

Seagrass Monitoring: A Partnership between citizens
and UWF students

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Introduction

Pensacola Bay has seen significant losses of seagrasses throughout the Bay since 1950s/60s (Handley et al. 2007). However, there are still healthy beds in Santa Rosa Sound & Big Lagoon. These remaining healthy beds are vital to estuaries. Recent monitoring suggests these areas have experienced increasing coverage ~13% between 2010 and 2015 (Yarbro and Carlson 2018). The dominant seagrasses occurring in this system are *Thalassia testudinum*, *Halodule wrightii*, and *Ruppia maritima*.

In shallow areas throughout the Santa Rosa Sound and Big Lagoon, seagrass beds form the nexus of life and activity. Seagrass beds function as a nursery for many species of fish and a trap for sediment that protects coastlines. In the summer of 2017, the University of West Florida (UWF) along with Escambia and Santa Rosa County Sea Grant Extension began a partnership to enlist UWF students and citizens to monitor these seagrass beds. Monthly during the growing season, local citizens use quadrats to estimate seagrass coverage, identify seagrass species and macroalgae cover at different locations in the Pensacola Bay system, predominantly Big Lagoon and Santa Rosa Sound.

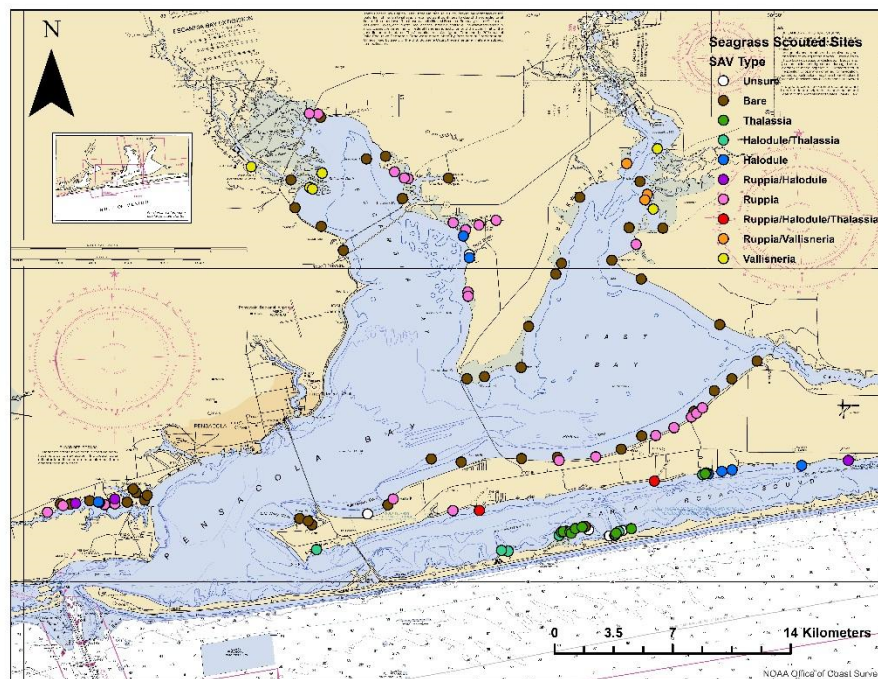
The goals of this project are twofold:

1. Develop a network of citizen scientists in the community, and
2. Establish a long-term monitoring program for seagrass beds.

Study sites

Surveys of seagrasses from the 2016 FWC Roadblocks to Recovery project (Caffrey et al. 2017) was used as a basis for locating sampling locations for the citizen scientists. The primary

locations were Big Lagoon and Santa Rosa Sound. Access points to seagrass beds included public sites as well as private property.



Map of survey sites from 2016 showing presence/absence of seagrass species in Pensacola Bay system



Sampling sites in Big Lagoon and Old River

Sampling sites in Santa Rosa Sound



Materials and Methods

Citizen Science

Citizens were recruited by Sea Grant Extension and trained in collection of data, water samples and safety procedures. Their activity occurred during the seagrass growing season from May to October. Every month during this period, citizens used 0.25 m² quadrats to measure percent coverage of seagrass and macroalgae at 4 locations at their sampling site. They identified seagrass species present and noted whether drift algae were present. Data was recorded on a data sheet and water samples were collected and refrigerated until they were sent to UWF.

UWF sampling and analysis

Water samples were analyzed for Total Suspended Solids (TSS) utilizing EPA method 160.2. Salinity was directly measured using YSI multimeter.

