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Introduction

- Global biodiversity is in decline with nearly 1/3 of all freshwater fishes threatened with extinction.
- Routine biological monitoring can be used to evaluate patterns and trends in aquatic biodiversity.
- The National Rivers and Streams Assessment (NRSA) is conducted by the Environmental Protection Agency (EPA) along with states, tribes, academics, and other federal agencies.
- NRSA is conducted every five years to assess long-term trends in lotic ecosystem health, including fish assemblages across the United States.

Study Area

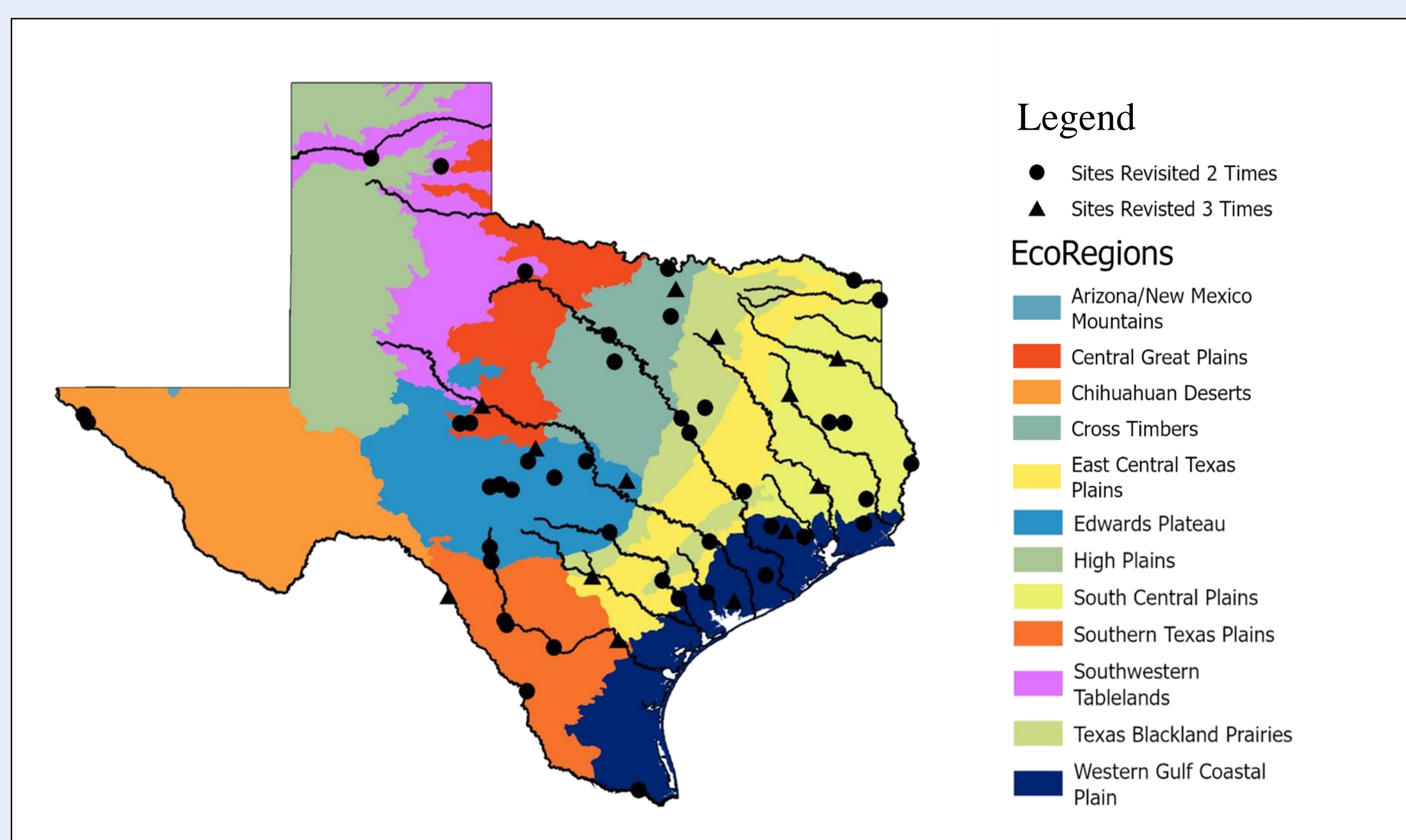


Figure 1: Map of Texas showing the major ecoregions, rivers, and sampled sites.

