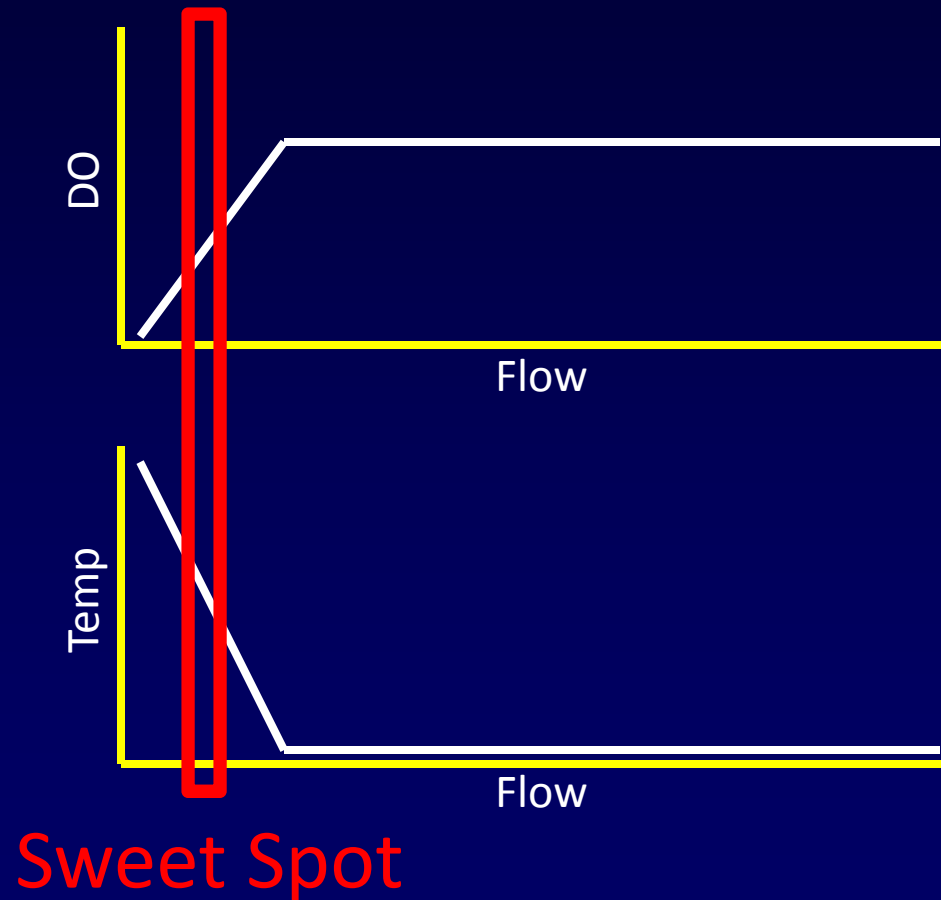
Kirk Hansen

HREP Team Meeting
September 28, 2016



Important Winter Backwater Water Quality Variables

- Dissolved oxygen
- Temperature
- Flow
- These water quality variables are not independent





Stone Lake

Jan. 19, 2010

1.2 acres

Centrarchids will seek out the warmest water with sufficient oxygen while avoiding flow.



Stone Lake

Feb. 5, 2010

5.0 acres

Centrarchids will seek out the warmest water with sufficient oxygen while avoiding flow.



