

Sea-ing Red

A Suitability Analysis for Red Tide Clean Up Technology on Florida's Coasts

Background



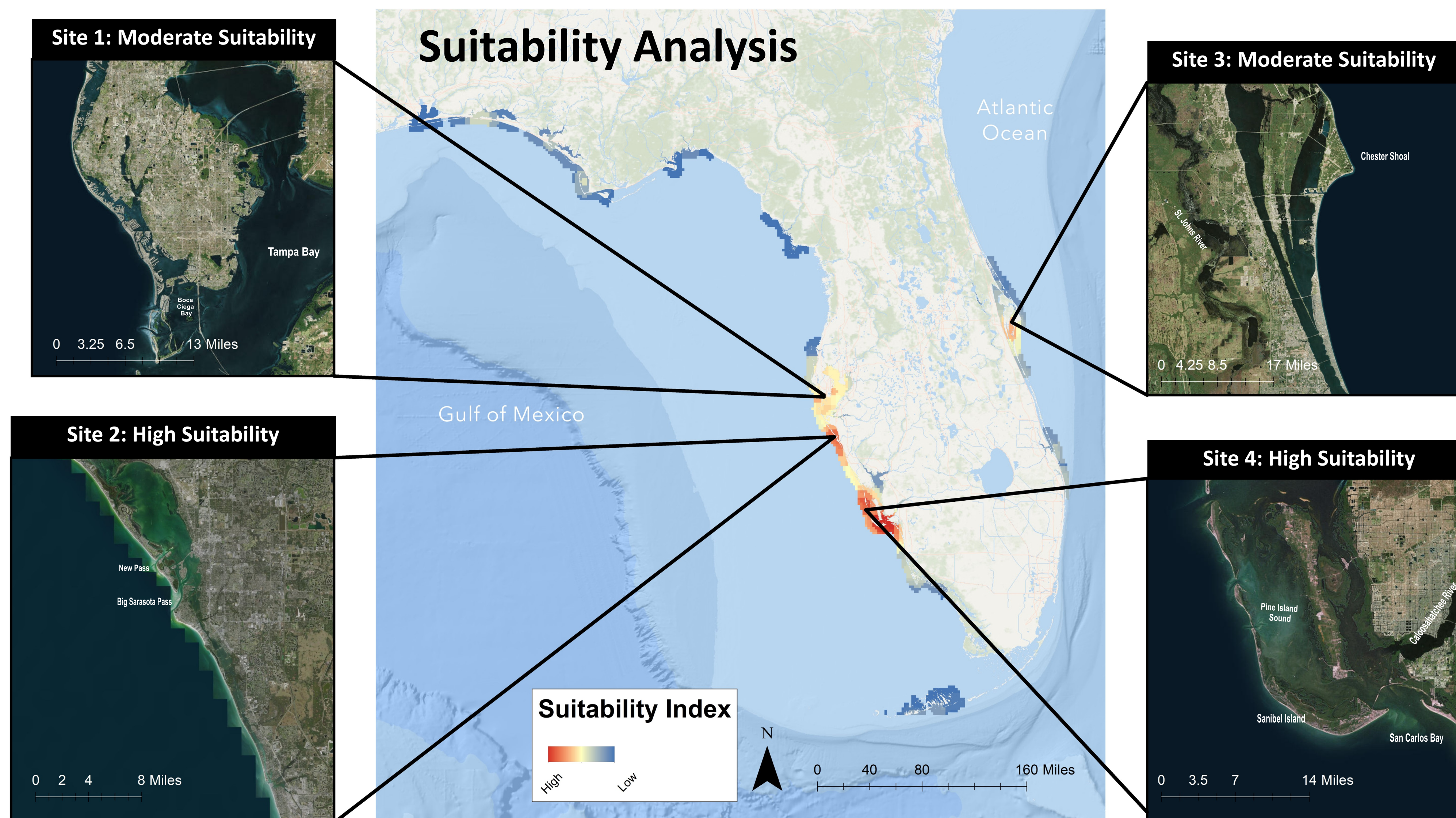
Red Tide, named for its color, is pictured here in a small inlet in Florida

Karenia brevis, otherwise known as Red Tide, is becoming more and more common along Florida's coasts and water ways. These toxic algal blooms are deadly to fish and other wild life, and harmful to people with respiratory issues. Red tide thrives on the artificially high levels of nutrients in water flowing out of Central Florida's agricultural areas.