Methods

- A sub-sample of sites were “resampled” (e.g., sampled before in a previous survey) between 2008 and 2024 in Texas (Figure 1).
- 44 sites sampled twice
- 13 sites sampled three times
- Electrofishing used to assess fish community (Figure 2).
- Species richness (n) is the total # of different species
- Shannon-Weiner Diversity (H) is the sum of the proportion of individuals from i-th species x the ln of the proportion; for all species
- Evenness is the H ÷ the ln of the n



Figure 2: Electrofishing methods a) boat, b) barge, c) backpack.

Sampling Protocol

- Electrofishing methods differed by stream size (small: Figure 3 panels a or b; large: Figure 3 panels c or d) and type (wadeable: Figure 3 panels a or c; non-wadeable: Figure 3 panels b or d).
- In small streams, full reach was fished.
- In large streams, fishing ceased if > 500 individuals caught after five sub-reaches or fishing continued until > 500 individuals were collected or the whole reach was sampled.

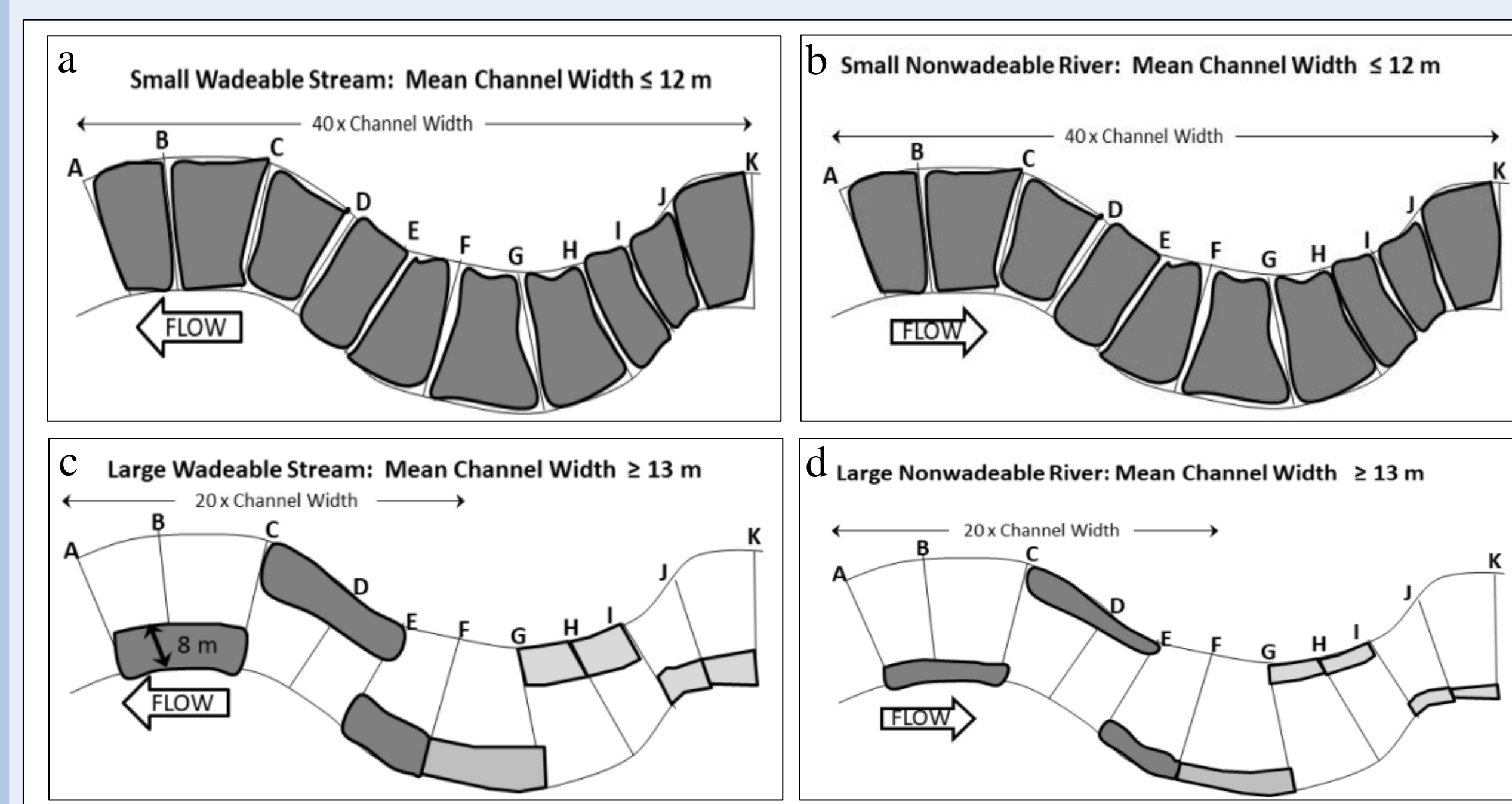


Figure 3: Fish sampling area differences based on stream size and type.

Results

- Species Richness (n), Shannon-Wiener Diversity Index (H), and evenness (e^h/s) through time is statistically stable, however variability by survey can be observed (Figure 4).

