

Marsh Nekton Communities Across Natural and Created Sites along a Salinity Gradient

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Marsh Restoration

Global degradation of saltmarshes have increased restoration interest for nursery habitats that support fish and invertebrate communities (nekton). As a result, there is a need to evaluate the effectiveness of our investment (billions of dollars) in created habitats. In addition to quantifying the success of these sites, we also monitor the influence of a freshwater diversion that siphons Mississippi River water to areas that lack natural accretion of sediment.



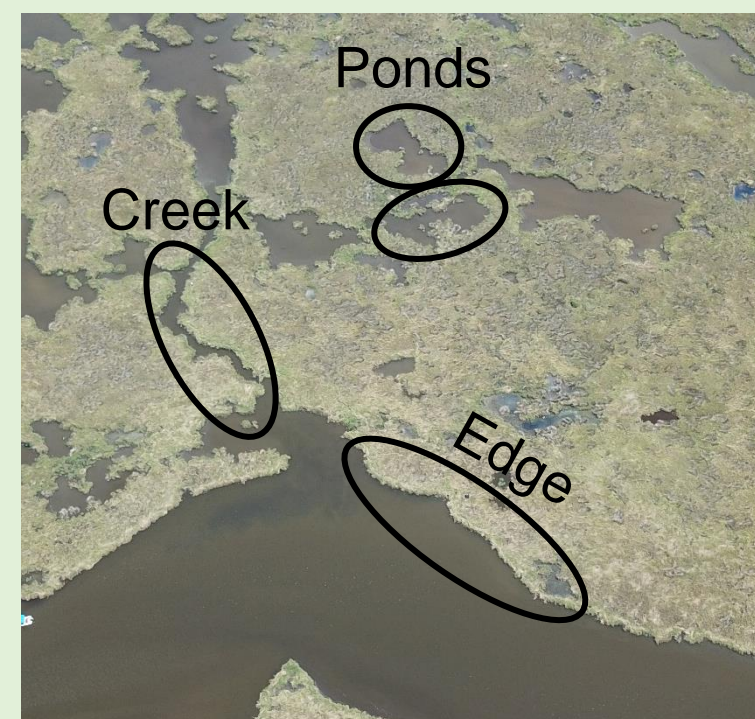
Created marshes near Lake Hermitage (2.7km², 667acres)