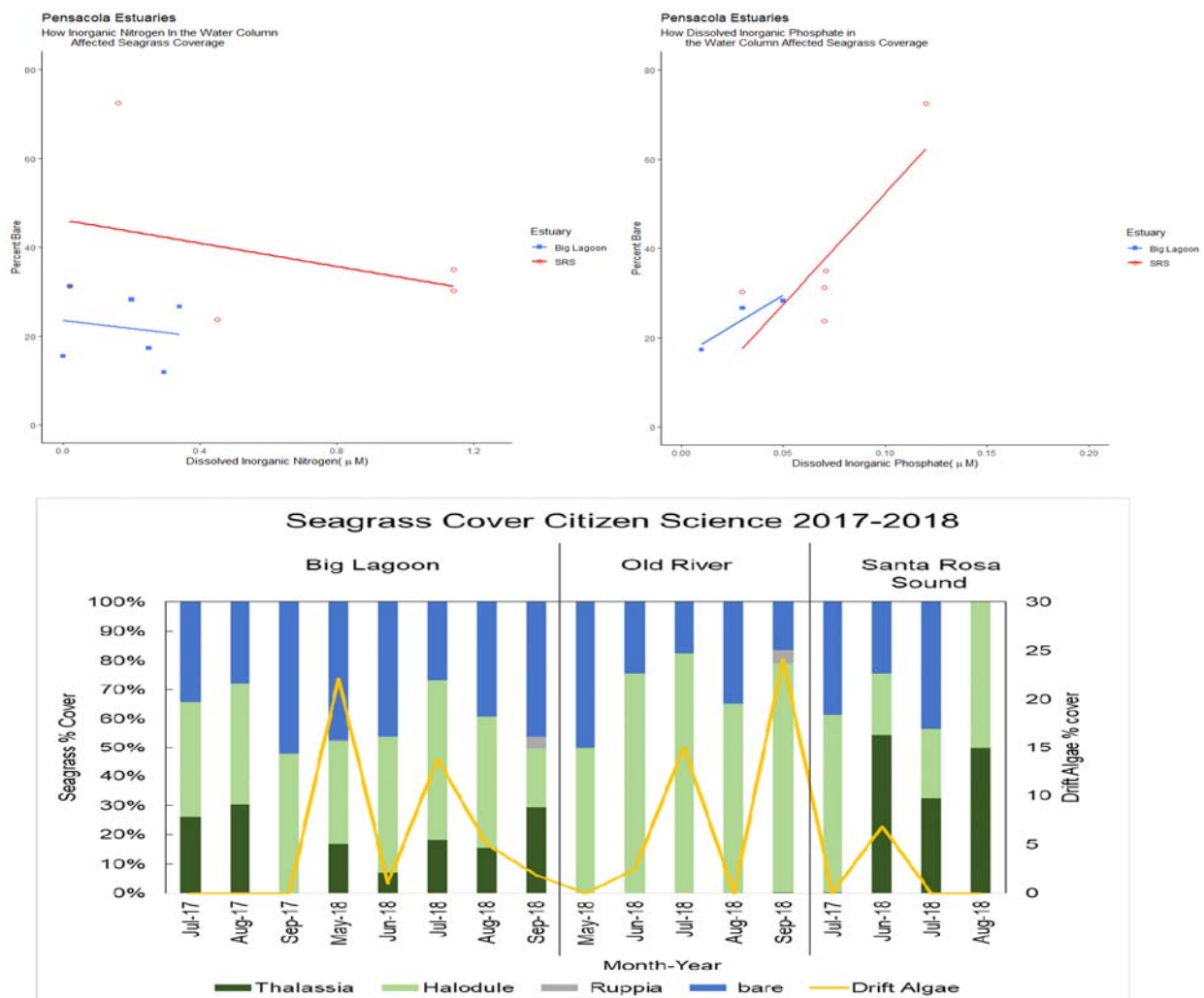
Three times throughout the growing season, 5-8 sites in each system (Big Lagoon/Old River and Santa Rosa Sound) were visited. Water quality measurements (temperature, salinity, dissolved oxygen and pH) were made using a YSI multimeter at the surface and bottom (if the depth was greater than 1 m). This provides an insight to the degree of stratification. Water depth and light attenuation were evaluated using a secchi disk and light profiles using a LiCor 4 Pi sensor. Students collected samples for TSS, nutrients: dissolved inorganic phosphate, ammonium, nitrite and nitrate, and chlorophyll a. All analyses were conducted using standard methods (see References). TSS was analyzed via vacuum filtration through a glass fiber filter. Nitrite plus