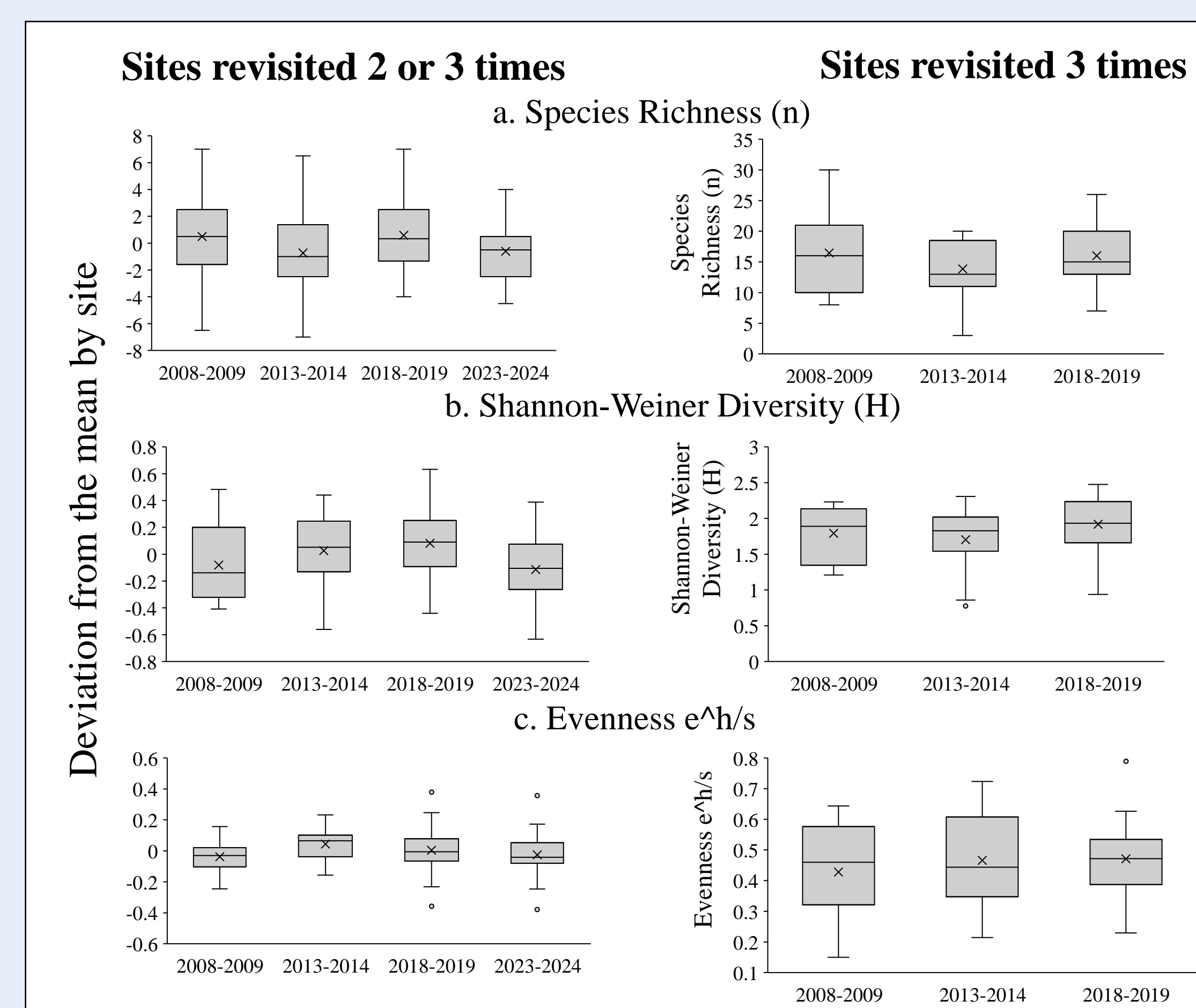


Figure 4: Fish assemblage differences between resampled sites. Differences in (a) Species Richness, (b) Shannon-Weiner Index, and (c) Evenness e^h/s. Left panels (a,b,c) show sites revisited 2 or 3 times and the Y-axis are deviations from the mean, due to differences in resampled sites. Right panels (a,b,c) show sites revisited 3 times and the Y-axis are raw values, since sites were the same across all three years.

- The ratio of non-native to native species appears to increase during the years when the fish community richness, diversity, and evenness decreases (Figure 5).