A technology is currently being tested for use in Florida that uses ozone to clean water of Red Tide. This prompted the question:

Where is the best location for this new technology, based on density of algal bloom events and harm to humans and wildlife?

Results and Discussion



Four sites were identified as having moderate or high suitability. It is advised that these places be the first to use the Red Tide cleaning technology, once fully developed.

Three out of four of the sites are located on the west coast of Florida, and two of those three sites have the high suitability (with one site having two very high suitability spots located in close proximity). The common location of these sites can likely be attributed to nutrient-rich waters being pumped out of the agricultural areas in mainland Florida. The Caloosahatchee River is mainly used for this practice, and the results of this study indicate that the Caloosahatchee estuary, Site 4, has one of the highest densities of harmful algal blooms and manatee deaths, and is located next to Lee county, the county with the highest number of fish kills in Florida.

Methods

Six criteria were used to assess suitability:

1. Historically harmful algal bloom occurrence density
2. Number of hospitalizations and emergency room visits due to COPD, by county
3. Number of hospitalizations and emergency room visits due to asthma, by county
4. Number of fish kills recorded by county
5. Number of Manatee Carcass Recoveries
6. Number of reported Sea Turtle Carcasses

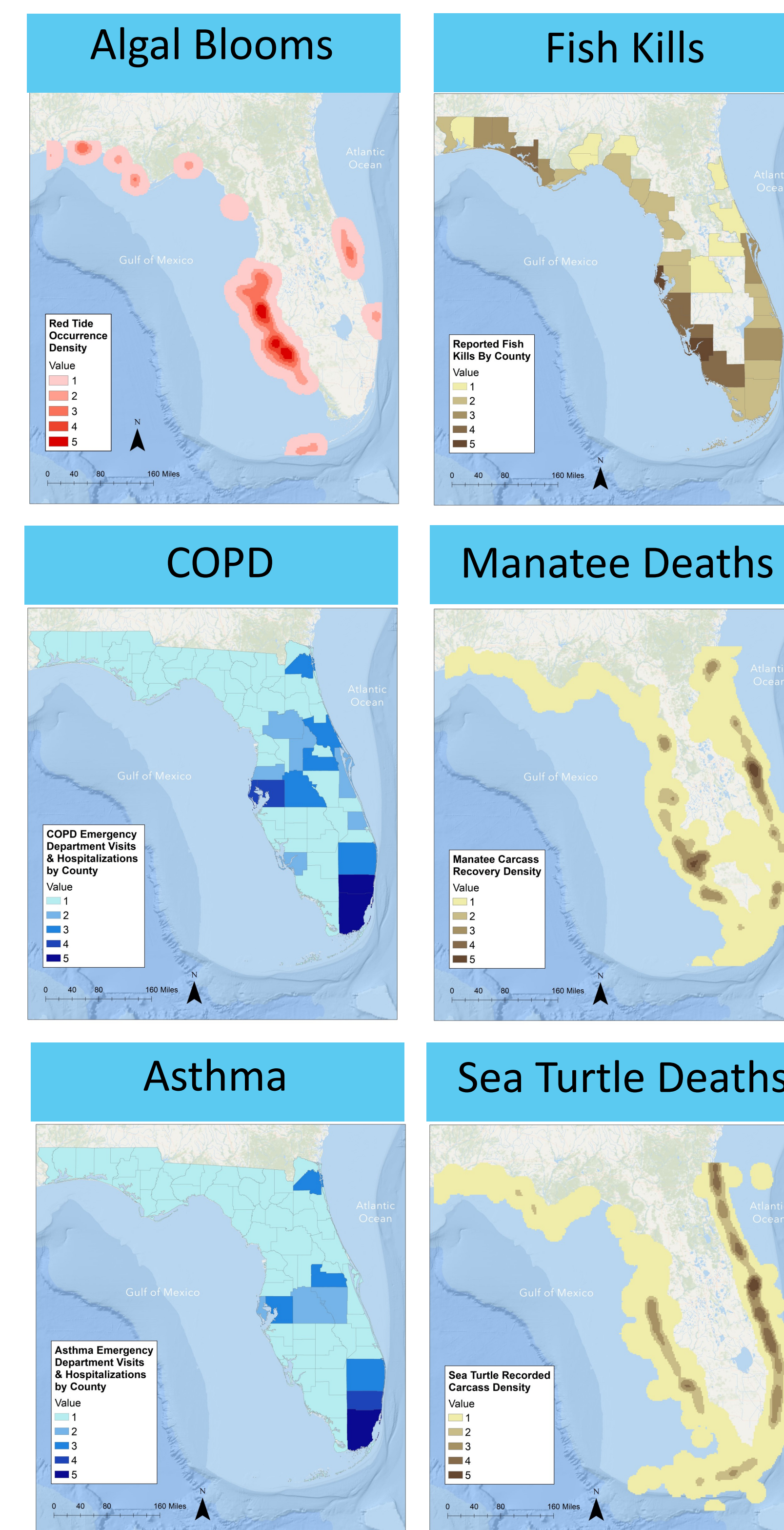
Using a heat map, each of the criteria was assessed following the Suitability Index (Table 1). For the Fish Kills, COPD, and Asthma data, a location was considered more suitable if located near a county with a high number of reported data. For this reason, a buffer of five miles was created to extend the county data into nearby water, where the algal blooms occur.

