We're gonna need a bigger boat ...

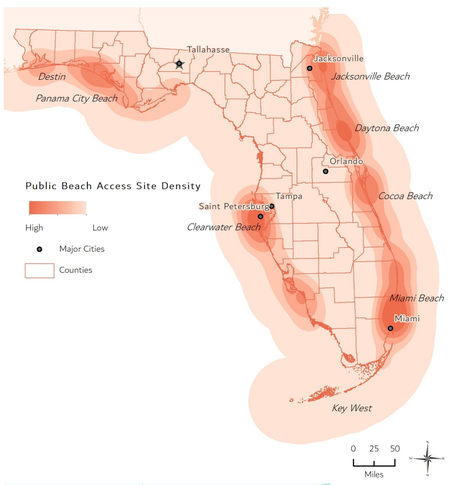
A Risk Analysis of Shark Attacks in Florida

Why are sharks important?

Despite their negative connotation, sharks are incredibly important to the ocean. They play critical economic and ecological roles in their environment by providing income and job security through shark watching tourism and by controlling populations of sick, injured, and carnivorous fish in the ecosystem. Unfortunately, many shark species are classified as near threatened or vulnerable by the International Union for the Conservation of Nature as a result of the overfishing of prey species, finning, and bycatch.

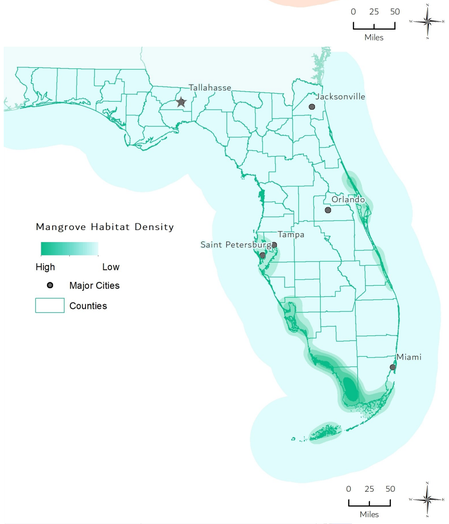
Although shark attacks are rare events, human-shark conflicts occasionally occur in certain parts of the world. The United States has the highest number of reported, unprovoked shark attacks in the world, with Florida having the most out of any state.

The aim of this analysis is to determine sites of high shark attack risk throughout the state of Florida in order to better inform the public about potential human-wildlife conflict. Having a better understanding of sharks and their behaviors can help reduce future attacks and assist in the cohabitation of both humans and sharks.



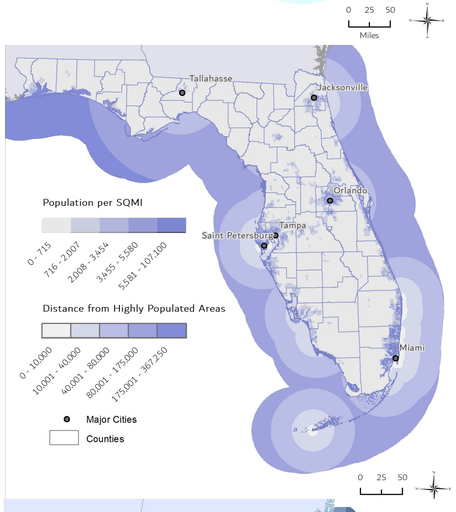
Public Beach Site Density

The use of public beaches is one of the main ways people gain access to the ocean for relaxation and to participate in aquatic activities. Kernel density was run on the public beach access site data acquired from the Florida Fish and Wildlife Conservation Commission and reclassified.



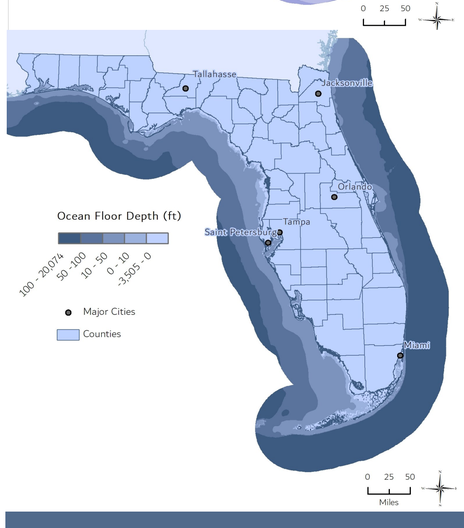
Mangrove Habitat Density

Mangrove forests are nutrient rich, intertidal habitats that serve as nursery and feeding grounds for many organisms such as sharks. Identifying locations of mangrove habitat could help predict areas sharks may be frequenting. Kernel density was run on mangrove habitat data from the Florida Fish and Wildlife Conservation Commission and reclassified to assess areas of potential risk.



