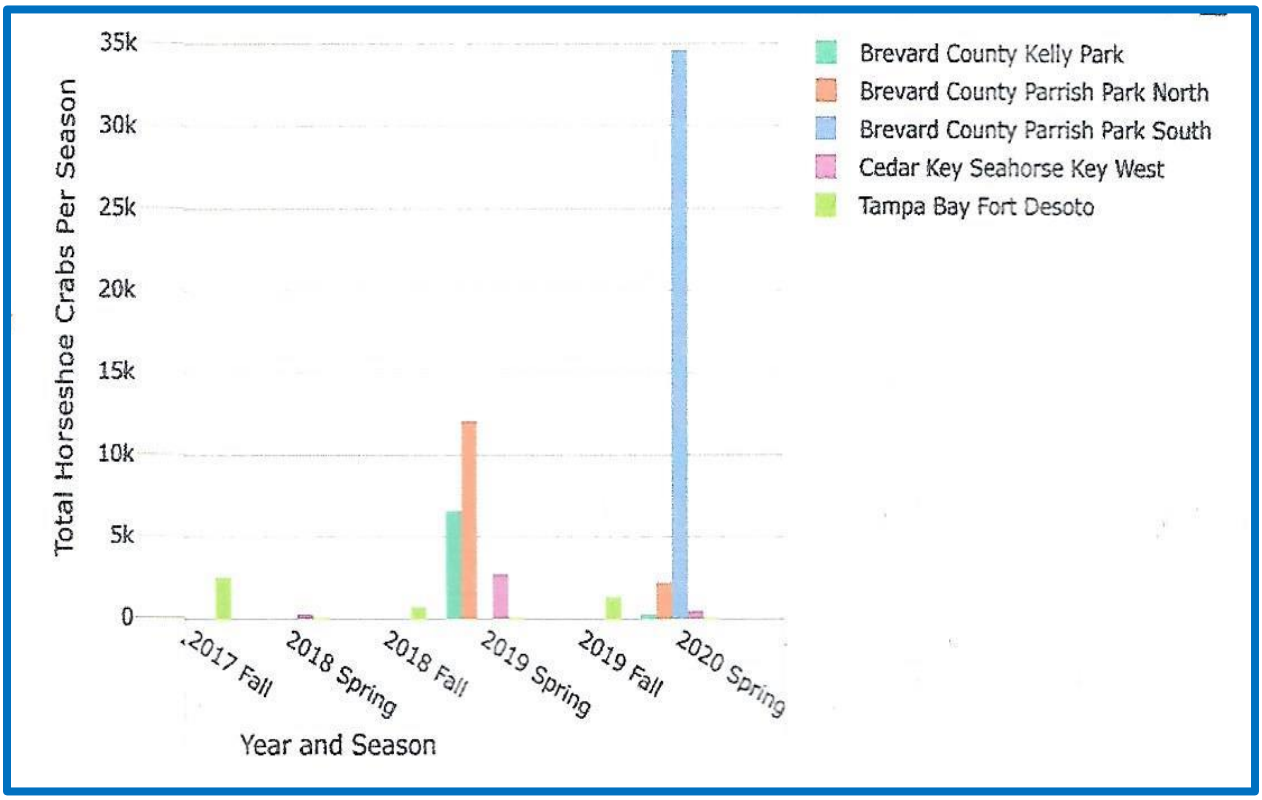
A Conversation About Why the Titusville Causeway is Critical to Horseshoe Crab Survival in the Northern Indian River Lagoon

I am a volunteer for a program called "Linked with Limulus." The program started on Florida's west coast around Tampa Bay in 2015 when researchers from the Florida Fish and Wildlife Research Institute and the University of Florida launched a citizen science initiative which trained volunteers to assist biologists in surveying, tagging and re-sighting Florida's nesting horseshoe crab (HSC) populations. Brevard County's Parrish Park North was added to the survey sites in 2019. Parrish Park South was added in 2020. The Parrish Parks straddle the Titusville Causeway.

