

Interannual Variation of Ichthyofaunal Utilization of a Man-Made Salt Marsh Creek in Mission Bay, California

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Background & Objectives

Marsh restoration and creation are increasingly being used to mitigate Southern California's wetland's drastic decline due to human activities, but there are few studies on the effectiveness of marsh creation (Lui, 2021; Talley, 2000). A study of resident fish species in the first few years following the construction of a man-made marsh, conducted by Dr. Drew Talley, found that the created marsh initially did provide the same function for the wetland fish communities as the adjacent natural marsh with the deep channel and minimal shallow water habitat leading to populations that were skewed towards larger size in the created marsh.

Research Question:

"How have fish characteristics changed between a natural and created marsh over short (year-to-year) & long temporal scales (two decades)?"

Study Site

- Natural Northern Wildlife Preserve (NWP) & adjacent created Crown Point Mitigation Site (CPMS) marsh in the northern part of Mission Bay, San Diego, California (Figure 1A).
- The NWP has three discrete creek systems; the system closest to the mitigation marsh will be used for this study (Figure 1B).
- The CPMS is a salt marsh system established by the City of San Diego in 1993 as mitigation for losses of intertidal habitat due to the expansion of the San Diego International Airport (Ferren et al., 1996).

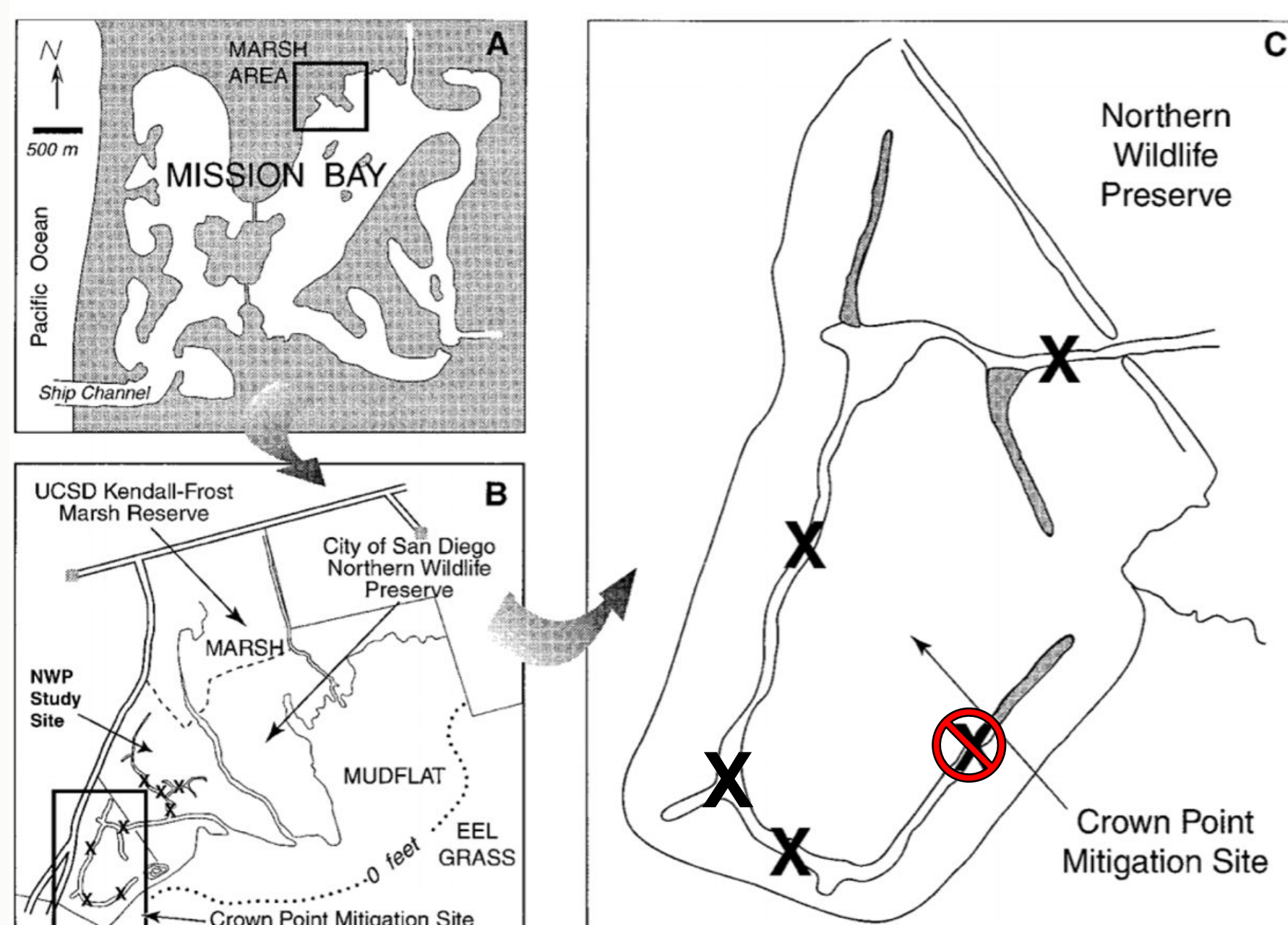


Figure 1. Map of study site, showing (A) Mission Bay, San Diego, CA and (B) the Crown Point Mitigation Site (CPMS) and Northern Wildlife Preserve (NWP) site. Shaded area in (C) indicates shallow subtidal habitat. Xs mark the locations of minnow traps. The prohibition sign marks a former minnow trap.

Methods

Preparation:

- Ichthyofauna were sampled with Gee® minnow traps, 22-cm diameter from the center, tapering to 19 cm at each end, made of 0.6 cm wire mesh with 2 cm openings.
- Traps were baited with canned cat food, attached to stakes with 2–3 m of rope, and placed at 4 locations in the creek at CPMS and four locations in the NWP (Figure 1).

Data Collection:

- Minnow traps were placed during daytime low-tide and were recovered approximately 24 hours later from the months of June to August of 2021 and 2022.
- During trap recovery, all fish were counted, identified to species, and measured (total length) to the nearest mm.

Analysis:

- Created histograms and summary statistics using Excel to perform linear regression analysis, and to calculate averages \pm one standard deviation.
- Compared 2022 and 2021 data with data collected from the Talley 2000 study.



Discussion

- Created marsh (CPMS) is shallower likely due to sediment deposition causing the *F. parvipinnis* distribution and mean size to shift (Leonardi et al., 2016).
- Shift in size to the CPMS due to juveniles preferring/surviving better in shallower waters due to predation (Talley, 2000).
- Low diversity in the CPMS is likely from extremely shallow and anoxic waters (Marshall, 2012; personal observations).
- Limitations:**
 - Summer study (not year-round)
 - Predation on *F. parvipinnis*

Conclusion

After 25 years the CPMS (created) marsh still doesn't have the equivalent functions from a fish's perspective as the NWP (natural) marsh. The differences in ichthyofaunal communities between the created and natural systems suggest that marsh and creek geomorphology may be affecting the suitability of habitat for resident fishes, and so should be more carefully considered when designing marsh restoration projects (Burdick and Roman, 2012). This implies that there needs to be a reassessment of design in marsh restoration projects to understand equivalence salt marsh functions under a wide range of natural variation in environmental settings.

Acknowledgment

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Selected References

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Results

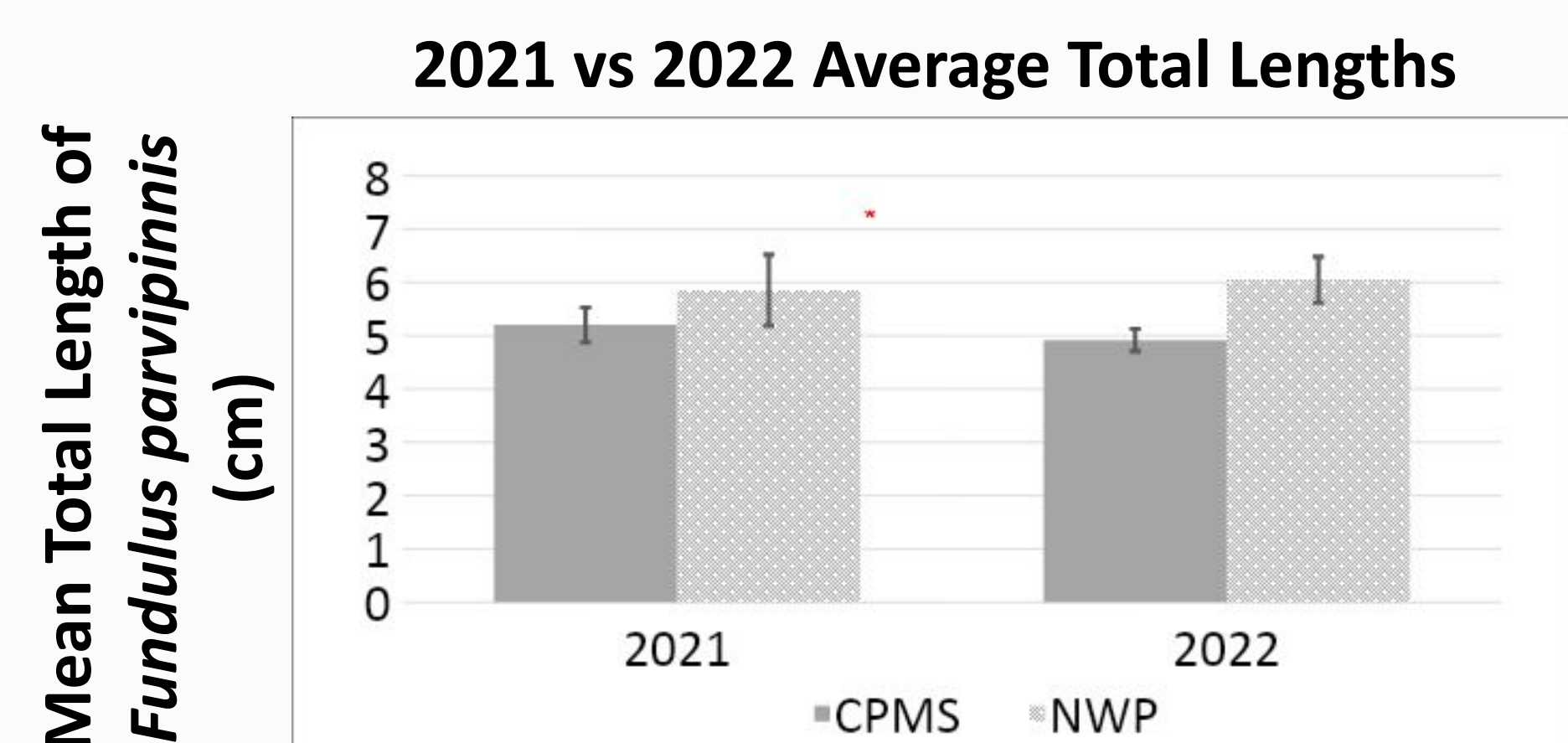


Figure 2. Calculated mean for *F. parvipinnis* from the Crown Point Mitigation Site (CPMS) and the Northern Wildlife Preserve (NWP) marsh in 2021 and 2022. Observation year with an asterisk show a significant difference in average total lengths between the two marshes.