Stone Lake

Feb. 26, 2010

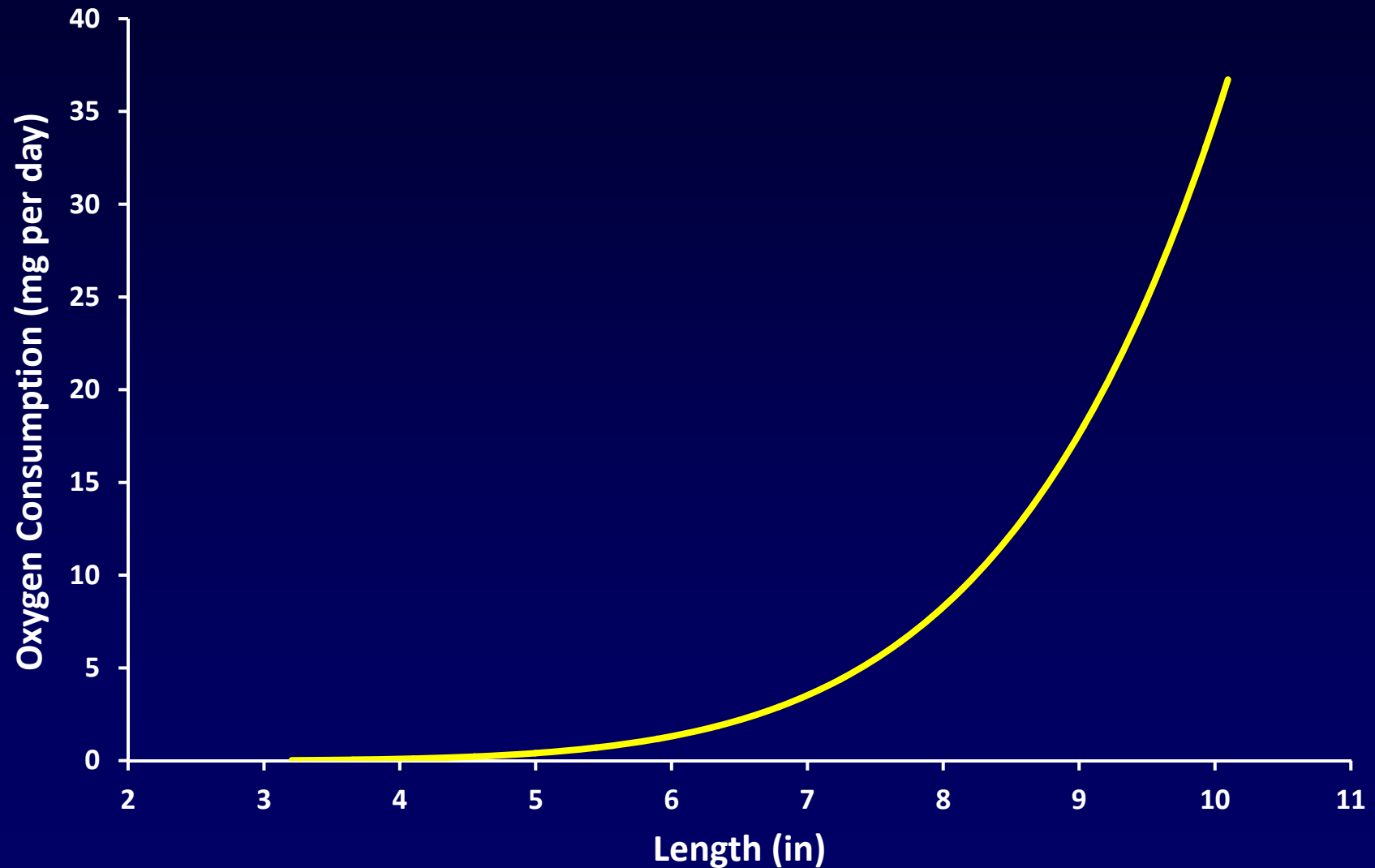
2.5 acres

Centrarchids will seek out the warmest water with sufficient oxygen while avoiding flow.

Poor Winter Water Quality

- Generally falls into two categories:
 - Low DO
 - Too much flow (causes low temperatures)
- These two conditions do not affect all sizes of fish equally
- Anoxic conditions are harder on larger fish

Bluegill Oxygen Consumption (1.7°C)



*Modified from Wohlschlang and Juliano (1959)