Mississippi River freshwater diversion near Lake Hermitage

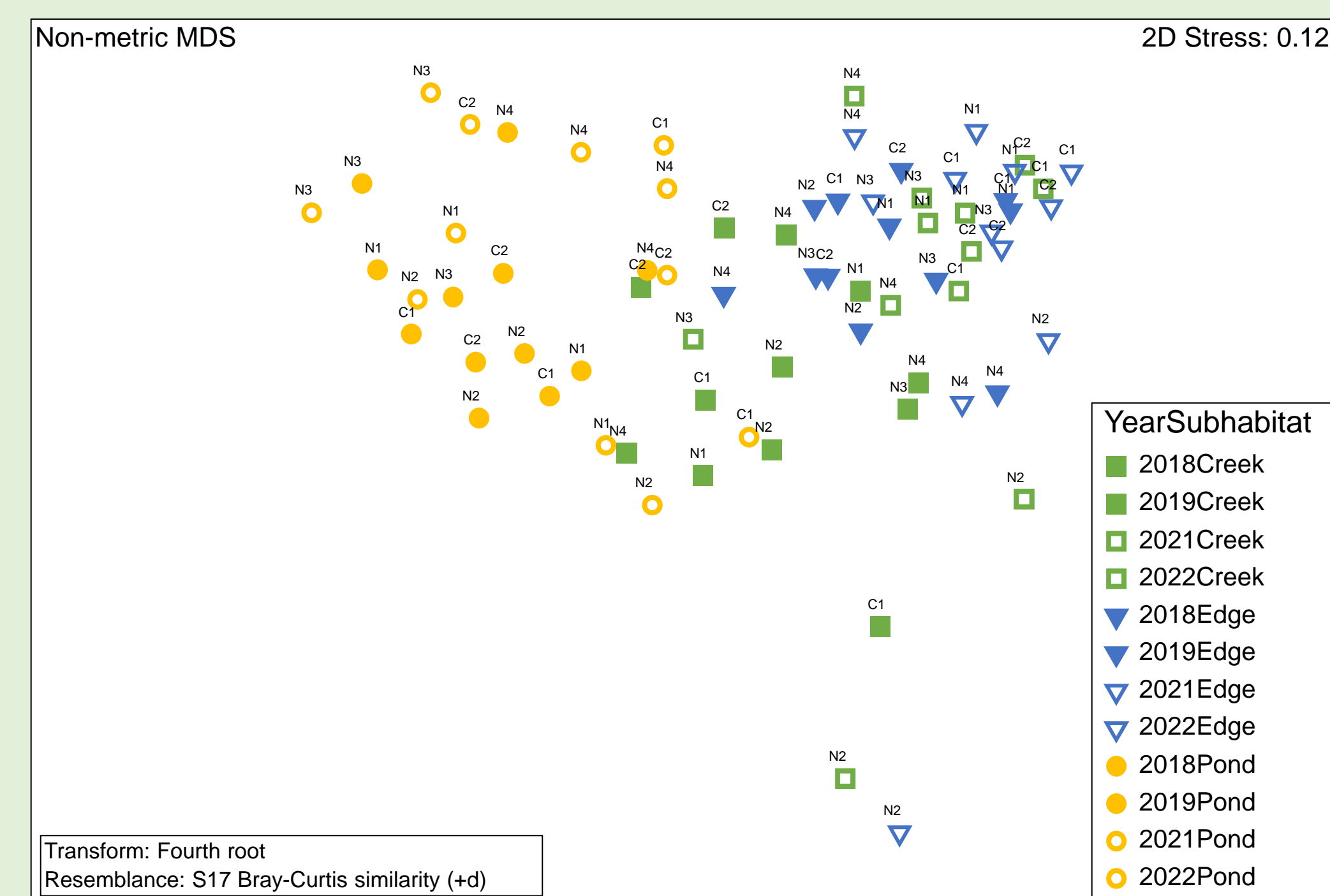
Saltmarshes occur in subtropical and temperate coastlines around the world and can be found in near freshwater to full strength seawater conditions. Within these areas, we find deeper, more open water habitats (edges), narrow channels or creeks, and semi-isolated to isolated ponds.

The objectives of these study are to compare (1) the community composition of created vs. natural saltmarshes and (2) the population structure of the most common fish species, the Gulf killifish (*Fundulus grandis*), across marsh subhabitats and salinity conditions.



The three main habitats within marshes are highlighted using ellipses in the picture above.

Community Comparison



Comparisons of nekton communities across subhabitats, sites, and years (nMDS) indicate both consistencies and shifts across spaces (subhabitat) and time. Closed polygons represent siphon off years and open polygons represent siphon on years. In ponds, Cyprinodontiforme (killifishes) dominate regardless of salinity conditions. In creek and edge, killifish are less common and there is a community shift with lower salinity conditions (driven by a shift in shrimp species).

Gulf Killifish Total Length Frequency Distributions



In 2018, the length frequency distributions of Gulf killifish were dominated by adults (>40mm, vertical dashed line) at all subhabitats. Juveniles (<40 mm) are present primary in ponds and adults mostly in creeks and edges.

Patterns at created sites (C1 and C2) were similar to those at natural sites (N1-4), indicating similar habitat function between created and natural.

Next steps will include an assessment of other metrics (e.g., weight, sex) to compare populations across sites.

In 2019, the length frequency distributions of Gulf killifish were still dominated by adults, but most were captured in ponds. Catches in creeks and edges were lower across all size classes.

The shift that occurred at all sites, in a year with the siphon still off, indicates that there is interannual variability unrelated to the siphon and its associated salinity changes.

Next steps will include an assessment of the response of other species in this year.

In 2021, the total catch was lower and the size classes were smaller, especially at the site closes to the siphon (N2). Most fish were captured in ponds.

Freshwater input may have been a contributing factor to decrease in catch. However, we see a change in N4, which is outside of the influence of the siphon.

Next step will include an assessment of other species within ponds since we know the community structure remains consistent regardless of salinity conditions.

In 2022, the total catch was lower at all the sites that are influenced by the siphon (C1, C3, N1-3), but at the site not influenced by the siphon (N4) we recorded a return to patterns similar to 2018.

Freshwater inputs are seemingly still influencing populations shifts and N4's return to 2018 patterns indicates the shift in 2021 was not related to the siphon.

Next steps will include an assessment of other species responses to determine if they continue to shift from 2021 as well.