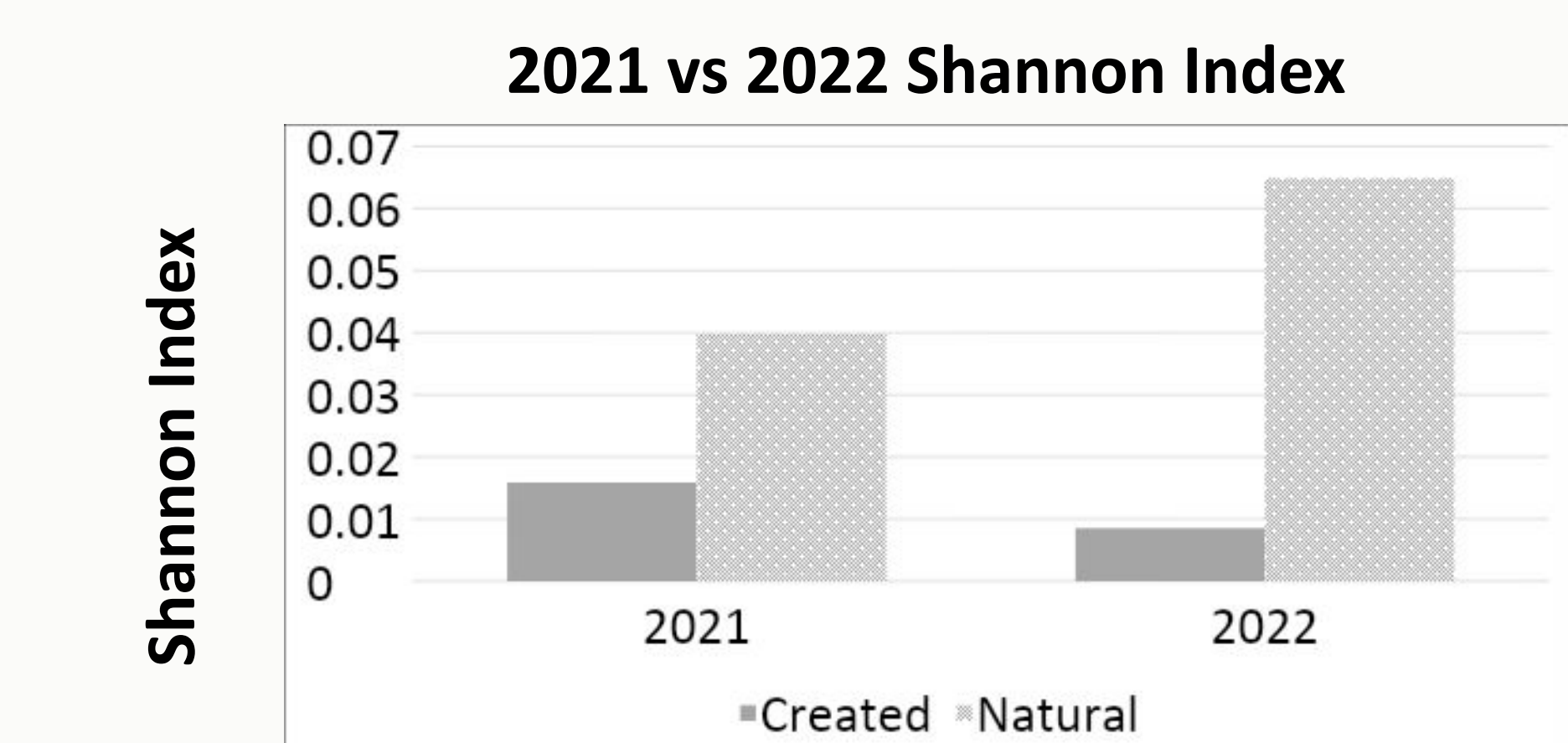


Figure 4. Calculated mean of species richness from the Crown Point Mitigation Site (CPMS) and the Northern Wildlife Preserve (NWP) marsh in 2021 and 2022.

Overall Findings

- CPMS (created) had smaller average *F. parvipinnis* in 2021 & 2022.
- NWP (natural) had greater diversity patterns in 2021 & 2022.
- CPMS is shallower than the NWP in 2021.

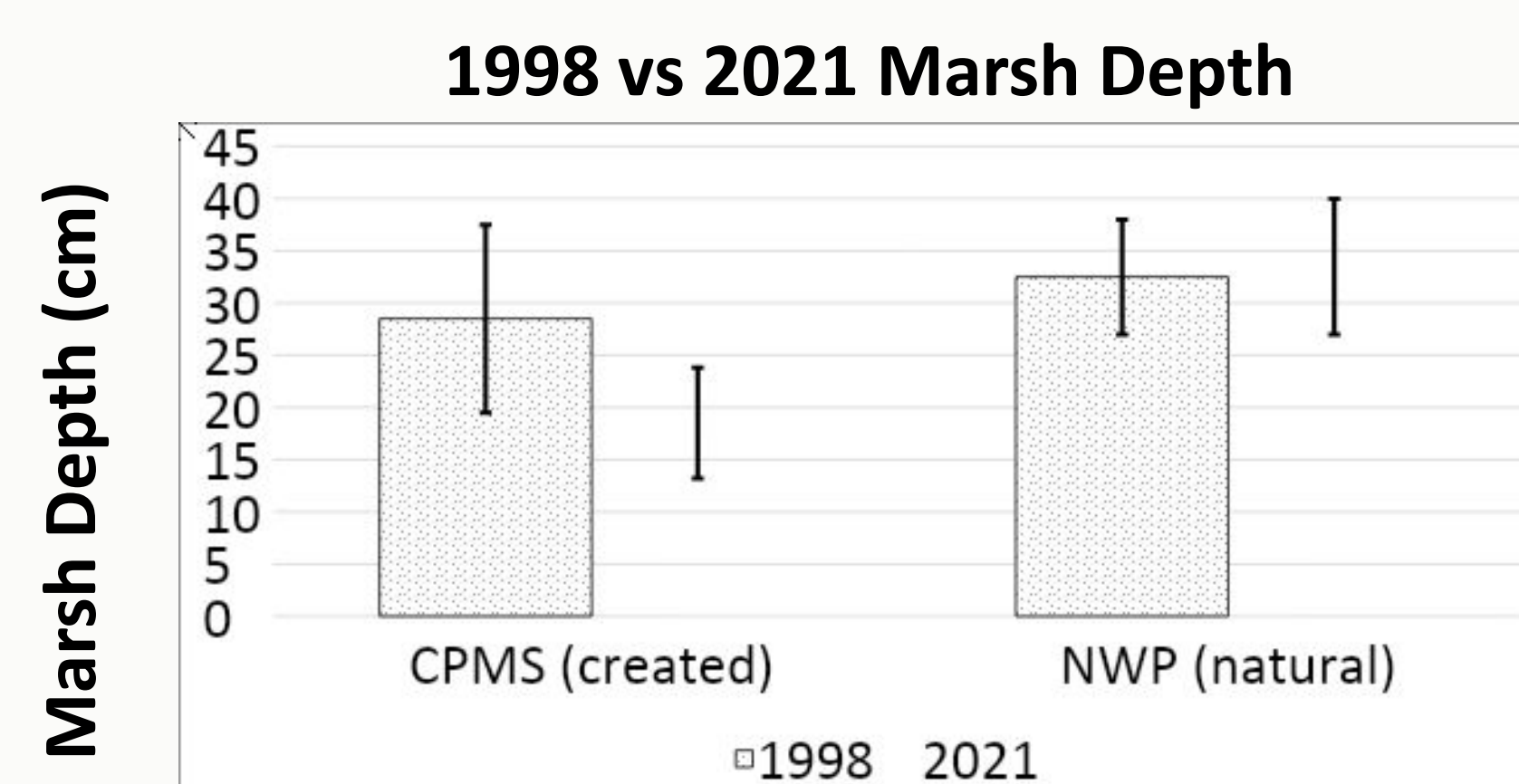


Figure 3. Depth of Crown Point Mitigation Site (CPMS) and the Northern Wildlife Preserve (NWP) marsh in 1998 and 2021.