Poor Winter Water Quality

- Low temperatures are harder on small fish
- Flow makes things worse

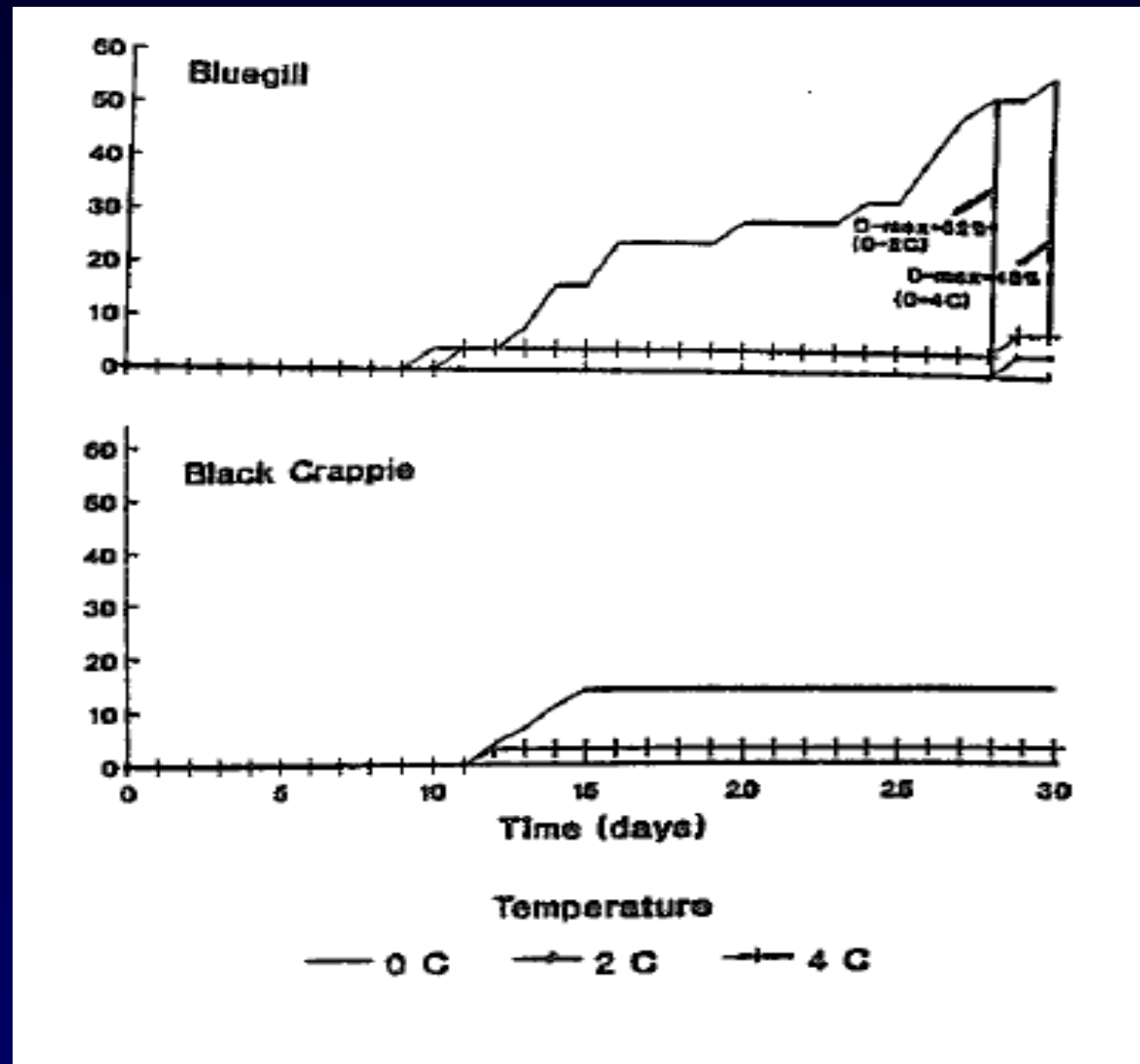


Figure 3. Mortality for young-of-the-year of five temperate species at 0, 2, or 4 C over 30 days. Significantly different time-mortality distributions are indicated (D-max).

Sheehan et al. (1990)