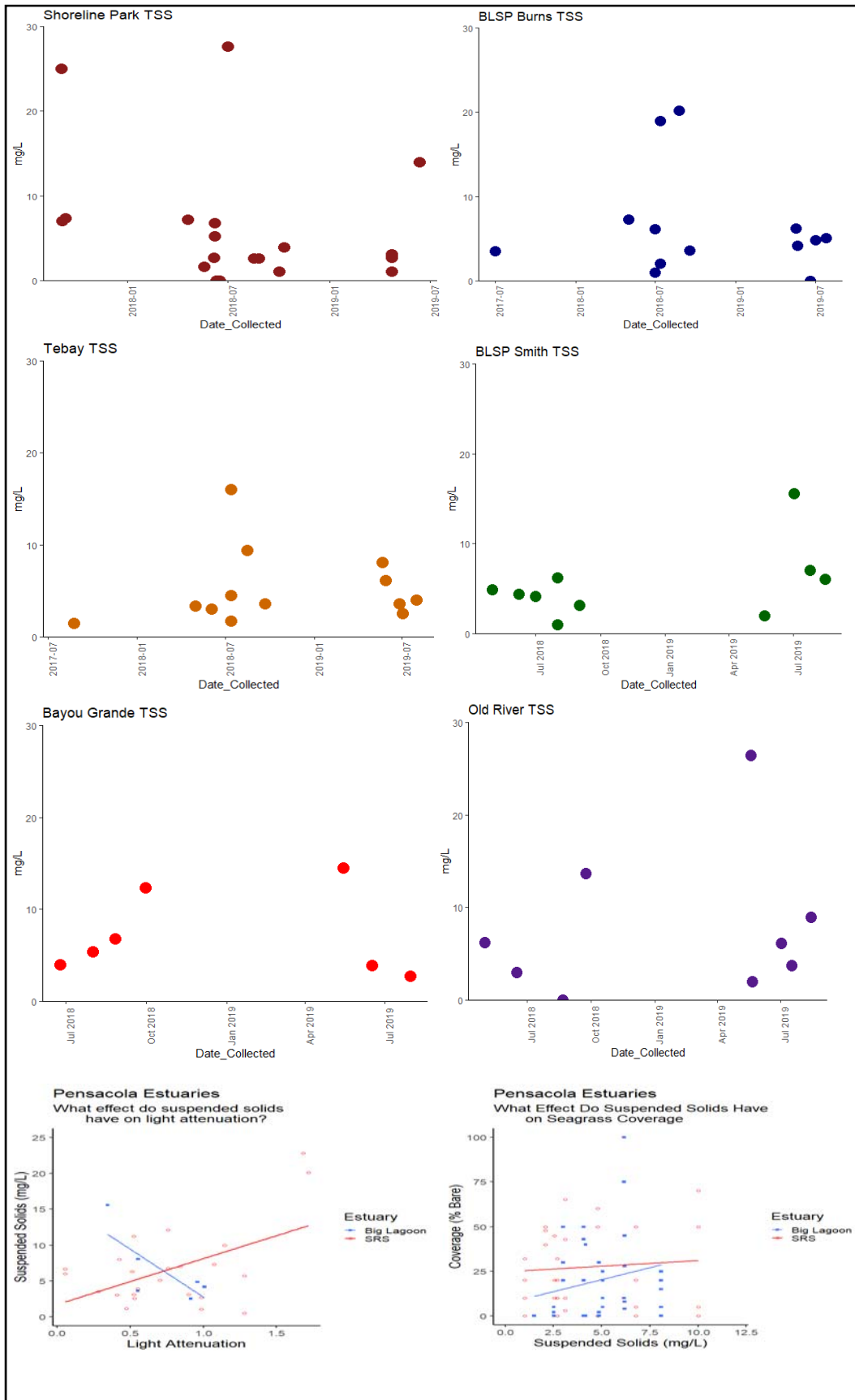
nitrate and DIP were quantified by colorimetric techniques. Ammonium and chlorophyll a used fluorometric techniques.

Results

Species composition and Percent Cover

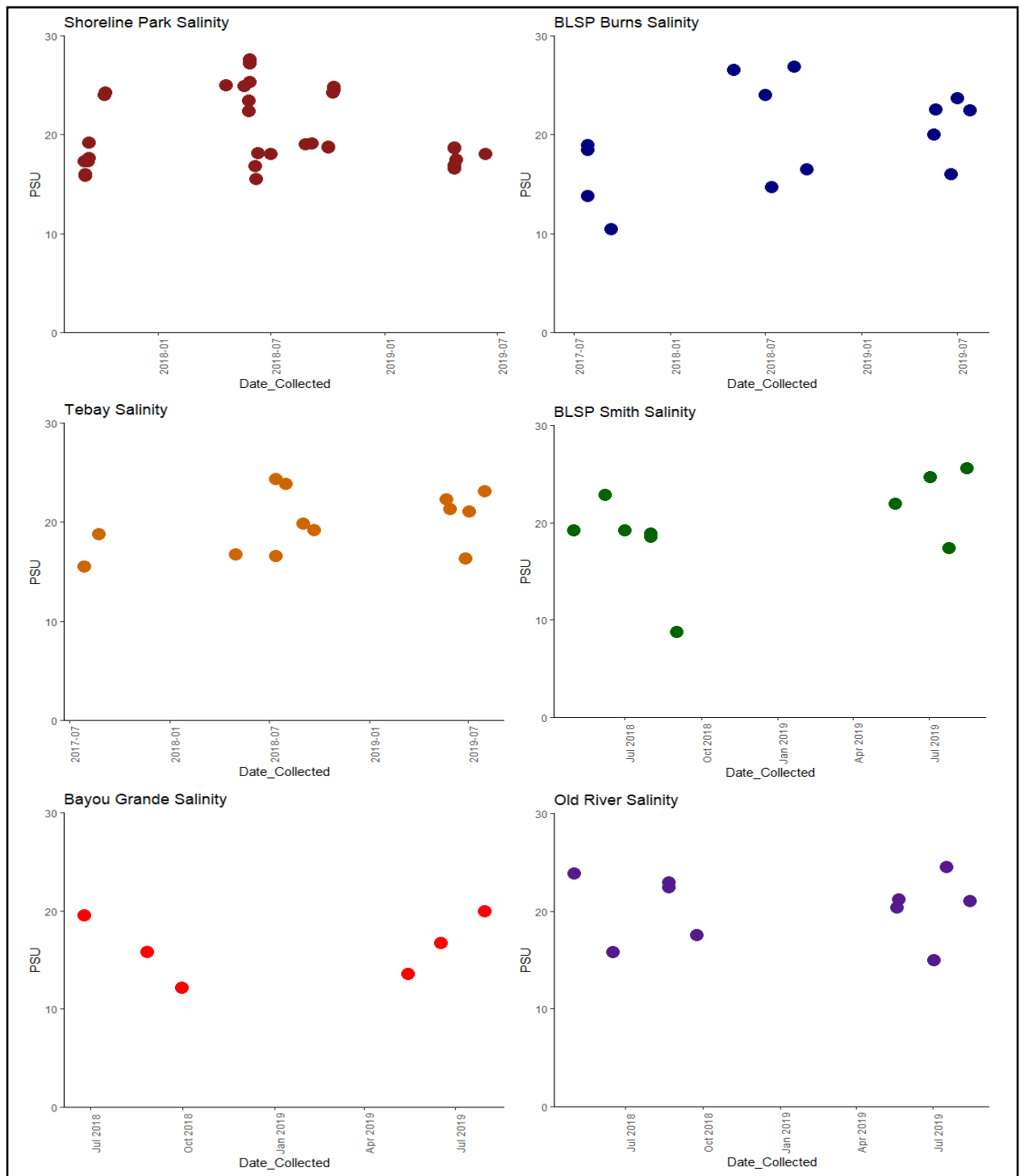
Old River was generally dominated by *Halodule wrightii*. Overall differences in percent cover over the summer within Big Lagoon or Santa Rosa Sound were difficult to determine based on uneven sampling. *Halodule* is more common closer to shore than *Thalassia testudinum*. Thus, if one individual mainly sampled in a *Halodule* bed and they only sampled once or twice during the summer, *Halodule* would appear more common. As the concentration of dissolved inorganic nitrogen (DIN= ammonium+nitrite+nitrate) increased, the percent bare decreased. This suggests that DIN promotes the growth of the seagrasses. In contrast, dissolved inorganic phosphate had a positive relationship with the percent bare.





