Saltwater Marshes: The Key to Carbon Sequestration

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INTRODUCTION

With the increase in urbanization, there is an increased threat to various natural habitats that provide a variety of ecosystem services. One of the most threatened ecosystems by urbanization (1) are saltwater marshes. Marshes provide a variety of ecosystem services which include habitat for various organisms, water filtration, coastal protection from shoreline erosion and storm surges, and carbon sequestration (2). Carbon sequestration is the process of Carbon (CO_2) being removed from the atmosphere and stored into soils and other liquids. Wetlands, storing about 33% of the world’s total soil organic carbon are an important ecosystem to examine as atmospheric CO_2 continues to rise.
This research project examines the amount of organic carbon stored by three different coastal plants: “Salt Grass,” *Distichlis spicata,* “Common Salt Rush,” *Juncus lesueurii,* and “Broad-Leaf Cattail” *Typha latifolia* within Scotts Creek Marsh. In this study, the focus will be on the below-ground carbon levels of each plant zone.

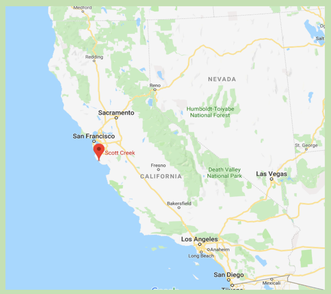


RESEARCH QUESTIONS

Which plant zone within Scotts Creek Marsh yields the most organic carbon?
How can we use carbon analysis to aid in the restoration of salt marshes?

SITE OF INTEREST

Our site of interest is Scotts Creek Marsh (SCM), CA which is considered anthropogenically altered.
SCM undergoes unique swell activity creating a sandbar that turns the cite into a short-term seasonal lagoon– a typical alteration with urbanization of coastal wetlands.

METHODOLOGY

50 soil core samples from each zone of Cattail, Saltrush and Saltgrass ranging from 0-50 cm were taken and divided in 5cm intervals for a total of 150 samples. For this specific analysis, only zones 0-5, 5-10, and 10-15 were analyzed because it is often considered the “critical zone” for microbial activity within soils (3). Each sample was then grinded and sieved to create optimal analysis texture. 5 grams were then measured and placed into crucibles which were then placed in a furnace to dry overnight. Both pre combustion and post combustion weights were measured to determine LOI and furthermore find the % organic carbon (4).

RESULTS

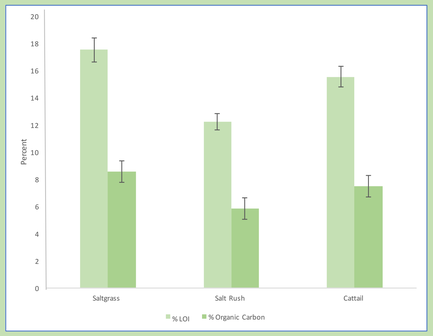


Figure 1. Average percentages of LOI and Organic Carbon between *Distichlis spicata, Juncus lesueurii, & Typha latifolia* at 0-5cm. No significant difference in carbon levels between three plants (p>0.05).

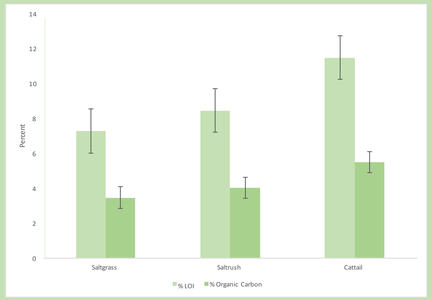


Figure 2. Average percentages of LOI and Organic Carbon between *Distichlis spicata, Juncus lesueurii, & Typha latifolia* at 5-10cm. No significant difference in carbon levels between three plants (p>0.05).

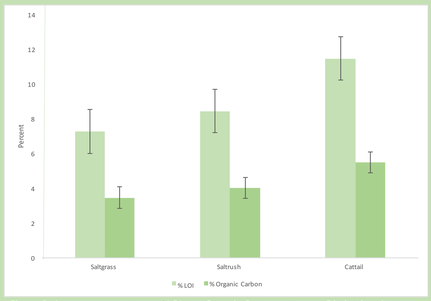


Figure 3. Average percentages of LOI and Organic Carbon between *Distichlis spicata, Juncus lesueurii, & Typha latifolia* at 10-15cm. No significant difference in carbon levels between three plants (p>0.05).

DISCUSSION

Based on the results from the three graphs, there is no significant difference between the amounts of organic carbon between the three different plants in SCM. These results are surprising as the three plants are located within three different zones, with different elevations and exposure to marine water. Cattail is usually located within lower elevations, salt rush midrange and salt grass located in higher elevations. Based on this study alone, since there is no significant difference in the amounts of organic carbon between the plants, pertaining to wetland restoration, given the adequate conditions, any of the three would be good storing agents of carbon.

CONCLUSIONS & FURTHER QUESTIONS

A limitation for this study may include analyzing only the critical zone of the core, the top 15 cm. While this has been associated with more microbial activity, by not analyzing the whole 50 cm core, the amounts of carbon sequestered by each plant may be much lower that actuality. Additionally, since the specific marsh has been extremely altered by anthropogenic urbanization such as a nearby road, there may be a significant alteration of the plant cover, especially within Cattail, which is usually located in lower elevations. For future studies, the total depth of the core of the plant soil should be considered to get a more holistic image.
It is important to continue marsh research in terms of carbon sequestration because urbanization is only increasing and threats to these ecological beneficial ecosystems become more apparent. Through further carbon analysis in saltwater ecosystems, we can begin to further understand their worth, and work to restore an ecosystem that is not only beneficial for other organisms but to humans as well.

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