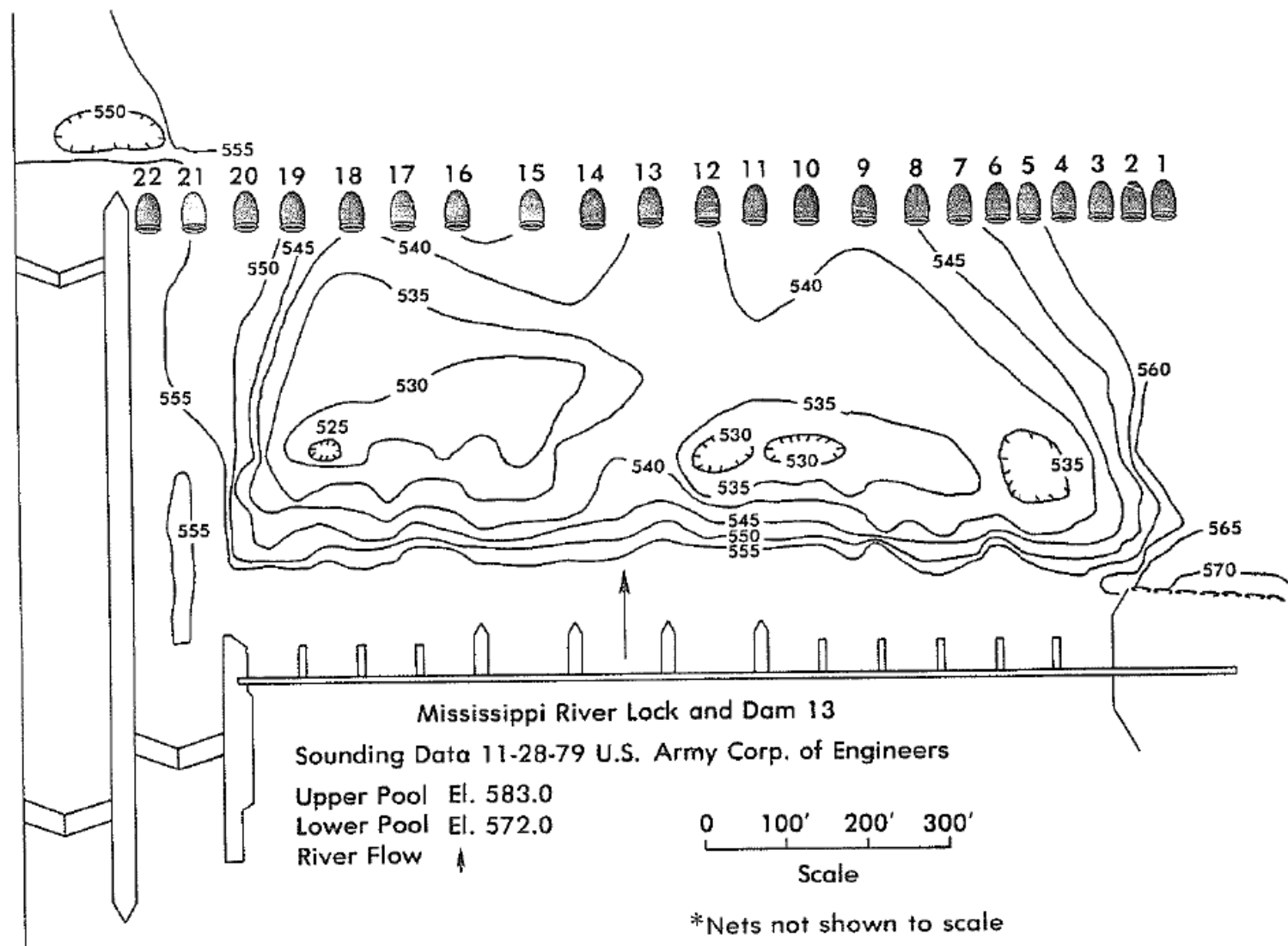


Figure 60. Drift net locations in the Pool 13 tailwater during March, 1985.

Bodensteiner and Lewis (1994)

