Infusing More Science About California's Coastal Wetlands to Create Effective Informal Educational Resources

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Introduction

- California's coastal wetlands provide vital functions for local animal and human populations
- These functions are supported by scientific concepts that are often difficult for the general public to understand
- This miscommunication can lead to a lack of desire to protect coastal wetlands
- In order to inspire the public to join the conservation effort, the scientific concepts must be communicated more effectively

Of all potential benefits of wetlands, this project will focus on three key functions:

- Nursery Habitats for many species of commercially important fish and shellfish (and birds)
- Wave/Flood Attenuation protects our coasts from extensive damage
- Nutrient Filter keeps our oceans and the food we eat from it clean

Methods

- Gather relevant literature/scientific evidence that provides concrete support for the important functions of wetlands
- Extract the most useful data that supports the claim
- Translate this data into real-life comparisons and analogies that all ages can easily grasp
- These comparisons can be visual or workable analogies in an educational script
- Educational materials should be created by professionals experienced in scientific communication, then passed on to non profits, schools, etc.

Results From Literature

Nurseries

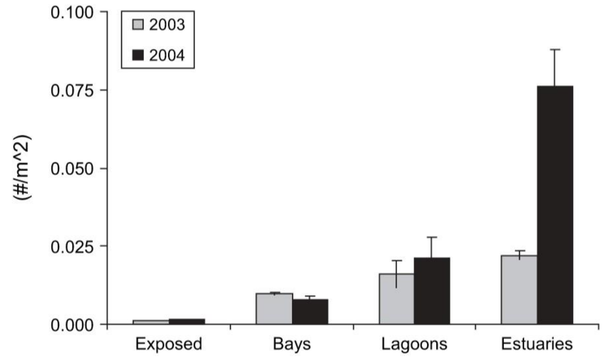


Figure 1: Nursery habitat distribution of juvenile halibut along the San Diego, CA coastline from Fodrie and Mendoza (2006). Although 85% of potential nursery habitats were along exposed coastline, more than 50% of juvenile halibut in each year preferred enclosed embayments, and primarily preferred coastal wetlands (lagoons and estuaries).

Wave Attenuation

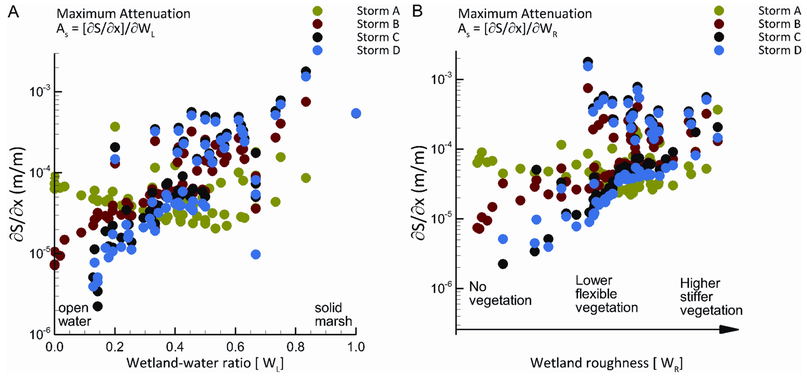


Figure 2: Storm surge attenuation relative to (A) wetland-water ratio and (B) plant composition of the wetlands in southeast Louisiana from Barbier et al. (2013). In general, areas of Louisiana with a higher wetland to water ratio were better at attenuating storm surge than exposed coastline. Additionally, wetlands with stiffer vegetation experienced higher storm attenuation than those with low, flexible plants, or no plants at all.