Total suspended solids concentrations were usually below 10 mg/L at most sites during most months. However, on several occasions, values exceeded 20 mg/L. These plants require sunlight to function properly, thus seagrasses thrive in areas where TSS is low. Future analyses will compare TSS and salinity to examine how freshwater inputs may affect TSS concentrations.

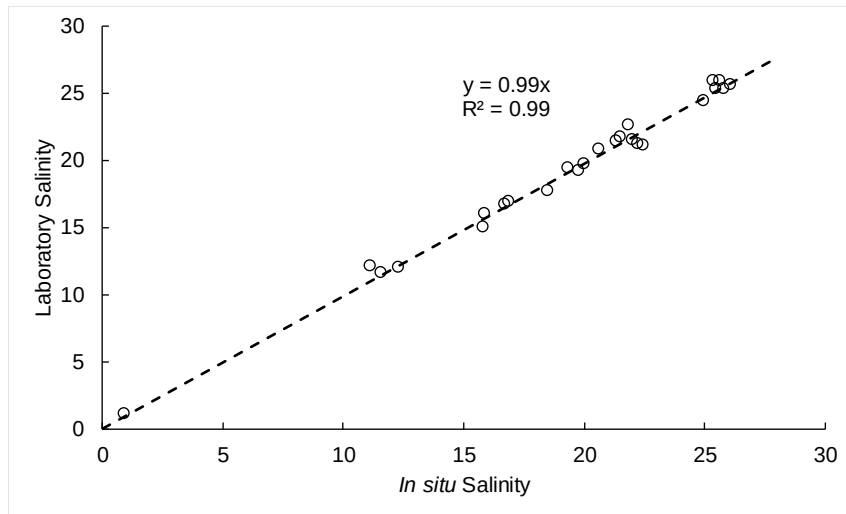
Light is more attenuated through the water column when TSS is higher. Preliminary data suggests as TSS increases, percent bare increases as well.

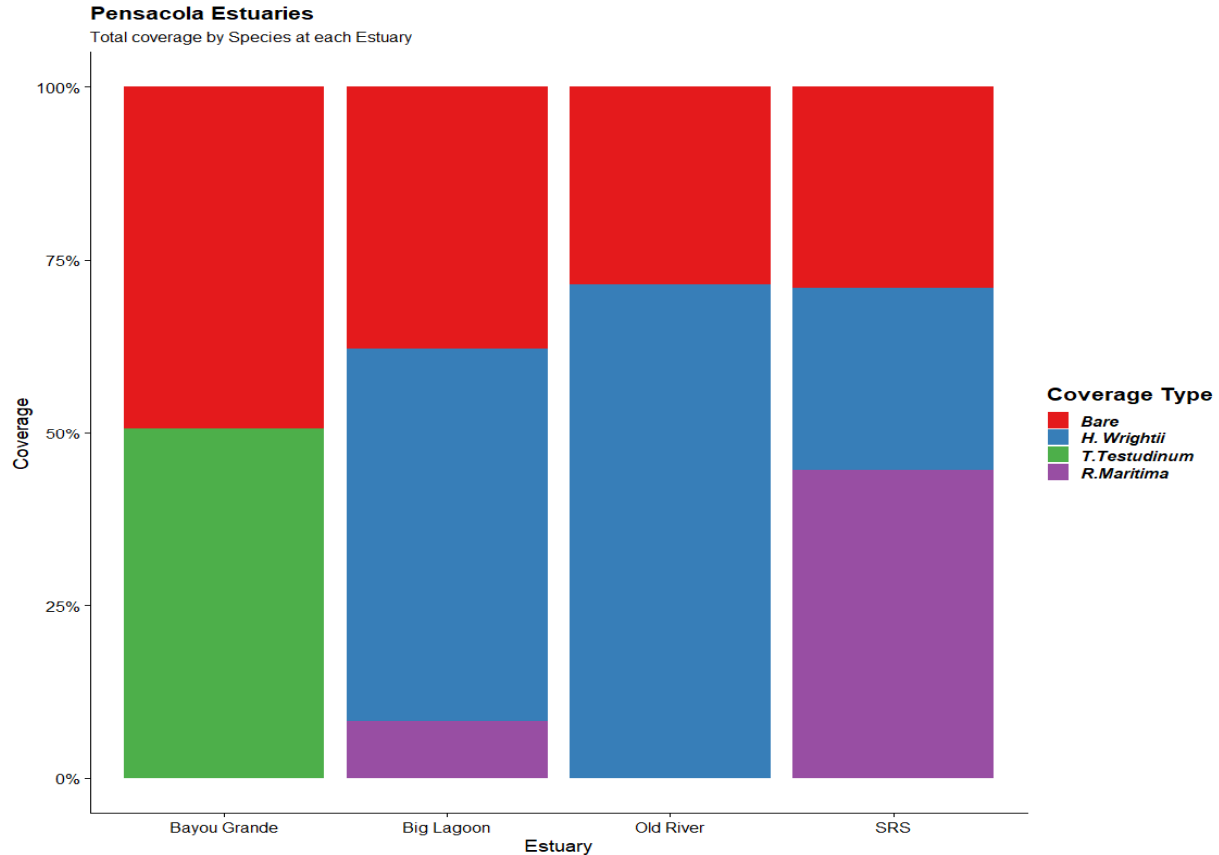


Salinity during 2017, 2018, and 2019 followed long term trends in salinity. Citizen science data included both Big Lagoon, Old River and Santa Rosa Sound. Low salinity events were attributed to high rainfall. Most sites in Santa Rosa Sound and Big Lagoon were within the expected range of 20-30 PSU, while Bayou Grande and Old River were slightly fresher with most salinity values between 10 and 20 PSU,

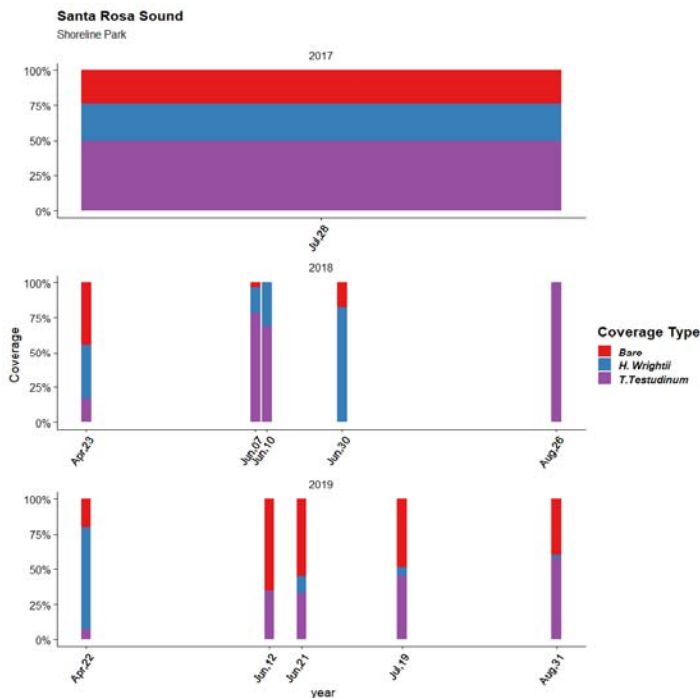
Salinity

Since sample bottles were often stored for several weeks, a comparison was done between salinity measured in the field (x axis) and salinity measured in stored water bottles (y axis). The slope of the line was essentially 1, showing that storing the bottles had a minimal effect on salinity. However, it was later found that freezing the sample bottles did affect salinity.