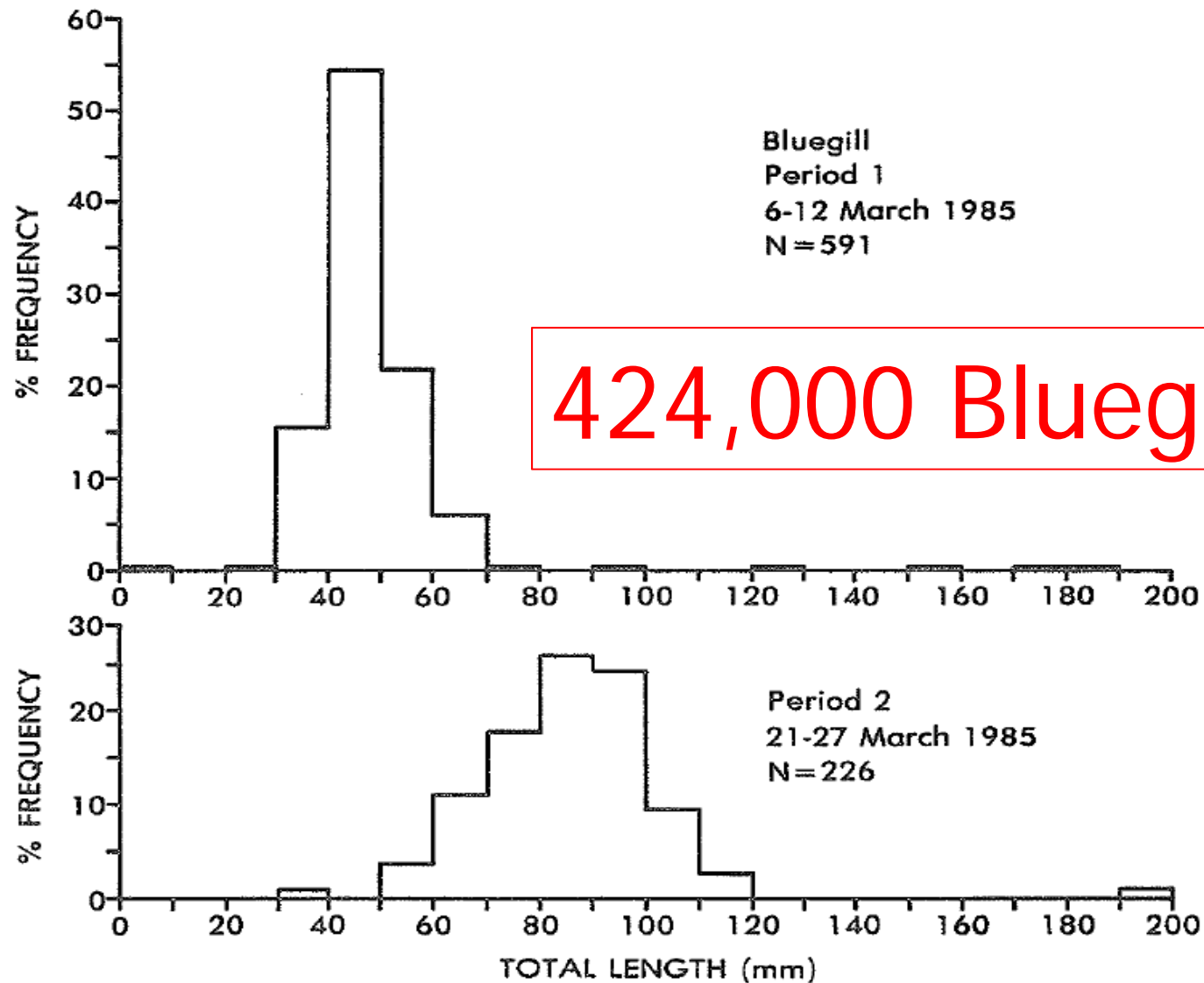


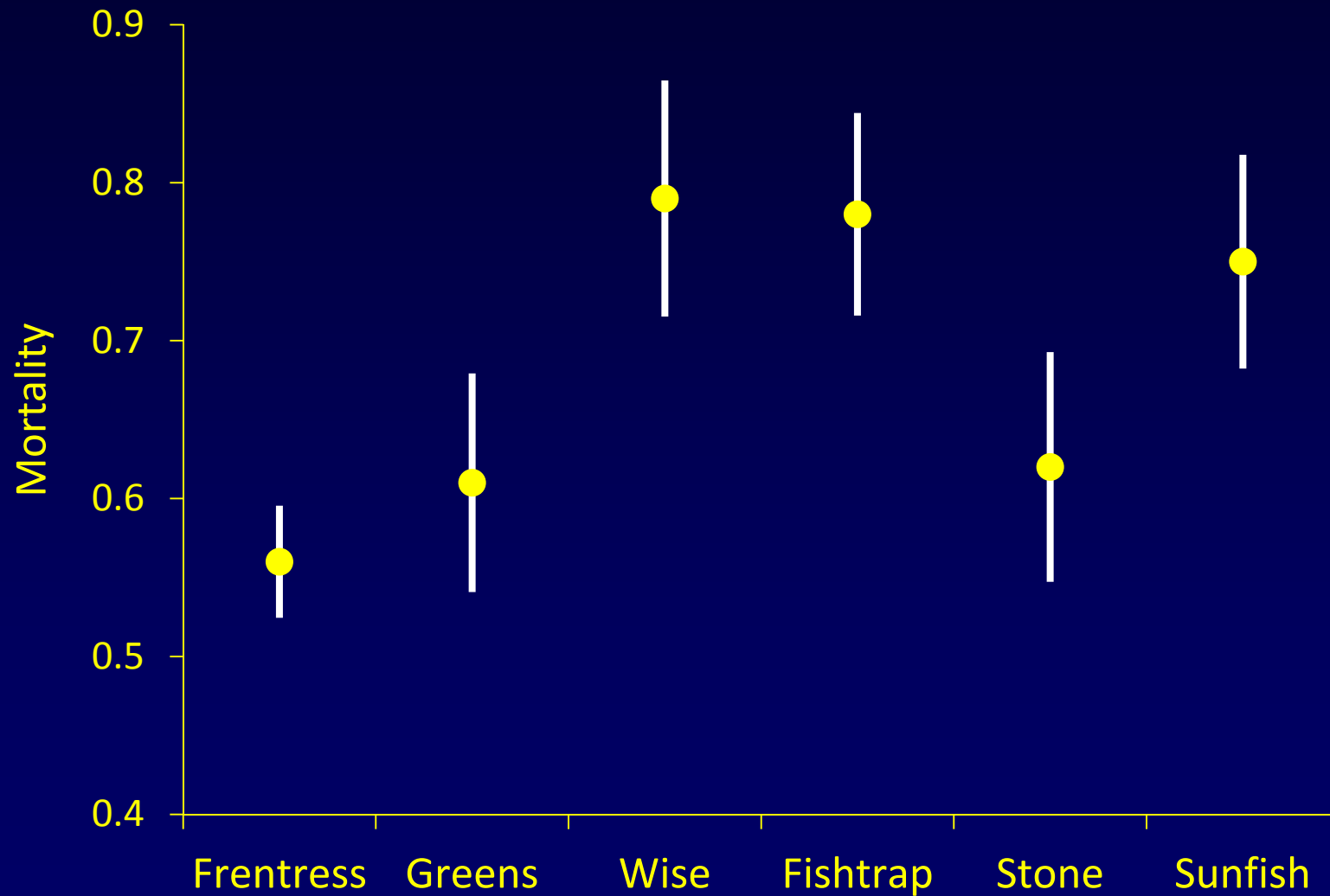
Figure 61. Length-frequency distribution of bluegill caught by drift nets in the tailwater of Pool 13 during March, 1985.

Bodensteiner and Lewis (1994)