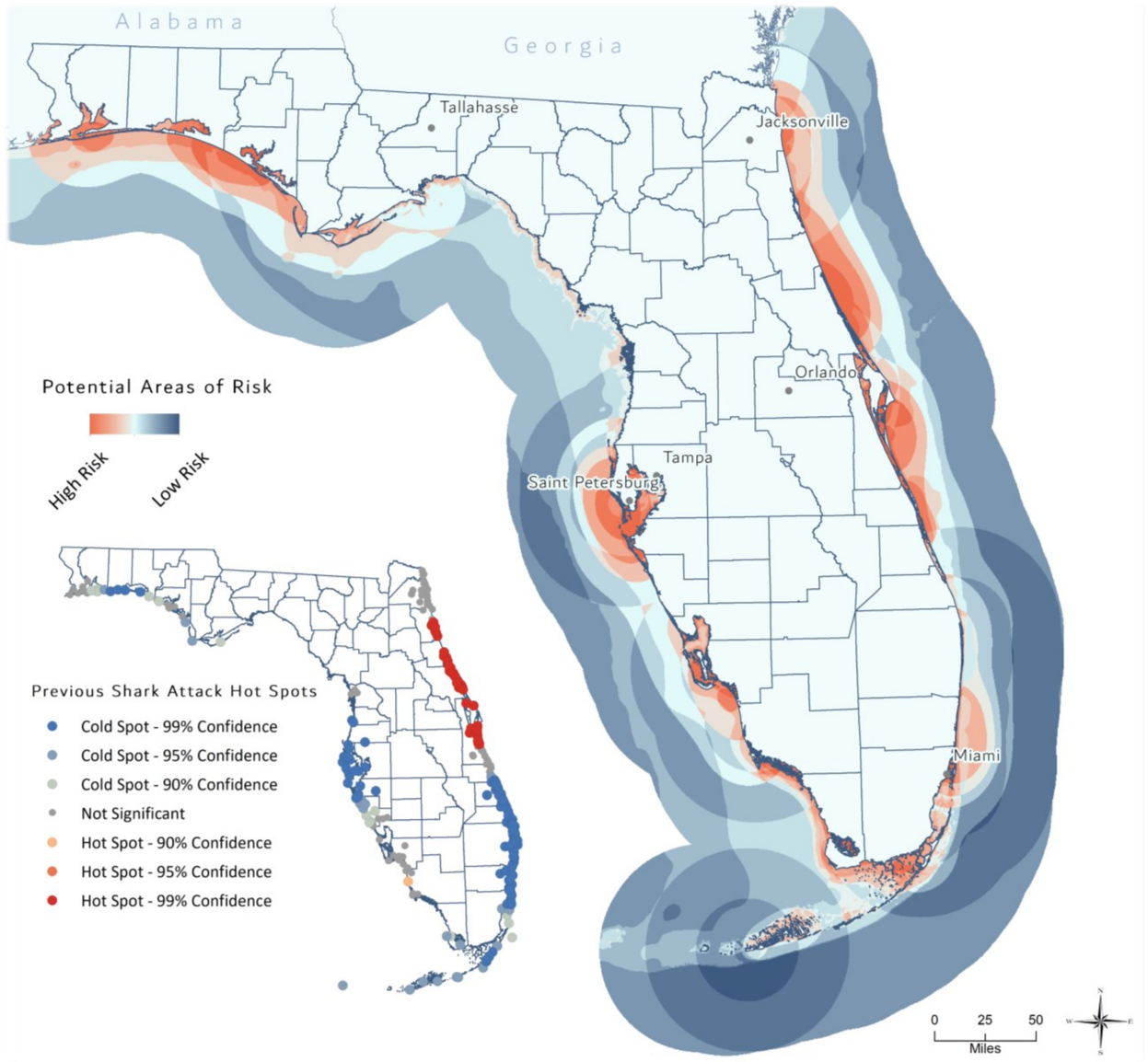
Population Density

As the population continues to grow, the number of people participating in water-based activities increases as well as the potential for human-shark conflict. Population data was obtained from the United States Census Bureau. Euclidean distance was run on areas with a population of over 8,000 people per square mile and reclassified.



Bathymetry

The majority of shark attacks occur along the coast in areas where the water depth is relatively shallow as people are often swimming or surfing at the time of attack. Bathymetry data obtained from NOAA was reclassified to identify areas of high risk for potential shark attacks.



Identifying High Risk Areas

A weighted risk analysis to identify areas at high risk for shark attacks was performed by analyzing four factors listed in the table on the right. Factors were each ranked from 1 to 5, with 1 having the lowest risk of an attack and 5 having the highest risk of an attack. Hot spot density was also run on shark attack points to determine where the attacks were historically statistically significant and to compare to predicted areas of high risk.

Final Map Factor Weights
35% Beach Density
25% Mangrove Density
20% Population Density
20% Bathymetry

Swimming forward

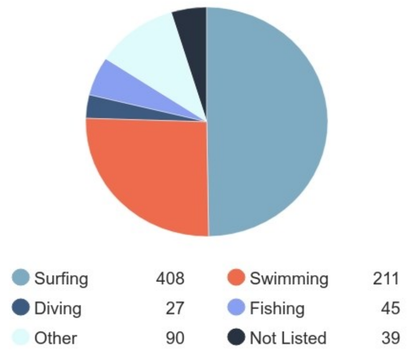


Fig.1 — Number of shark attacks per activity between 1842 and 2016.

Completion of the risk analysis demonstrates overlap between historical locations of shark attacks and predicted high risk areas based on selected criteria. The criteria included in this analysis are just some of the many factors that influence shark behavior. Further research must be conducted to better understand shark behavior, migration patterns, and other environmental changes that may impact shark attack rates.

Increasing public education about sharks by providing the public with a basic knowledge of shark behavior and patterns can help increase safety, minimize human-shark conflict, and alleviate some of the stigma associated with sharks.

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Projection: Albers Conical Equal Area (Florida Geographic Data Library)

Data Sources: Florida Fish and Wildlife Conservation Commission, NOAA, University of Florida GeoPlan Center, ESRI, and US Census Bureau

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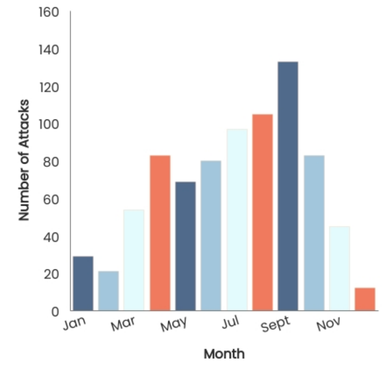

Fig. 2– Number of shark attacks per month between 1842 and 2016.