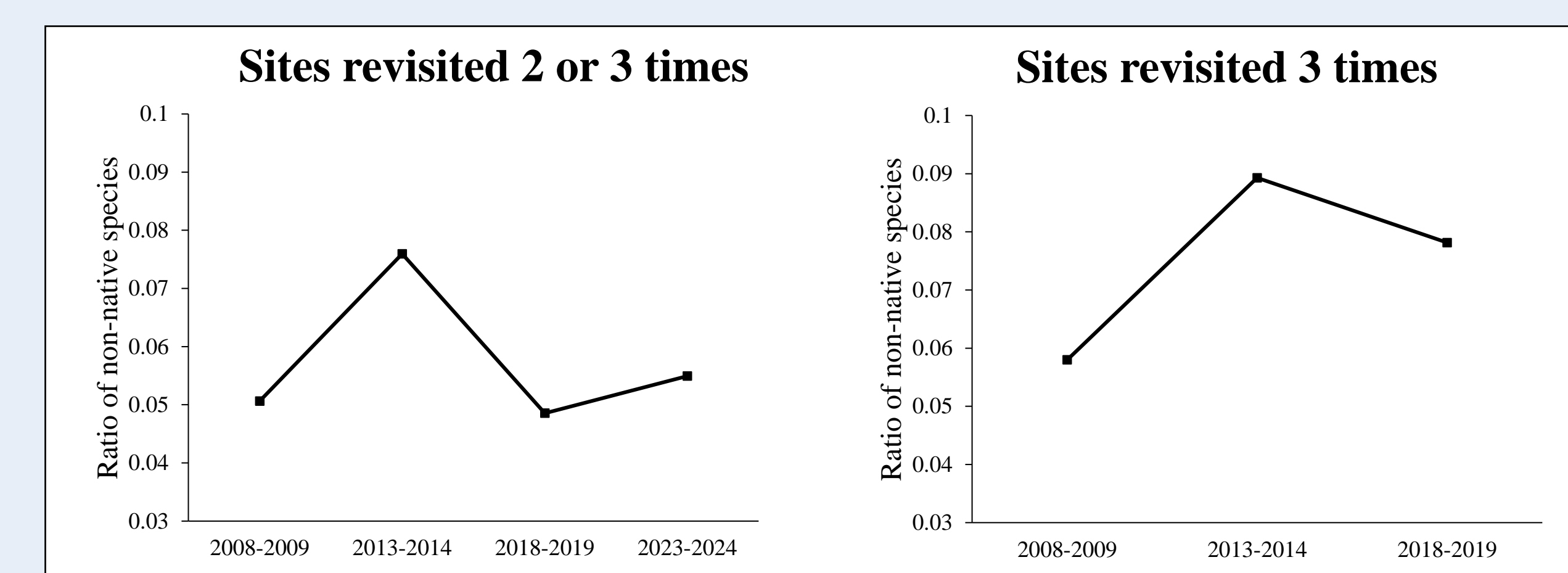


Figure 5: Ratio of non-native species/native species observed across surveys.

Discussion

- Likely many variables influencing general declines in our study metrics observed between 2013-2014 and 2018-2019.
- Droughts may be one factor (Figure 6).
- Continued large-scale monitoring is important in the face of habitat loss and degradation, water diversion, barriers to movement and anthropogenic impacts to watersheds.

