

# Study of Salt Marsh Restoration Success in Dodge Paddock and Beal Preserve Salt Marsh, Stonington, CT

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## Introduction:

“Salt marshes are perhaps the most important but misunderstood of the world’s major ecosystems. These coastal wetlands have long been valued for their benefits to human society including the provision of food, fuel, building materials, livestock fodder and, more recently, for their ability to filter pollutants, buffer against storms, sequester carbon, and provide aesthetic and recreational opportunities” (Altieri et. al, 2011). However, salt marshes often face a multitude of stressors causing degradation of their natural state and key functions. Some of these stressors include invasive species, debris clogging up regular tidal flow, and anthropogenic pressures that alter the natural environment. These stressors, which are prevalent in New England marshes, alter abiotic processes and negatively affect the biota living in these areas. Thankfully, marshland may recover from anthropogenic disturbances, invasive species, and irregular tidal flow complications over time through the process of secondary succession, returning the ecosystem to the pre-existing condition or state. However, depending upon the scale of time, space, and intensity of stressors, return along the historic trajectory of the ecosystem may be aided through ecological restoration where secondary succession is assisted by wetland restoration efforts (Borja et. al, 2010).

My study focused on the success of a salt marsh restoration project being completed by the Mystic Aquarium in Dodge Paddock and Beal Preserve salt marsh, Stonington, CT. The project had multiple steps, including the removal of the invasive plant species *Phragmites australis*, reintroducing the native salt marsh grasses *Spartina alterniflora* and *Spartina patens* by planting grass plugs, and improving tidal flow in to the salt marsh. The data collected from the restoration of Dodge Paddock and Beal Preserve salt marsh will be compared to data collected from a mature, “control” salt marsh, a section of Barn Island Salt Marsh. To measure the success of the restoration project, my study collected individual plant height data of both the newly planted salt marsh grass plugs in the restoration site and the mature plants in the control site. These measurements are then used to calculate the growth rates of the plants over the study time. Community data for the salt marshes were also collected through pictures taken weekly of the planted areas and control site to track any spread of plant coverage, which indicates growth of the plants. The results from this study can be used to determine the value and effectiveness of this restoration and predict the success of future salt marsh restoration projects.



## Materials and Methods:

- Locations: Dodge Paddock and Beal Preserve Marsh, Stonington, CT and a section of Barn Island, Stonington, CT
- Week 1 6/13/16 – Week 6 7/21/16
- Measured plant height from base to tip of stem in centimeters along predetermined transect lines using a sample area of a ½ m<sup>2</sup> quadrat.
- Collected height data for *Spartina alterniflora* and *Spartina patens*
- Took pictures of each quadrat weekly and analyzed for percent coverage of plants in the software CPCe

## References:

- Altieri, A., Bertness, M., Gedan, K. 2011. Uncertain future of New England salt marshes. Inter-Research [Internet]. [Feb 11, 2011; Feb. 15, 2016]; Vol. 434: 229-237. Available from: <http://www.int-res.com/articles/theme/m434p229.pdf>
- Borja, Á., Dauer, D., Elliott, M., Simenstad, C. 2010. Medium- and Long-term Recovery of Estuarine and Coastal Ecosystems: Patterns, Rates, and Restoration Effectiveness. Estuaries and Coasts [Internet]. [Nov. 2010; Feb. 20, 2016]; Vol. 33(6): 1249-1260.

## Abstract:

Data was collected to track the growth rates of both mature and newly planted *Spartina alterniflora* and *Spartina patens* to study the effectiveness of a salt marsh restoration project. Measurements were recorded in Dodge Paddock and Beal Preserve Salt Marsh, the restoration site, and Barn Island Salt Marsh, the control site. The growth for *Spartina alterniflora* generally increased weekly for both locations and plant types, mature or plug. The growth rate for the mature *Spartina alterniflora* in Dodge Paddock and Beal Preserve was considerably higher than the mature plants of Barn Island (Figure 1). Additional data collection is needed to clarify the growth rates for *Spartina patens* in Dodge Paddock and Beal Preserve (Figure 2).

Growth Rate of *Spartina alterniflora* per Week

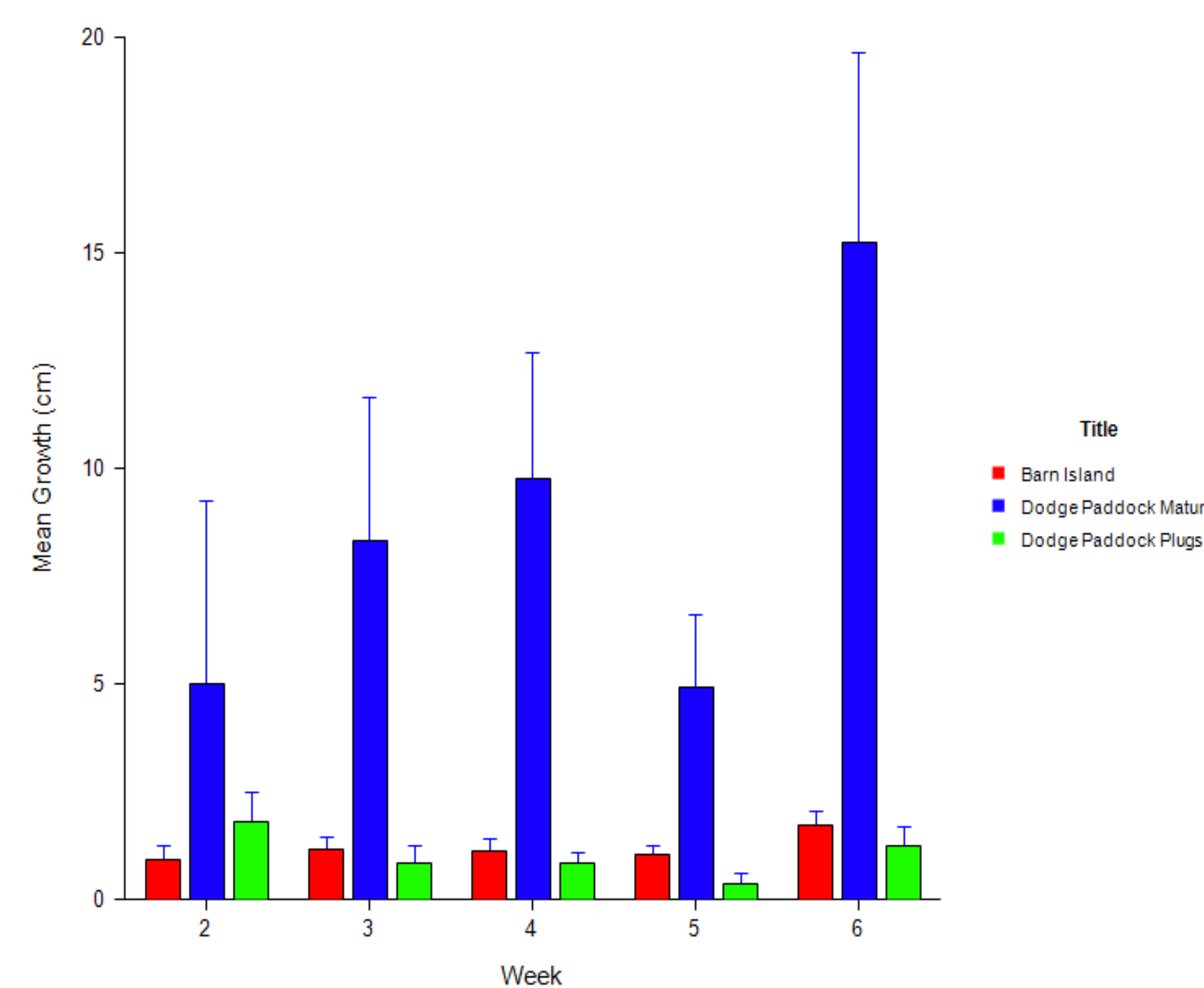


Figure 1: Average Growth Rates for *Spartina alterniflora* in both locations: Barn Island, Dodge Paddock and Beal Preserve Plugs, and Dodge Paddock and Beal Preserve Mature Plants. Week 1 starting 6/13/16 and Week 6 starting 7/21/16

Growth Rate of *Spartina patens* per Week

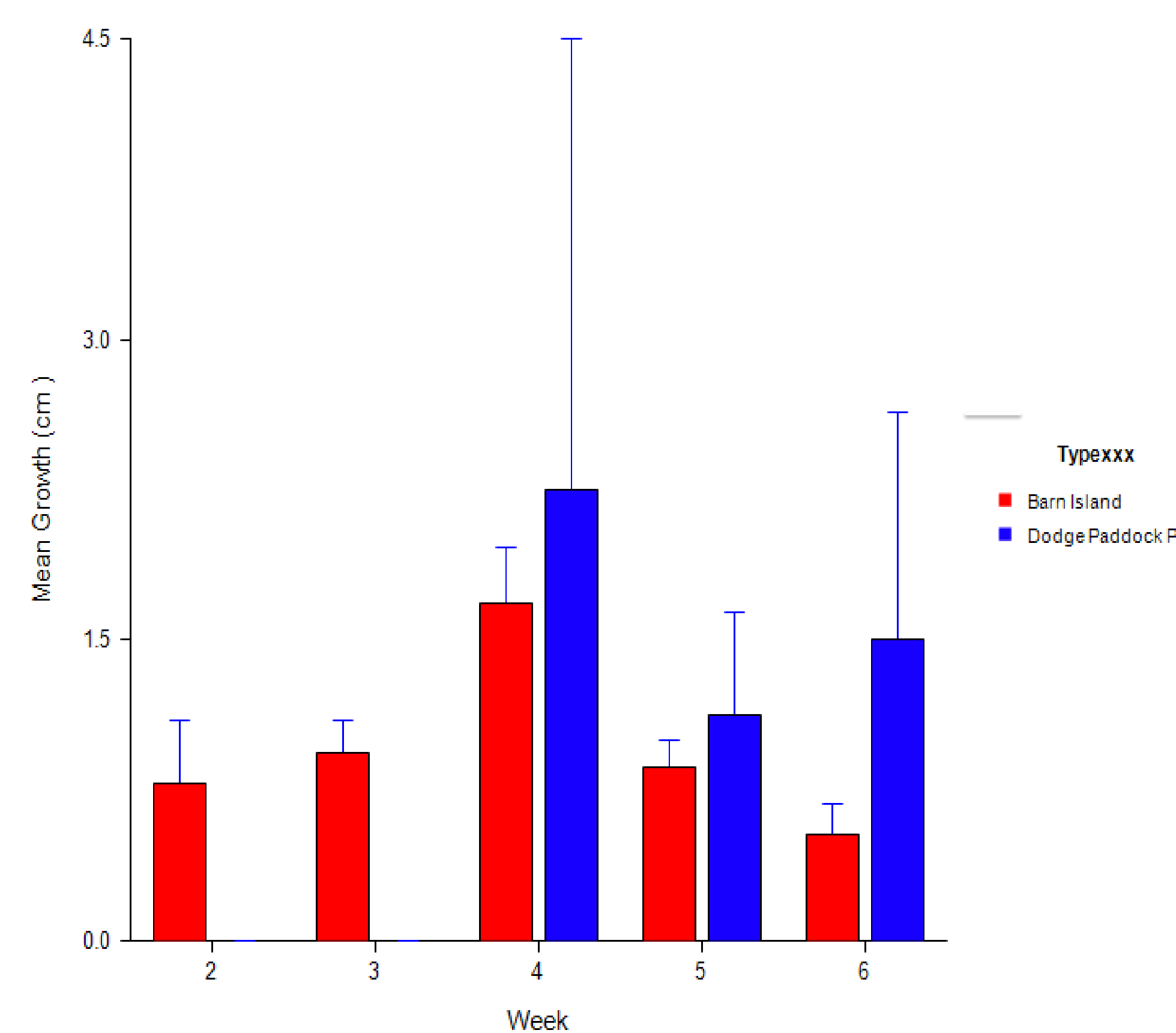


Figure 2: Average Growth Rates for *Spartina patens* in both locations: Barn Island and Dodge Paddock and Beal Preserve Plugs. Week 1 starting 6/13/16 and Week 6 starting 7/21/16. Growth rate for Dodge Paddock and Beal Preserve plugs weeks 1-3 values zero growth.

## Results:

- Growth rate for DP&BP *Spartina alterniflora* mature plants generally increases each week and shows considerably faster growth than the mature plants of BI (Figure 1).
- Spatial distribution of the plugs for both *Spartina alterniflora* and *Spartina patens* in DP&BP show no significant change from week 1-6.
- Sprouting of new plants in DP&BP occurred only for *Spartina alterniflora* starting week 2 and continued to week 6.
- The growth rates for *Spartina patens* show peaks on week 4, but no clear pattern for either DP&BP nor BI.



## Discussion:

The mature *Spartina alterniflora* in Dodge Paddock and Beal Preserve were planted as plugs in the late Spring, 2014. After 2 years the growth rate of the mature plants is significantly higher in value than the plugs that were just planted in June 2016. Though, information of the mature plants does not exist previous to this date, it is assumed that the growth rates of those plants as plugs would have been different. It would be interesting to see if 2 years from this Summer’s planting of *Spartina alterniflora*, if that growth rate would resemble that of the mature plants in Dodge Paddock and Beal Preserve currently (Figure 1).

It is assumed that the growth rates for the newly planted plugs for both *Spartina alterniflora* and *Spartina patens* are lower because more energy and nutrients are sourced into building complex root systems rather than growing upwards in height. Further investigation in to the sprouting of *Spartina alterniflora* in the Dodge Paddock and Beal Preserve Salt Marsh can be taken to determine if the source was shoots sprouting from the newly planted plugs or if seeds from the surrounding area are establishing in the marsh. Additional data can be collected to clarify the growth rates of all the plant types, especially for the plugs of *Spartina patens* in Dodge Paddock and Beal Preserve where no clear growth pattern was observed.

## Conclusion

The restoration project in the Dodge Paddock and Beal Preserve Salt Marsh is a success story. The restored marsh does not resemble the mature marsh as closely as desired, but further monitoring will show its progress towards functioning as a mature marsh with proper tidal flow, increase plant coverage, and introduction of common salt marsh inhabitants.