A raster calculator was then used to create the final suitability analysis. Each criteria was weighted following the Suitability Index.

Finally, the results were clipped to the confines of hydrology in and around Florida, since the cleaning technology can only exist in the water.

Table 1: Suitability Index

Weight	Score	1 Less suitable	2	3	4	5 Very Suitable
45	Algal Bloom Occurrence Density Index: (per mile)	<=.17	.17-.33	.33-.56	.56-.82	>.82
10	Asthma Index: # ER visits & hospitalizations	<=3,574	3574.1-7130	7130.1-10687	10687.1-14243	>14243
10	COPD Index: # ER visits & hospitalizations	<=4515	4515.1-8945	8945.1-13374	13374.1-17804	>17804
15	Fish Kills Index: # reported	<=2	2.1-27	27.1-89	89.1-302	>302
10	Manatee Index: # deaths per mile	<=.4	.41-.7	.71-1.5	1.51-2.5	>2.5
10	Sea Turtle Index: # deaths per mile	<=.8	.81-1.6	1.61-2.6	2.61-4.3	>4.3
100						



Sources

Research:
 Shin, M., Lee, H., Kim, M. S., Park, N., & Lee, C. (2017). Control of the red tide dinoflagellate *Cochlodinium polykrikoides* by ozone in seawater. *Water Research*, 109, 237-244. doi:10.1016/j.watres.2016.11.050
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 Fleming, L. E., Kirkpatrick, B., Backer, L. C., Bean, J. A., Wanner, A., Reich, A., . . . Baden, D. G. (2007). Aerosolized Red-Tide Toxins (Brevetoxins) and Asthma. *Chest*, 131(1), 187-194. doi:10.1378/chest.06-1830
Data:
 Florida Environmental Public Health Tracking, Official State of Florida Geographic Data Portal, Florida Fish and Wildlife Conservation Commission, ESRI

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