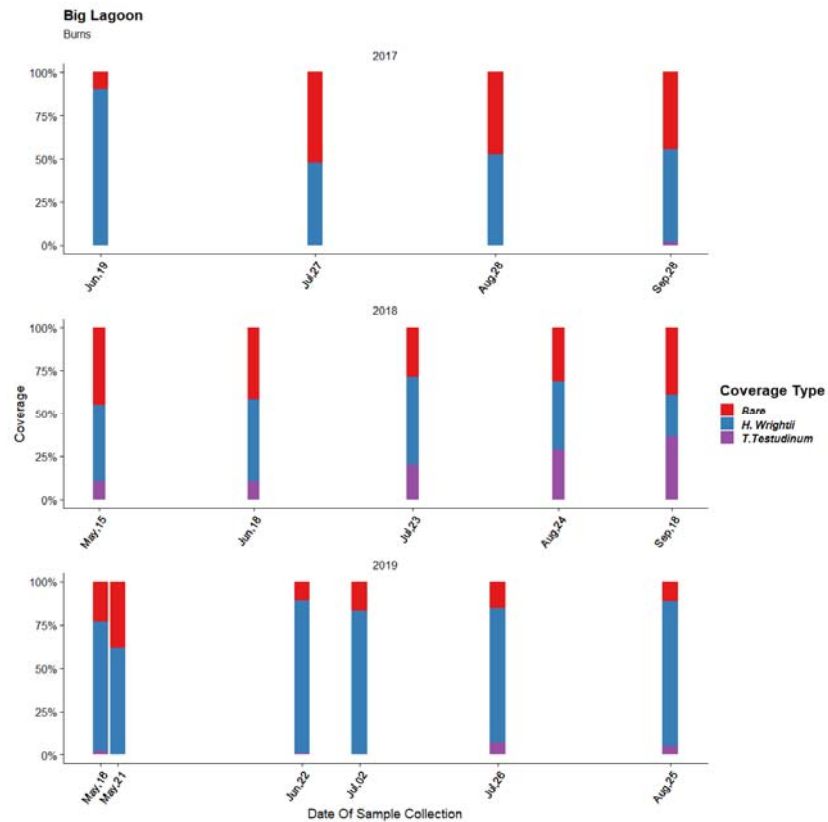
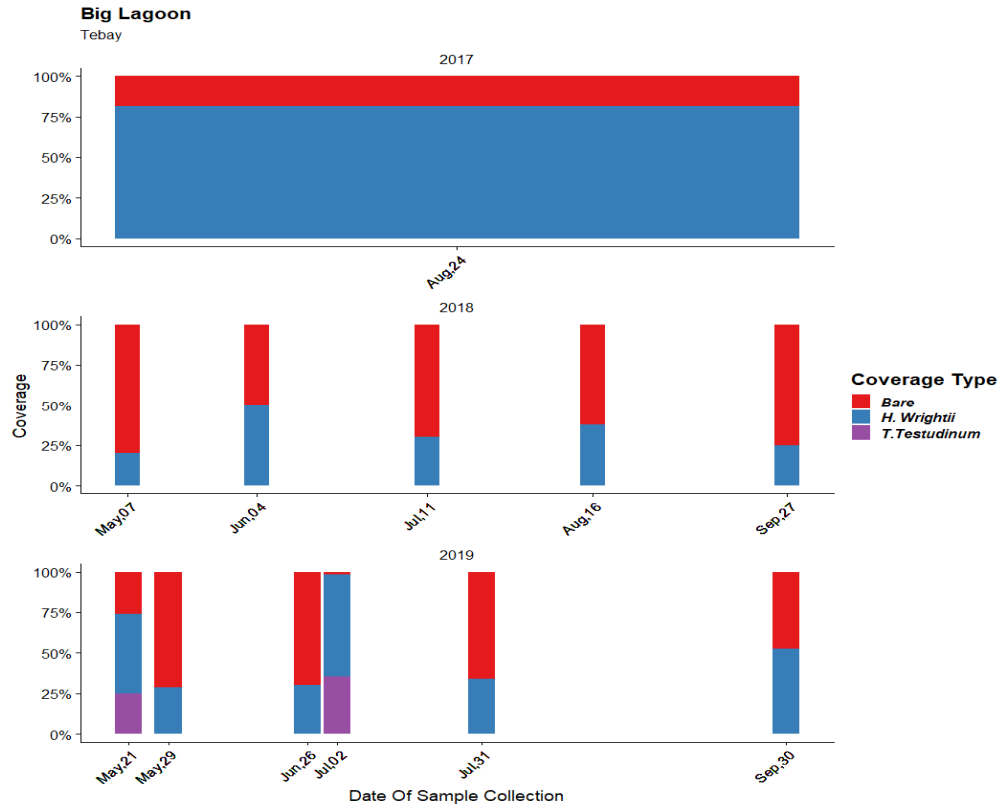


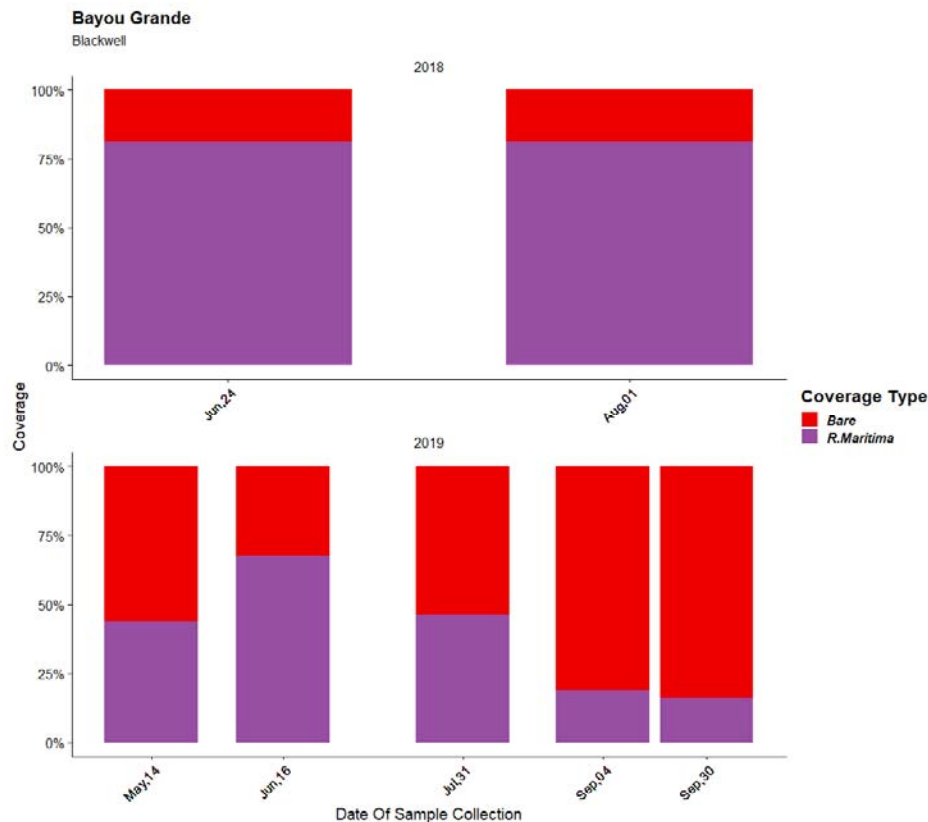
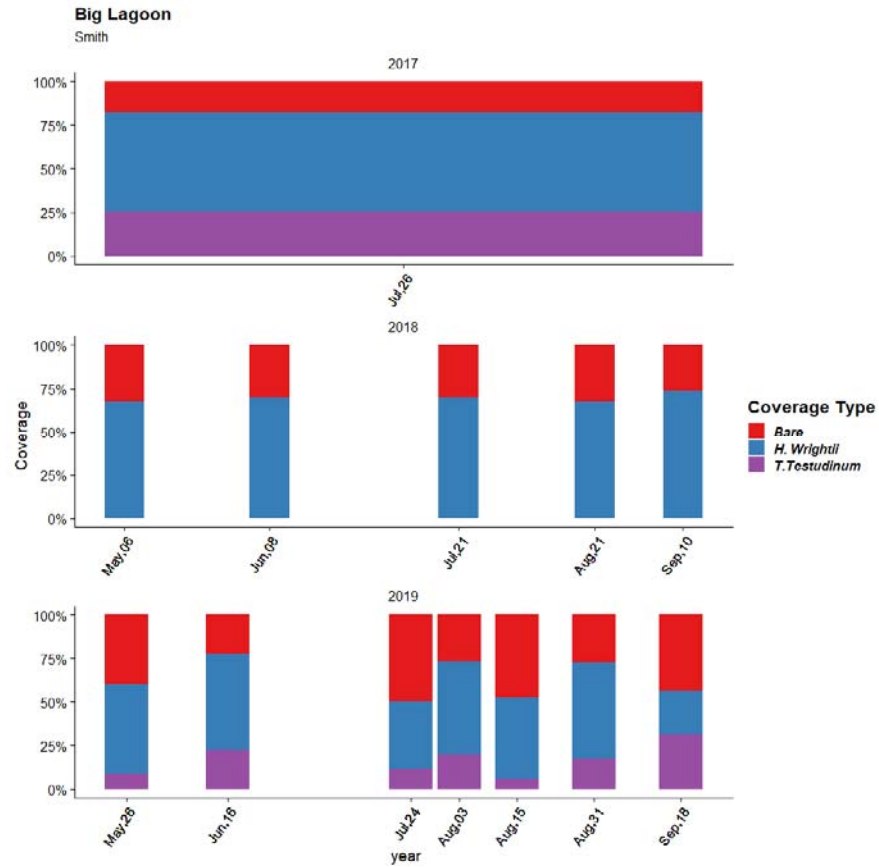
Halodule wrightii was the most common seagrass found in the sampled seagrass beds. Almost every site had some degree of *Thalassia testudinum*. Sites that included quadrats in deeper waters tended to have more *Thalassia* present.



