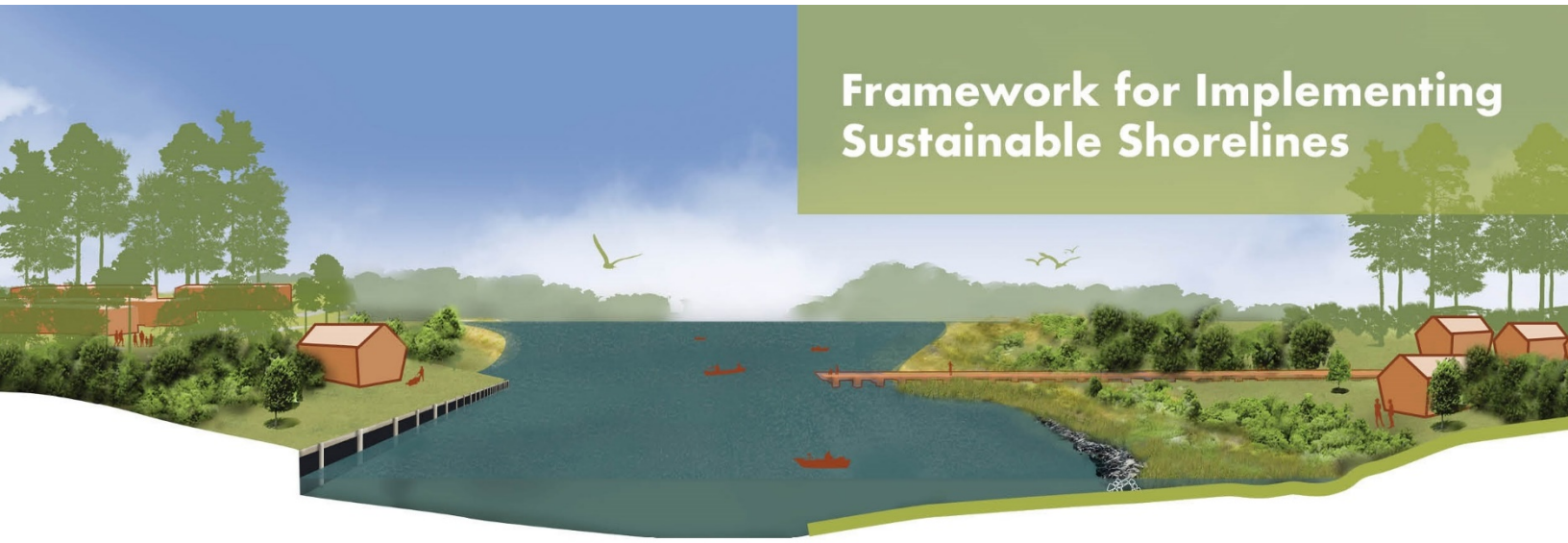


Summary of Natural Science Investigations:

Diamondback Terrapin in Marshes

Project Activity: Assessing Habitat Provisioning of Living Shorelines for Diamondback Terrapin (*Malaclemys terrapin*)

Objective: Over the last 50 years, diamondback terrapin populations have decreased across most of their range. Among many factors contributing to population declines are bycatch in fishing gear and loss of marsh habitat. In addition, a recent study showed that terrapins avoid areas dominated by shoreline armoring. Shoreline armoring is increasing as more property owners attempt to curb property loss due to sea level rise. The degree to which Living Shorelines provide habitat provisioning for terrapins has not been evaluated. Here, we compare terrapin use between Living Shorelines and natural fringe marshes.

Methods: Terrapins were observed three times for 30-min between mid-May and August (comprising the terrapin nesting season) in 2018 and 2019. For each sampling occasion, observers noted factors that could influence terrapin detection, such as glare, temperature, wind speed, and precipitation. Once a terrapin is detected, we noted size (small vs. large) on the basis of the head and coloration (black, black-white, and white). We use coloration to reduce sampling the same individual multiple times. The sampling and data structure enabled us to estimate terrapin density adjusted for imperfect detection. We modeled the detection process on the basis of covariates collected during each sampling occasion. We will model density of terrapins in the context of the shorescape, particularly in relation to the proportion of marsh and shoreline armoring.