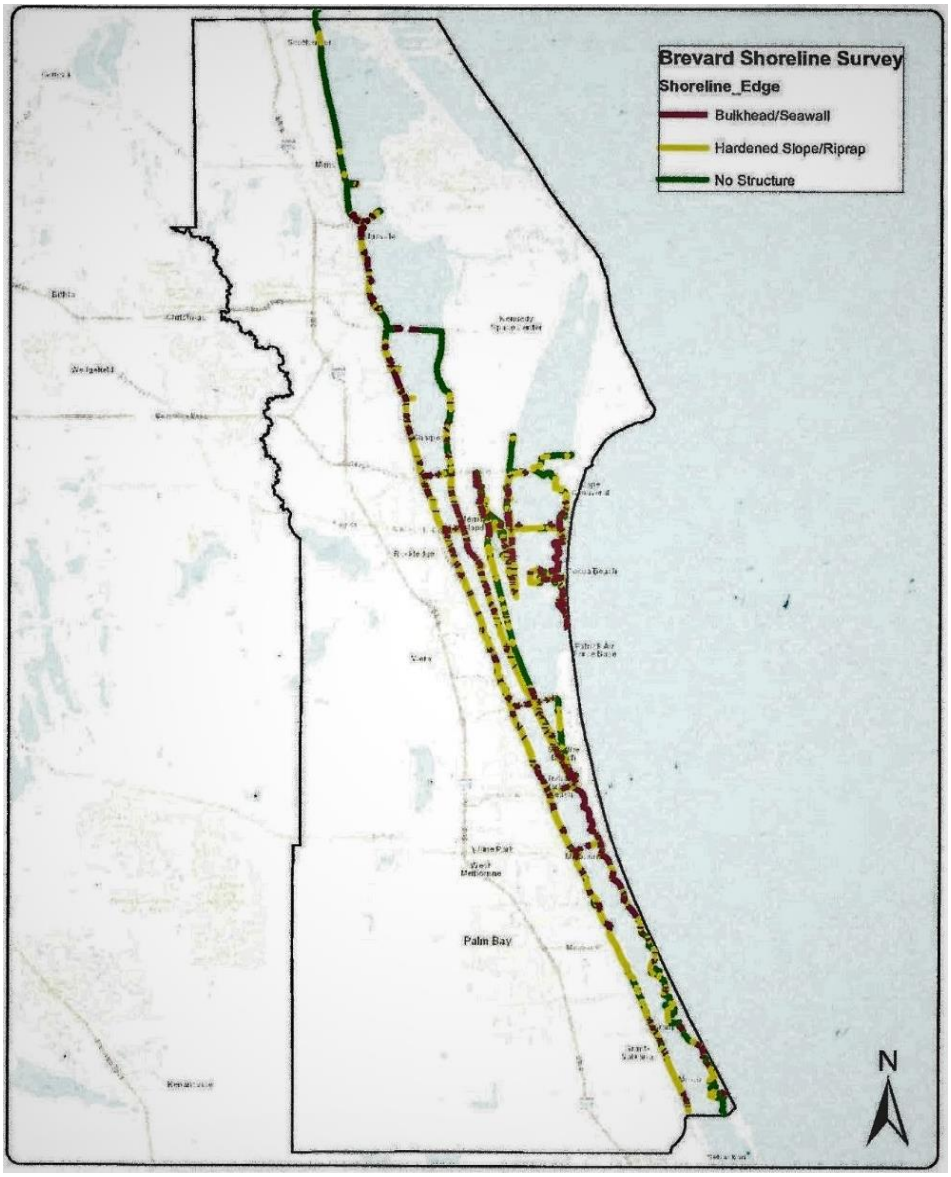
Now, counting HSCs might sound a little boring – unless you're one of the surveyors that works the two Parrish Parks on the Titusville Causeway. During the 2020-2021 nesting season, volunteers counted 58,952 HSCs and tagged 1,068. That's 8,449 crabs at Parrish Park North and 50,503 crabs at Parrish Park South. 8,449 crabs may not sound like a lot compared to the 50,503 crabs we counted on the south side of the Titusville Causeway. But both sides of the Titusville Causeway will be critical in the future for the survival of HSCs in the Indian River Lagoon (IRL).

The following graph depicts Florida's top five producing HSC survey sites for the years 2017, 2018, 2019 and 2020. The top three sites are in Brevard County – two of them along and near the Titusville Causeway. During their best survey periods, the other sites pale in comparison to the Brevard County sites: Tampa Bay's Ft DeSoto Park had 2,450 HSCs, Cedar Key Seahorse Key West had 2,600 HSCs. Brevard County's Kelly Park had 6,200 HSCs, Parrish Park North had 12,000 HSCs and Parrish Park South had 34,000 HSCs. The following graph only includes crabs counted during the official Spring Survey Period of February 1 - April 30. When the months of November, December and January are included, volunteers counted 55,500 crabs at the Titusville Causeway during the 2019-2020 spawning season and more than 58,000 crabs during the 2020-2021 spawning season.