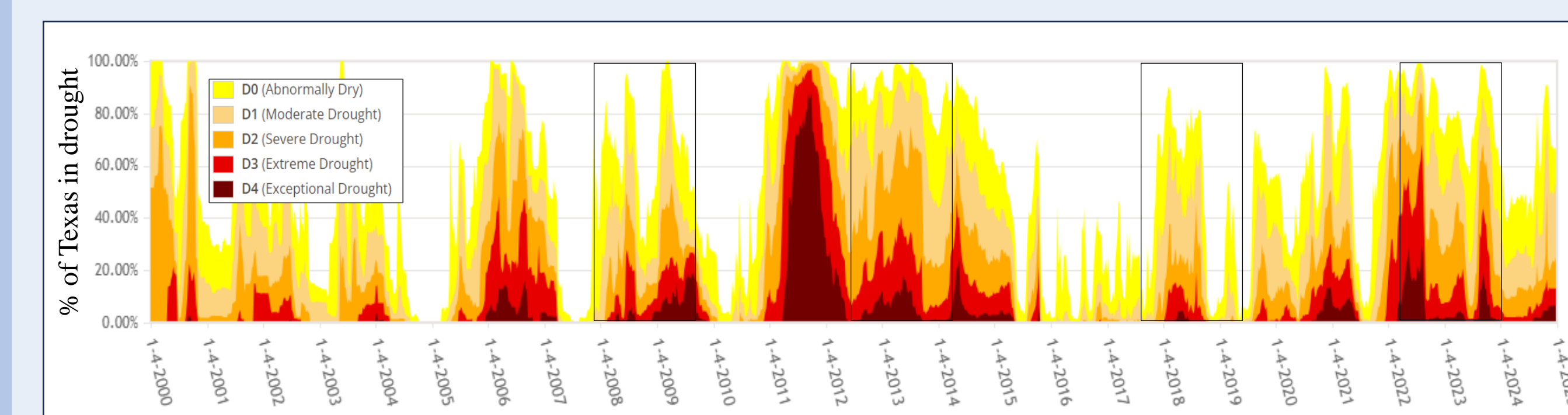


Figure 6: Texas drought data from the National Drought Mitigation Center. (<https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx>)

Future Work

- Calculate and compare Indices of Biotic Integrity (IBI's)
- Investigate potential differences by ecoregion, river basin, stream type, and Strahler order.

Acknowledgements

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All NARS data can be found online at:



For more information on EIH please visit:

