What does **14 trillion liters** of freshwater do to an estuarine ecosystem?

Less than you might think.

Introduction:

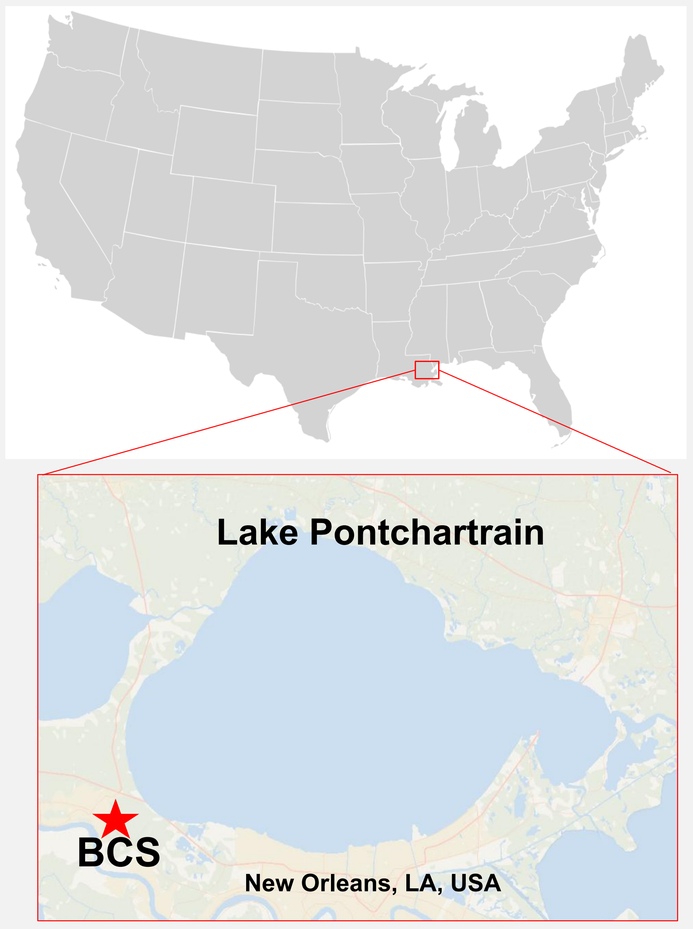
Lake Pontchartrain: brackish estuary in southeast Louisiana, USA

Bonnet Carré Spillway (BCS): river diversion, sends nitrogen-rich Mississippi River water into estuary during high flood conditions.

- Average total discharge of a BCS opening is 14.7 trillion liters (338 billion gallons)
- Spillway openings known to halve residence time in the estuary

Pontchartrain hosts valuable **seafood resources**, known to contribute 385 million kg.

This system is a pillar of coastal Louisiana's ecological and economic stability.



Objectives:

To define how BCS openings are affecting the ecosystem of Lake Pontchartrain and how these changes impact estuarine fish abundance.

Methods:

I ran Generalized Additive Models (GAMs) to explore nonlinear relationships between ecological variables.

$$g(E(Y)) = \beta_0 + \sum_{j=1}^{J} f_j(x_j)$$

Modeled multiple years with and without BCS activity to assess how the spillway changes the way this estuary functions and potentially alters the fish abundance.

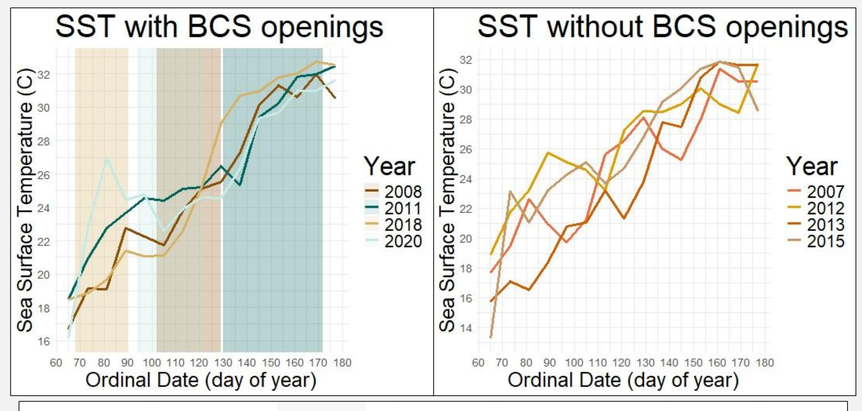
Results:

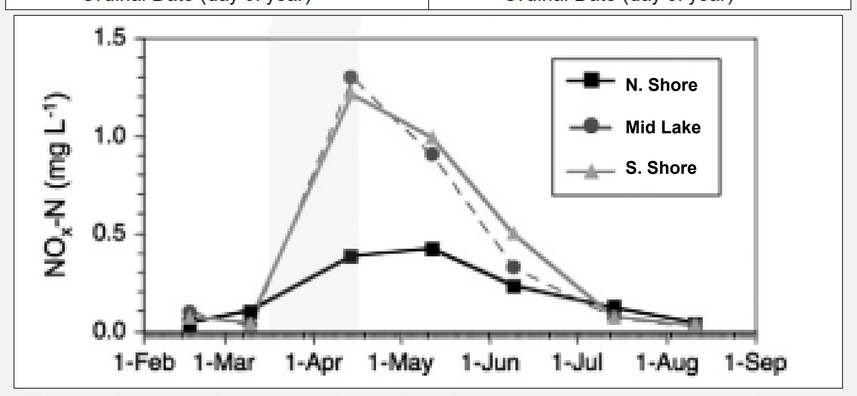
BCS openings, though *massive*, seem to leave few lasting impacts on the Lake Pontchartrain Estuary.

Environmental conditions return to pre-opening seasonal levels within 15-30 days post-opening.

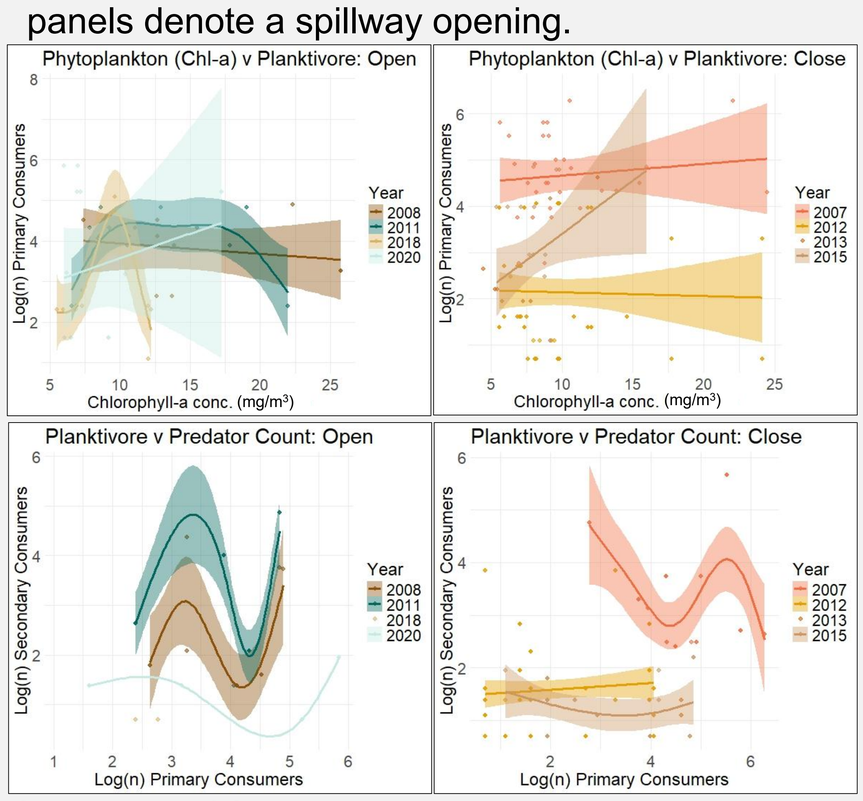
However,

Inter-annual variability in fish abundance across multiple species is dampened by spillway activity.





The above time series depict temperature and nitrogen measurements in context of BCS activity. The shaded rectangles on the top-left and bottom panels denote a spillway opening.



Comparison of GAM-smoothed relationships between chlorophyll-a (proxy for phytoplankton concentration) and multi-species fish abundance in Spring of years with and without BCS openings.

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