Florida's Top Five Horseshoe Crab Survey Sites

For the discussion on why the Titusville Causeway is so important for HSCs, let's start out with a map that shows the condition of Brevard County's shorelines. Green indicates shoreline with no structures. Yellow designates hardened slope with riprap and red shows where bulkheads or seawalls exist. The map was produced by University of Central Florida professors Linda Walters and Melinda Donnelly. They have done extensive work with oyster restoration in Mosquito Lagoon and are now also working on oyster restoration in the Indian River Lagoon. They created this map to aid in decisions on where it would be appropriate to place oyster reefs and living shoreline restoration projects.



Brevard County Shoreline Survey Showing Shoreline Edges

You will notice that the map excludes the Federal lands of Kennedy Space Center, Merritt Island National Wildlife Refuge and Canaveral National Seashore. It's reasonable to expect that their shorelines will have the green color that indicates shoreline with no structures. Within those three entities, the U.S. Fish and Wildlife Service manages 140 miles of dikes along the shores of Mosquito Lagoon, Indian River Lagoon and the Banana River. Those dikes suffer extensive damage with every hurricane and now, they are jeopardized during King Tide wind events when the water level in the IRL reaches its highest levels.

Refuge management has been instructed from higher up to hard armor every future dike repair they make. The Federal Government is tired of paying to fix dikes. The sandy shores of those dikes are the last big remaining areas in the northern IRL for spawning HSCs. Eventually the sides of all of the dikes along the lagoon's shorelines will be lined with rocks. HSCs crawl over the rocks to try to nest in sand. There they get trapped and die from being out of the water or they become raccoon cuisine.

Horseshoe Crabs Trapped by Construction Debris Used for Erosion Control

North of Titusville there is solid green on the map along the western IRL shoreline. When Henry Flagler built the Florida East Coast Railroad in the early 1900s, he built it so close to the IRL that no room remains in order to build houses between the railroad track and the river. Due to rising water levels, north of Titusville there are few, if any, sandy beaches remaining along the western shore of the IRL on which HSCs can nest. The water goes right up to the trees. Eventually it will go right up to Mr. Flagler's railroad track.

From Titusville to the south, more than 85% of the shoreline in Brevard County is hard armored. The numbers of spawning HSCs south of Titusville are not good. They cannot spawn on seawalls and rock revetments.

HSCs spawn along the beaches of spoil islands. You can forget spoil islands as an alternative for nesting HSCs as there are no plans to save many of the IRL spoil islands as they erode away to nothing. We need to re-think where we put dredged spoil when the Florida Inland Navigation District dredges the Intra-coastal Waterway. I think it should go onto the spoil islands. Spoil islands are valuable habitat for HSCs and birds that feed on HSC eggs (Shorebirds) and birds that need beaches upon which to nest (Gulls, Terns and Black Skimmers). Spoil islands are also an important recreational amenity for Florida's residents and visitors. We are losing our valuable spoil islands at an accelerating rate.

Now let's talk about causeways. Brevard County's causeways provide access to the IRL for those who cannot afford a boat or a home on the river. The causeways of Brevard County are all hard armored from SR 528 south.

You can see a small spot of green on the map at the eastern end of the SR 528 Causeway right before it gets to Port Canaveral. The little beach on the south side of SR 528 gets a lot of spawning HSCs with a southerly wind. That beach is doomed. Construction plans for the widening of SR 528 include placing a hard armored slope down into the water at that location.