Nutrient Absorption

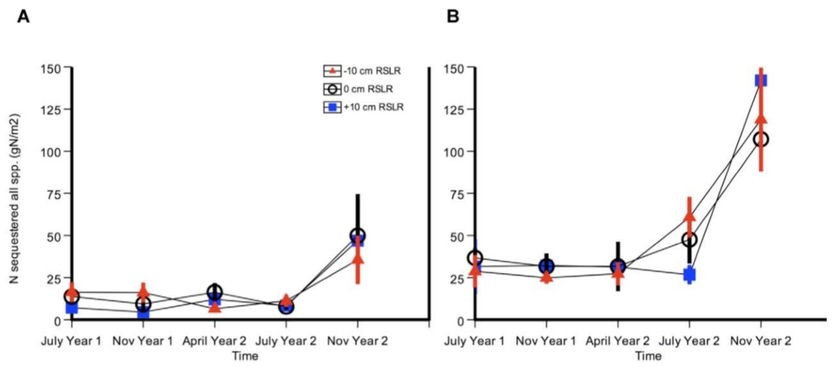
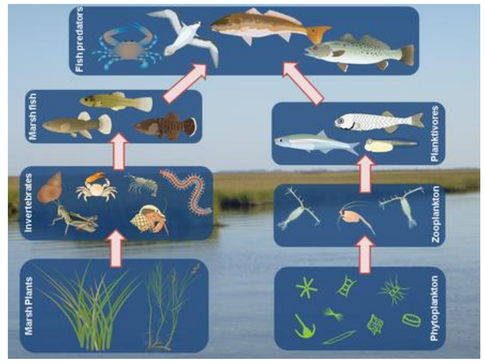


Figure 3: Seasonal nitrogen sequestering by salt marsh halophytes in (A) control and (B) N-addition treatments from Nelson and Zavaleta (2012). In both treatments, salt marsh halophytes were successful in sequestering nitrogen from the system, especially in the N-addition treatment. Salt marsh halophytes are successful during the winter months; these are times that runoff from winter storms is likely to increase, and thus increase the flow of nutrients into the system.

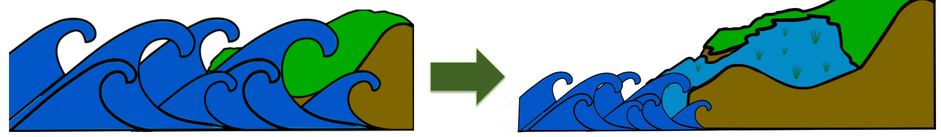
Proposal/Educational Translation

- Without these vital nursery habitats, adult stocks of many commercially important fish will decrease
- A decrease in adult stock of commercially important fish can have economic consequences, especially in areas that rely on the seafood market



Proposed activity: Experimenting with food webs

- The amount of wetlands, as well as the plant composition, play an important role in reducing both wave energy and flood waters
- This function helps to protect human coastal communities and businesses



Proposed activity: "Wetland" vs. "concrete" model, and marbles

"Have you ever tried to make a slip-n-slide on concrete?"

- Salt-loving species of plants that live within wetlands are successful at capturing nutrients that enter the water system, especially in the winter
- Just like a sponge, these plants clean the water of excess nutrients, making direct contact and eating seafood much safer

Proposed activity: A wetland model, food dye, and a sponge.

References

Barbier, Edward B., et al. "The Value of Wetlands in Protecting Southeast Louisiana from Hurricane Storm Surges." *PLoS ONE*, vol. 8, no. 3, Nov. 2013, doi:10.1371/journal.pone.0058715.

Fodrie, F. Joel, and Guillermo Mendoza. "Availability, Usage and Expected Contribution of Potential Nursery Habitats for the California Halibut." *Estuarine, Coastal and Shelf Science*, vol. 68, no. 1-2, 2006, pp. 149–164., doi:10.1016/j.ecss.2006.01.017.

Nelson, Joanna L., and Erika S. Zavaleta. "Salt Marsh as a Coastal Filter for the Oceans: Changes in Function with Experimental Increases in Nitrogen Loading and Sea-Level Rise." *PLoS ONE*, vol. 7, no. 8, July 2012, doi:10.1371/journal.pone.0038558.

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Bolsa Chica Conservancy

SAN DIEGUITO RIVER VALLEY CONSERVANCY