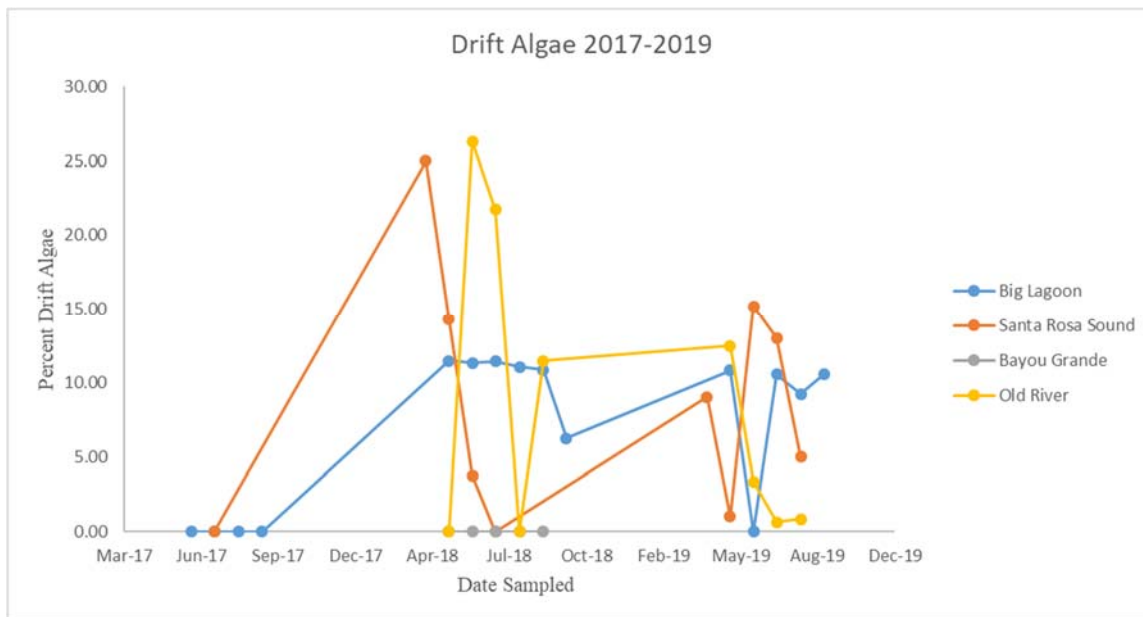
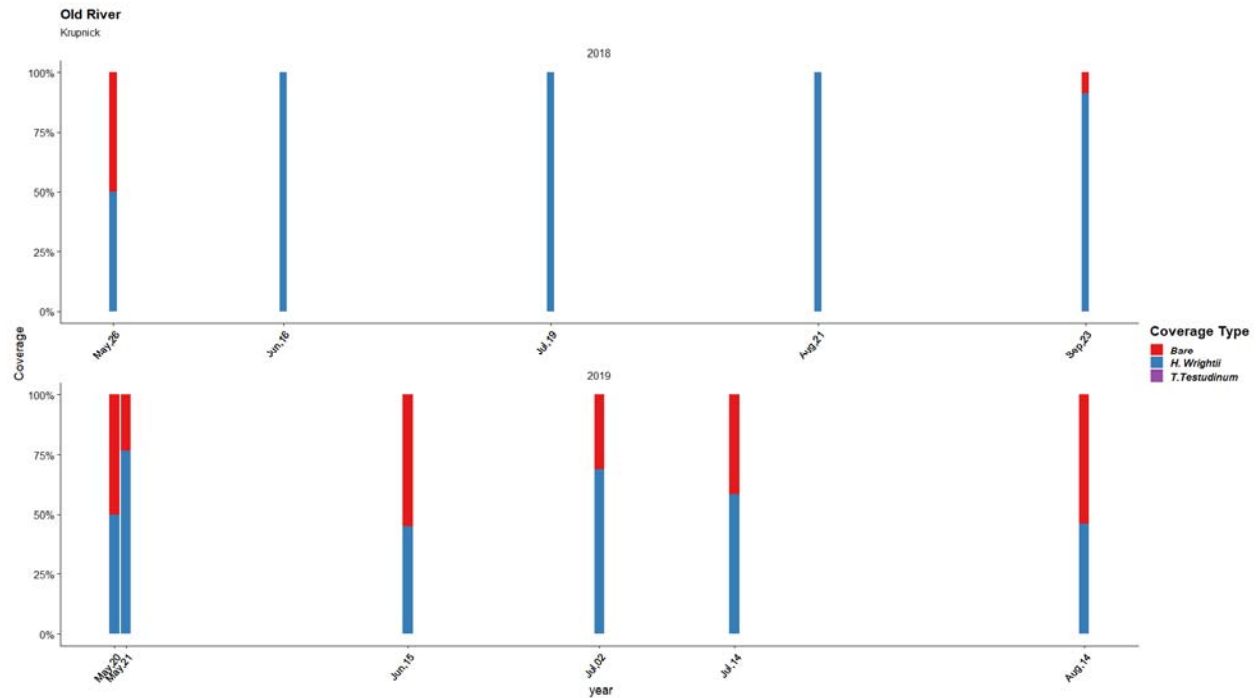
Ruppia is only found in Bayou Grande, where it is mixed with *Spartina*.
Halodule is only found in Old River.
Halodule is more common closer to shore than *Thalassia*.

Interannual differences in percent cover of the different species within Big Lagoon or Santa Rosa Sound was difficult to determine based on uneven sampling between years.





A percentage of the Percent Bare in the Blackwell/Bayou Grande site include parts of the site that have been taken over by *Spartina alterniflora*.



Drift algae covers seagrasses, thus reducing seagrass productivity. Coverage was highly variable, and the averages ranged from 0 to 26%. This trend continued in the analysis of the 2019 data.

Discussion

These are preliminary results. Future analyses will examine spatial and temporal differences in seagrass and macroalgal cover. The relationships among variables will also be examined in more detail. For example, what are the relationships among percent cover and environmental

conditions such as salinity, temperature, TSS, nutrients and chlorophyll a? As the number of volunteers and samples analyzed increases, a clearer picture can be created of the health and abundance of the local seagrass beds. Continued monitoring by citizens and UWF students will be useful in evaluating the health of seagrass beds in the Pensacola Bay system.

References

EPA method #160.2 Residue, non-filterable (Gravimetric)

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