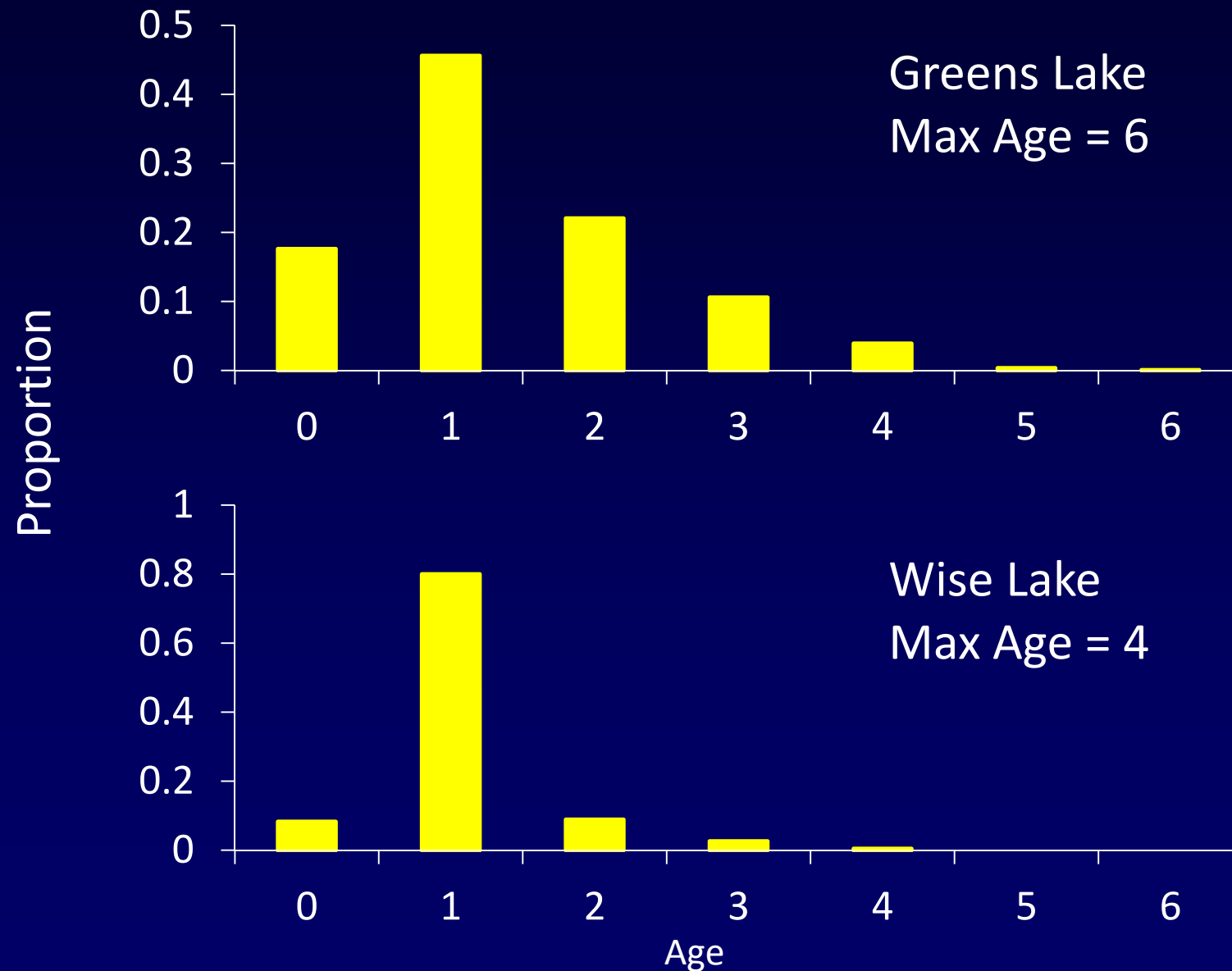




Mean Bluegill Mortality



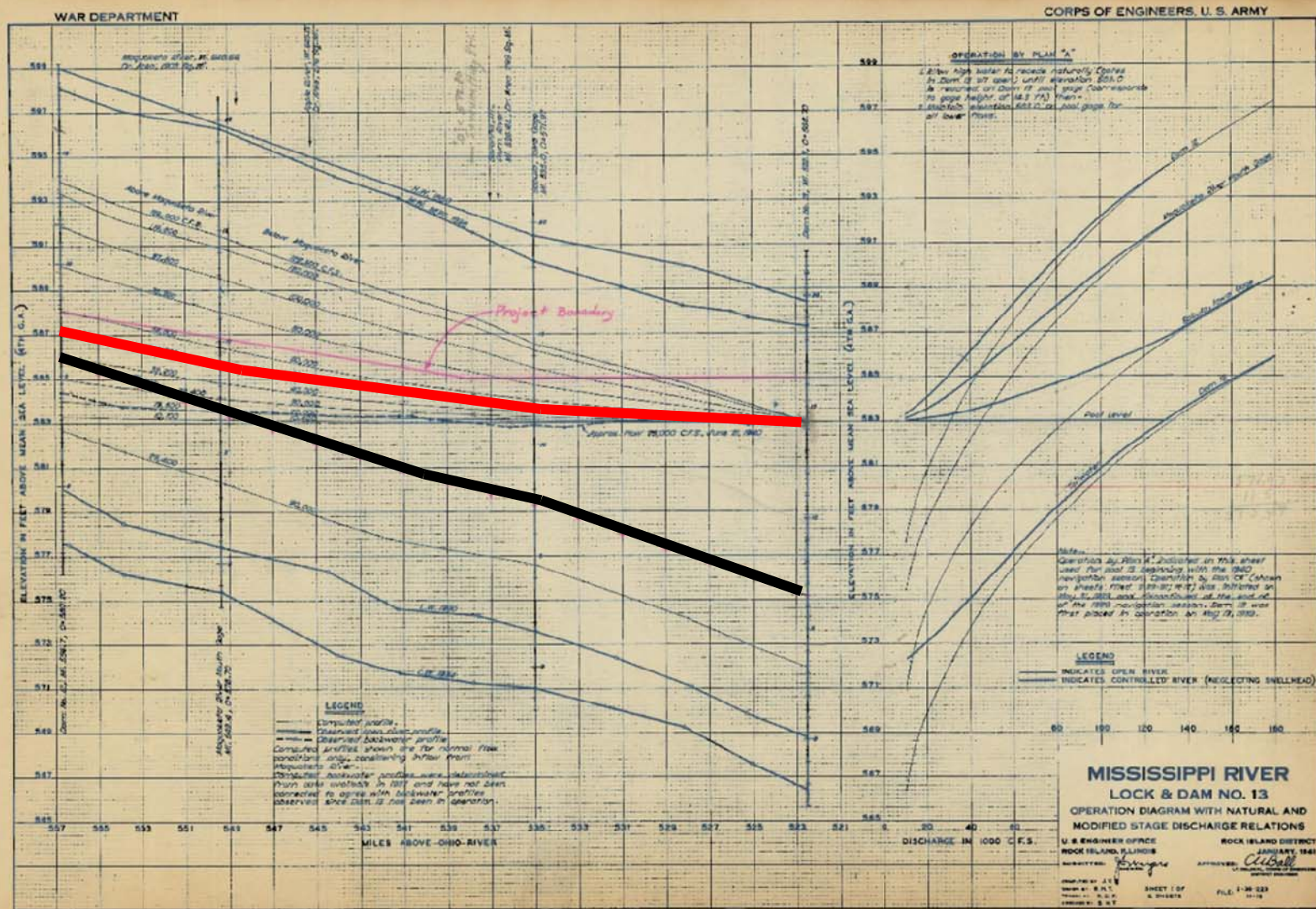
Bluegill Age Frequency



Natural Levees

- Increase water elevation has effectively reduced island elevations
- Increased lateral connectivity through island dissection
- Turned single- into multiple-connection lakes or side channels