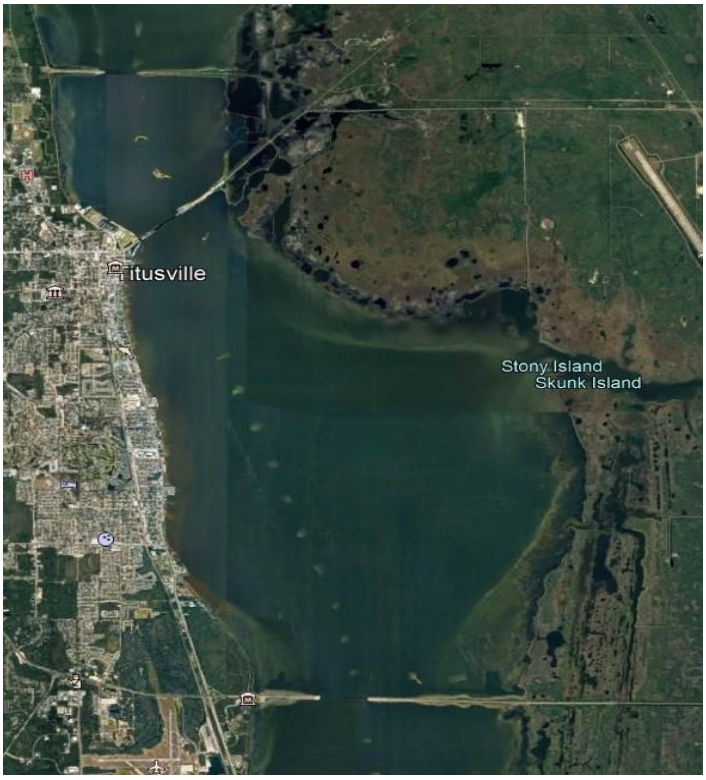
The bridges inside the Kennedy Space Center are old. Most were built in the 1960s. HSCs spawn along NASA's causeways inside the Center. Space workers have told me that they see them. I don't know whether NASA's plans include preserving sandy shorelines or not. I doubt they do. My guess is that NASA will likely hard armor their causeways when they build new bridges. NASA is constructing a $50 million bridge where SR 405 crosses the IRL. Several pockets of sandy beaches remain among the mangroves along its south side and a sandy beach lies in the northwest corner of that causeway. HSCs extensively use those areas, which may be impacted with construction of the new bridge and causeway stabilization.

That promising-looking strip of green on the map along the eastern shore of the IRL that shows shoreline with no structures south of the SR 405 Causeway is similar to the shoreline north of Titusville.

The water goes up into the mangroves – there are no sandy beaches available there for the animals that need them. The Titusville Railroad Bridge Causeway holds some hope for the future of HSCs in the Northern IRL. There are some pockets of sandy beaches among the mangroves along both sides of its eastern end as well as nice beaches on both the north and south sides of that causeway where it intersects the eastern shore of the IRL. But, because that causeway belongs to NASA, its future is also uncertain.

That leads us to the Titusville Causeway. That tiny spot of green on the map at the eastern end of the Titusville Causeway is the most significant area in the state for spawning HSCs. I have strong opinions on why that is the case. First, I believe that the reason we see such large numbers of crabs spawning along the Titusville Causeway is simple -- there are very few places remaining in the Northern IRL where they can lay their eggs on a sandy beach. Second, the Titusville Causeway is the only causeway on Florida's entire east coast that has a northeast/southwest alignment. Every other causeway orients east-west.

The following image shows the three causeways that are located in the northernmost part of the IRL. The top causeway is the Titusville Railroad Bridge. It connects the railways within the Space Center to the Florida East Coast Railroad. The center causeway is the Titusville Causeway, also known as the Max Brewer Bridge and Causeway. You can clearly see the unusual northeast/southwest alignment of that causeway in the picture. The bottom one is the SR 405 (NASA) Causeway.