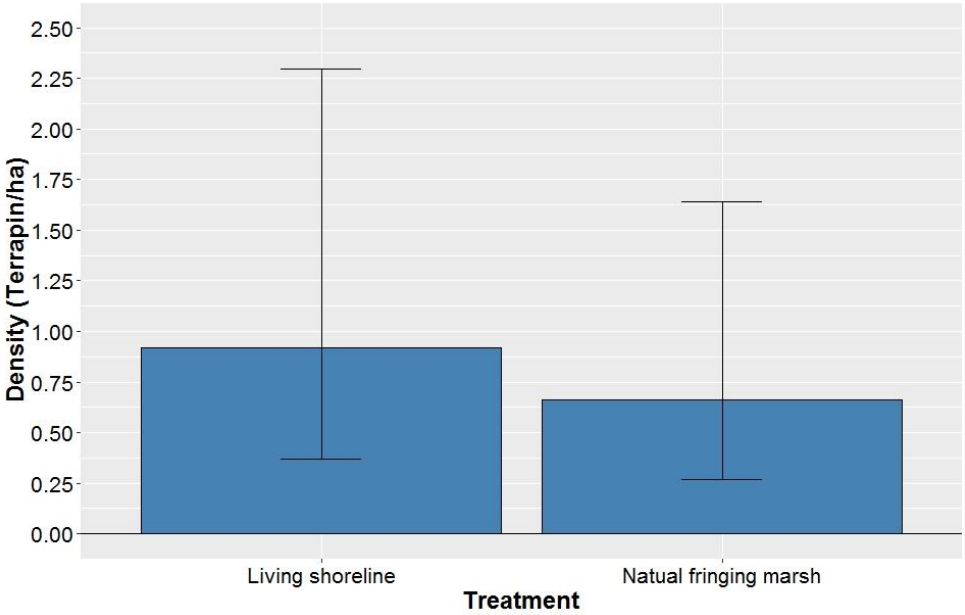
Progress to date: We detected at total of 104 terrapins in 2018, with detection distances ranging between 14-145 m from observer. In 2019, however, we only detected 55 terrapins, with detection distance ranging between 2-99 m from observer.

Visuals:

(left) Two terrapins basking at high tide on the rock sill of a Living Shoreline marsh. (right) Female terrapin captured at low tide in a fyke net in front of a Living Shoreline marsh.

Preliminary findings: We used distance sampling to estimate terrapin density between Living Shorelines and natural fringe marsh. Estimates were based on unique individuals only; that is, we removed any individuals that were detected multiple times within a given 30-min sampling period.

We used several covariates to model the detection function, including: Observer, Julian date, average wind speed (m/s), average temperature (°C), sky cover (categorical variable), starting time of sampling, and size of observed terrapin (categorical variable small vs. large). We first determined the best function to fit the distance data from observer and then investigated improvement in model fit on the basis of covariates. All statistical analyses were conducted using the "Distance" package in program R. Best model fit was evaluated on the basis of AIC and a Goodness-of-Fit test.



There is no difference in density estimates (± 95% Confidence Interval) between Living Shorelines and natural fringing marshes. Density estimates were adjusted for imperfect detection, which was modeled with wind speed.

We found no difference in density estimates between Living Shorelines and natural fringing marshes. The best model included the covariate wind speed. The probability of detection was 0.16 (± SEM 0.03). The detection probability related negatively to wind speed. The final model differed from the model not including any covariates by a delta AIC value of 16, and had an non-significant p value for the Goodness-of-fit test (p value = 0.49).

Product: Leu, M., R. Galvin, R.M. Chambers and D.M. Bilkovic. In prep. Comparison of wading bird and terrapin use of constructed living shoreline and natural fringing marshes.