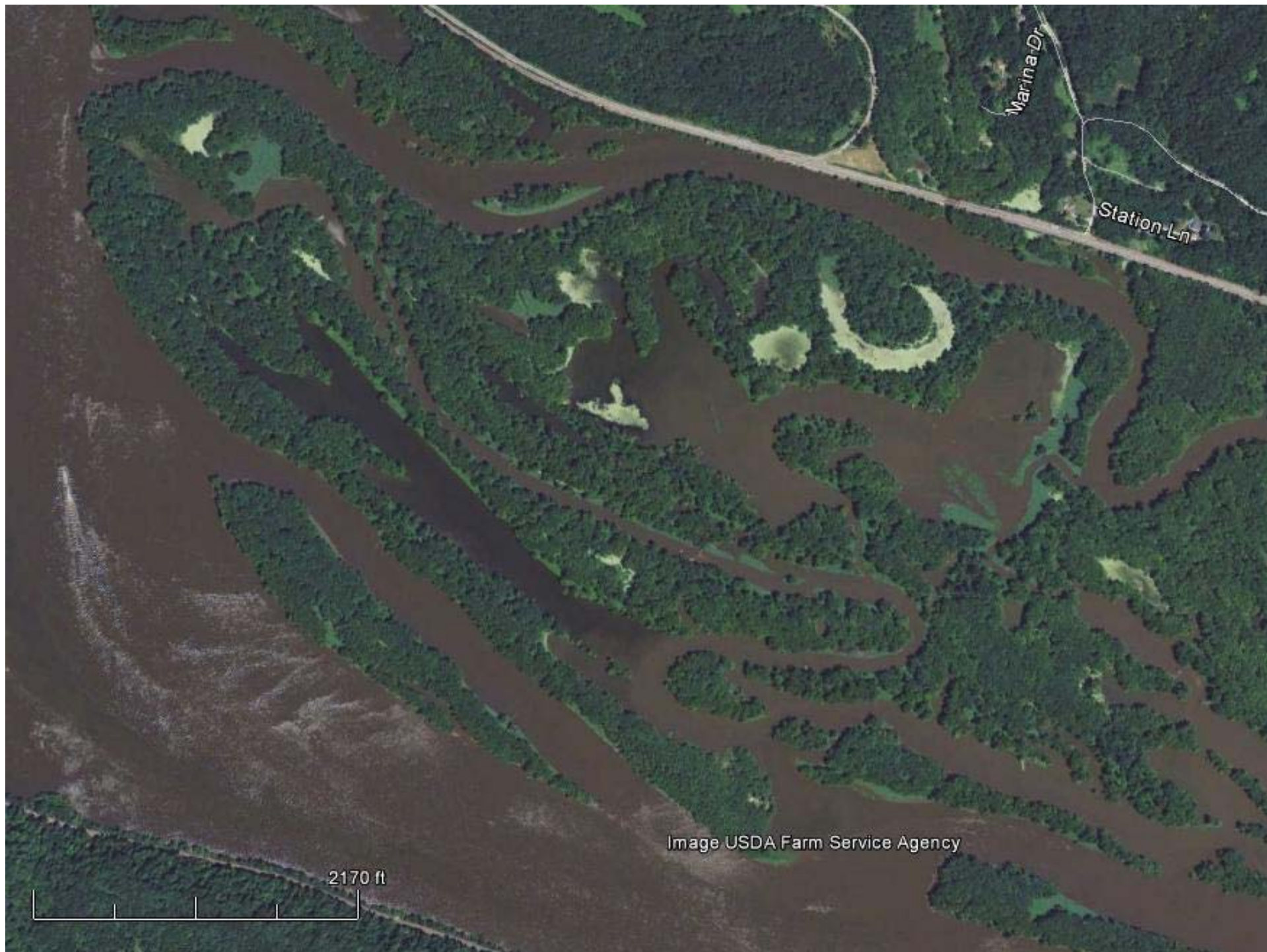
Natural Levees

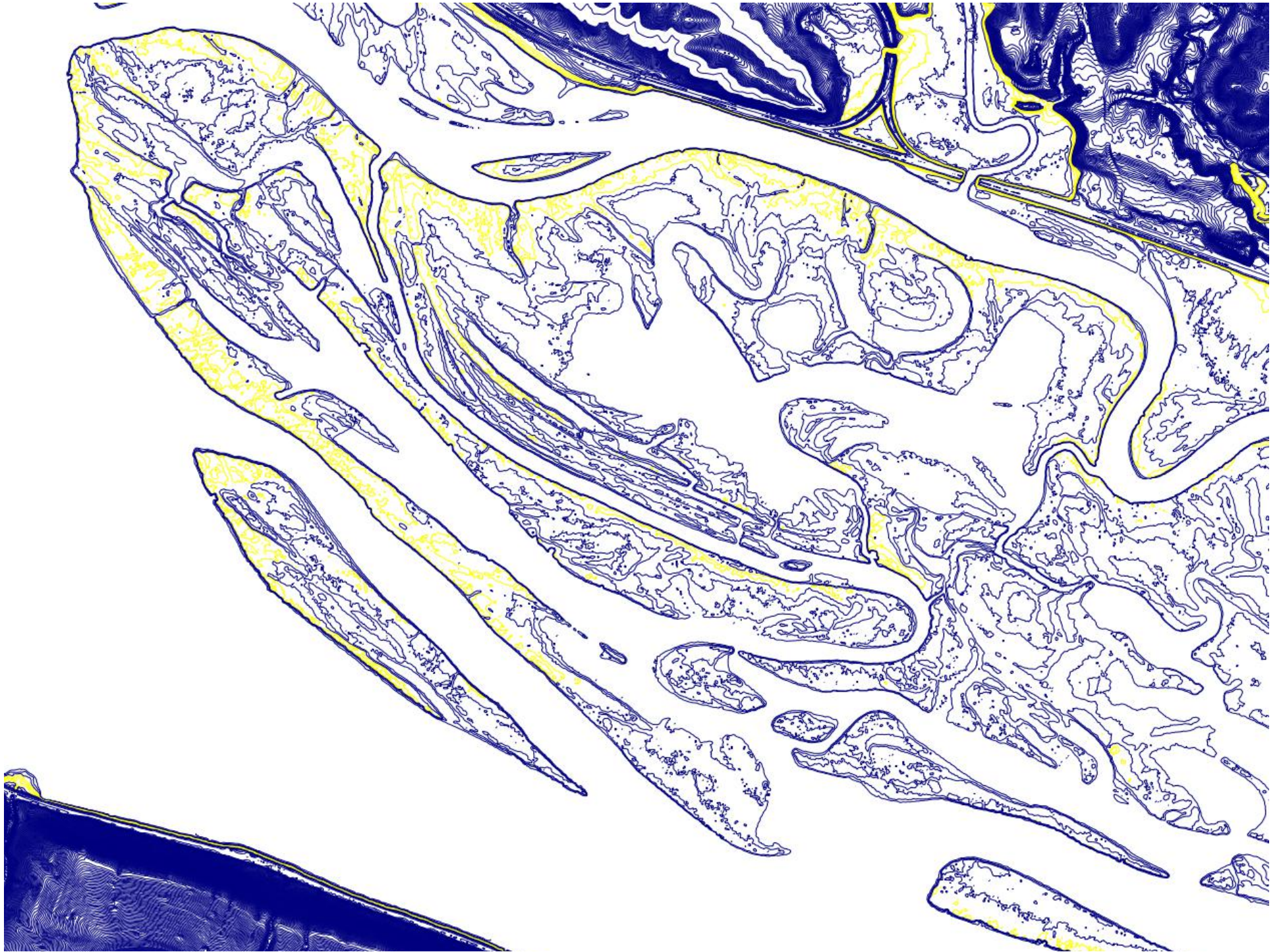




Natural Levees

- Existing quality overwintering lakes are surrounded or capped by diverse forests
 - Higher elevation
 - Less frequent overland flooding
 - Better sediment filtration
 - Lower sedimentation





Natural Levees

- Strong tie between high quality terrestrial and aquatic habitat
- Enhance forestry resources while reconstructing natural filter for backwaters
- Building like nature will result in more resilient and healthy projects



Questions