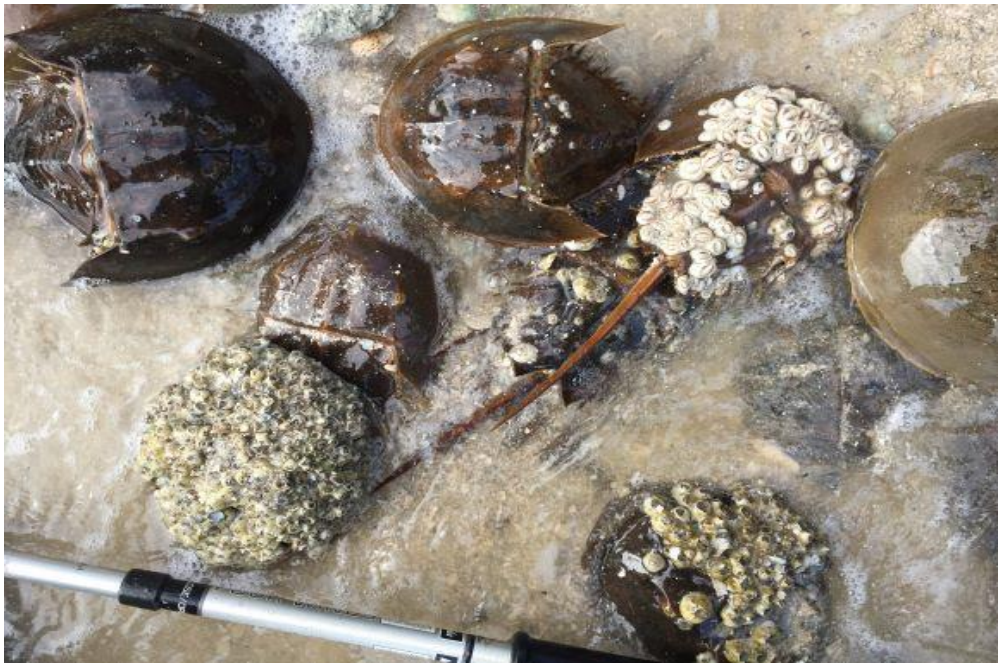


Causeways in the Northern Indian River Lagoon

Because of the Titusville Causeway's peculiar orientation, its south side is very special. As it has eroded over time, the causeway's sand has been swept to the east, collecting in the southeastern corner of the causeway where it joins the eastern shore of the IRL at the beginning of the Gator Creek Dike inside the Merritt Island National Wildlife Refuge. The Titusville Causeway's unusual alignment sets up perfect conditions for spawning HSCs during southerly wind events. When the wind blows from the south, water piles up in the cove area at the southeastern corner of the causeway. The HSCs use the wind and waves to get higher up onto the sandy beach to lay their eggs. Strong winds can hold the water level in that cove way up and as long as the wind and waves persist, HSCs spawn - sometimes non-stop for multiple days and nights.

Horseshoe Crab Survey Area on the South Side of the Titusville Causeway

I believe that HSCs come from other areas of the IRL to spawn at the Titusville Causeway. We know that HSCs move back and forth through Barge Canal. In April 2019 we found a HSC that had been tagged three weeks earlier at Kelly Park in the Banana River. She made a 23-mile trip that included 4 miles through the Barge Canal and a 4-mile detour at the NASA Causeway so she could get under the bridge and then up the east shore of the IRL to get to that special spot at the southeast corner of the Titusville Causeway. Her little legs must have been moving really fast. Occasionally we see some HSCs that have completely different species of barnacles growing on them. They come from a different location within the river.



The left and bottom crabs have the regular barnacles that we always see and the crab on the upper right has very different barnacles

Restoration and preservation of natural systems versus using concrete and rocks must be front and center in any conversation around causeway infrastructure improvements. New technologies for shoreline protection that don't include cement have emerged that can be used to stabilize the beaches of the Titusville Causeway and other causeways. They are resilient designs that work with nature and not against its blunt forces -- such as natural sand berms and beaches that waves wash over instead of crashing into concrete or rocks. A variety of wave attenuation devices (breakwaters) exist that will reduce the power of waves before they reach the causeways. At the same time, they allow water to seep through, mitigating the washing out of critical areas but also allowing those natural areas to recover and grow. With good water quality, seagrasses will flourish when they are protected from the force of waves.

The Titusville Causeway is a natural area that hosts astonishing amounts of wildlife at the entrance to the Merritt Island National Wildlife Refuge and Canaveral National Seashore -- two crown jewels in our nation's collection of wild places. Merritt Island National Wildlife Refuge is our country's fourth-most-visited national wildlife refuge and Canaveral National Seashore is one of only ten national seashores in the U.S. The Titusville Causeway is also the gateway to the only public space port in the world. Millions of people pass over the Titusville Causeway every year. It is the perfect location to do an environmentally friendly shoreline and seagrass restoration/stabilization project that will be seen by an enormous number of people. It would be an example for coastal resiliency that other organizations can emulate.

Horseshoe crabs are nature's great survivors. They've been around for 450 million years. What a shame it would be to see them wiped out during my lifetime. The Titusville Causeway represents the best chance for the continued existence for horseshoe crabs in the Northern Indian River Lagoon. There is an extraordinary opportunity for education here while preserving a very special place for horseshoe crabs, shorebirds and people. We must find a better way to preserve and maintain Florida's estuarine shorelines. Addressing the erosion issues with the Titusville Causeway in a manner that preserves its natural environment would be an excellent place to start.

Laurilee Thompson
April, 2021