Diamondback Terrapin Nesting Habitats and Projected Sea Level Rise

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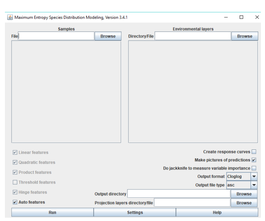
Introduction

Diamondback terrapins are turtles that inhabit Virginia brackish waters of the Chesapeake Bay and the Eastern Shore. As a species reliant on optimal nesting sites on land, climate change and sea level rise will likely impact terrapin survival (Woodland, Rowe, Henry 2017). But where are those nesting sites in VA, and where will they shift with sea level rise?

In parts of VA, "core habitat" for terrapin occupancy has been identified (Isdell et.al. 2015), but does not include nesting habitat. Our research examines how different environmental variables help describe current nesting habitat in Virginia. The goal is to use this information to predict how sea level rise will impact terrapin nesting habitat.

Methods

We used ArcGIS to create the environmental layers and refine the sample data (terrapin observations on land and in water). The environmental layers consisted of metrics related to core habitat, salinity, beaches, and roads. The environmental data and the terrapin observations then went into a modeling program (Maximum Species Entropy Distribution Model) to create a map of diamondback terrapin nesting habitat in VA.



Results

The model utilizes environmental grids and occurrence localities, to produce a probability distribution where each grid cell has a predicted suitability of conditions for terrapin nesting. Additionally, the program produces data and graphs displaying how each variable contributes to the model. The distance to core habitat, distance to beaches, and nearest salinity contributed the most to the model. (Figure 1). Additionally, the receiver operating characteristic (ROC) curve plots the true positive rate against the false positive rate at various threshold settings (Figure 2). The ROC area under the curve (AUC) value for our model is 0.935. This indicates that our model has a good fit, high power, and less likelihood of a false positive, Type I error.

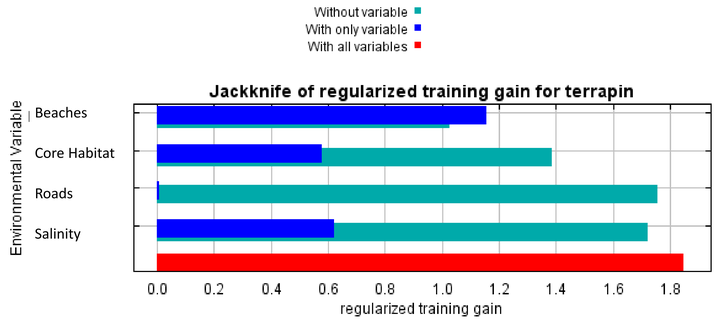


Figure 1

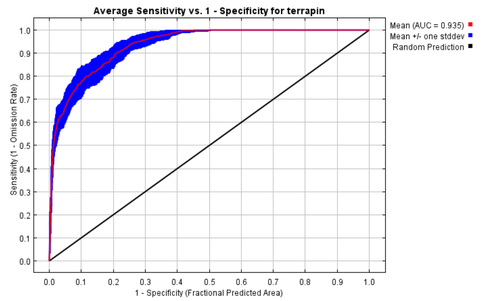
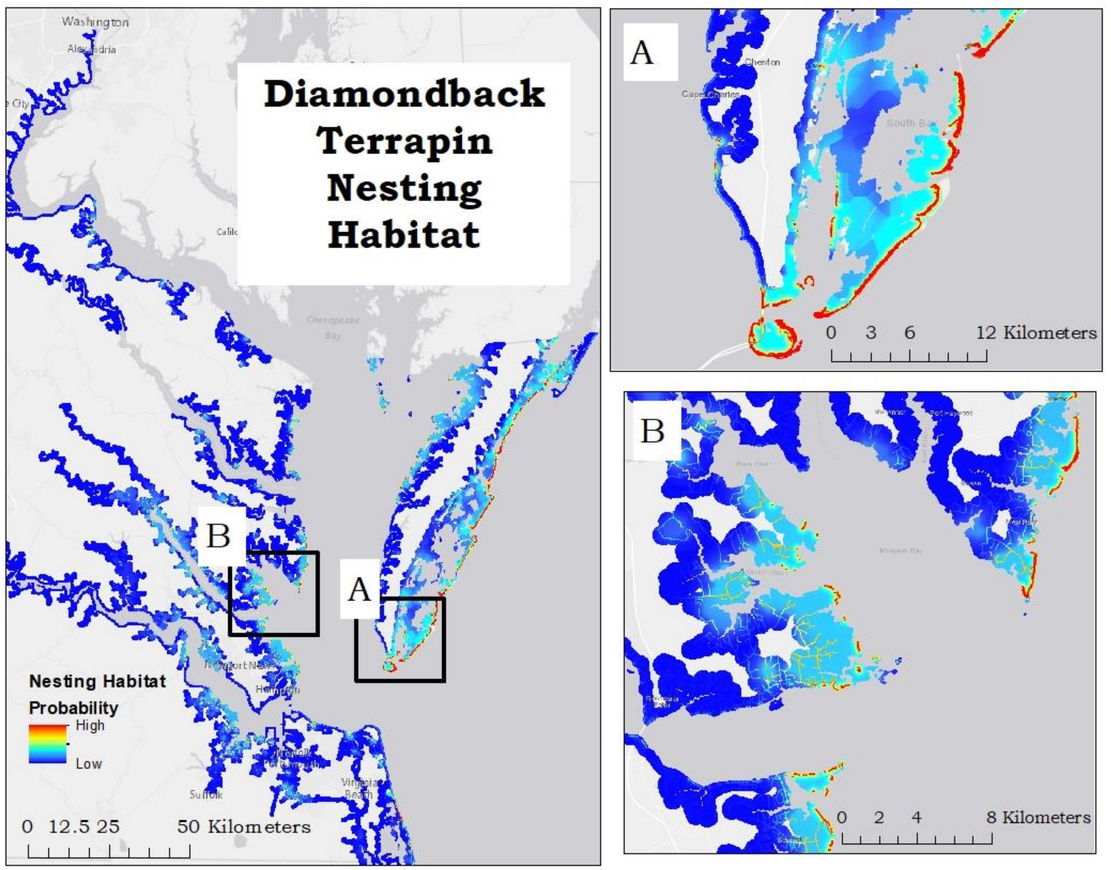


Figure 2



Discussion

The next step in our research is to address how sea level rise will specifically impact the current distribution of nesting habitat suitability. Using predictions of sea level rise coupled with environmental data obtained from the Virginia Institute of Marine Science, we will be able to create a diamondback terrapin nesting habitat distribution model for 2030, 2050, 2075, and 2100.

With future scenarios created for core habitat, beaches, salinity, and roads, we will then identify regions of current terrapin nesting habitat that may be lost to sea level rise. Conservation efforts thus can be focused on those nesting areas most at risk.

Acknowledgments

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References

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Isdell, R. E., Chambers, R. M., Bilkovic, D. M., Leu, M. and Richardson, D. (2015), Effects of terrestrial–aquatic connectivity on an estuarine turtle. Diversity Distrib., 21: 643-653. doi:10.1111/ddi.12289