

## **Recent Changes in the Fire Island Breach**

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We are closing out the summer season and the sixth year of the existence of the Fire Island breach so this is a good time to assess its current status and the latest changes. As you all know, we have been conducting more or less monthly aerial surveys of the breach, assisted by other folks at times, while collecting water property and water level data from around the Great South Bay. Of particular interest is the latest salinity data from Bellport which suggested a closer look at the conditions of the breach was in order. The Bellport salinity record shows suggests that we have been getting fewer high salinities events than in the past leading to the question of whether this was because of recent rain events or was the breach getting smaller and thus reducing the amount of exchange with the more saline ocean.

So first, let us look at the salinity record from Bellport for the past 21 months, ie. since January 2017, as shown in Figure 1. During the first five months or so in 2017 there were numerous times with salinities greater than 30 psu. (The ocean's salinity south of Long Island is between 32 and 33 psu and psu stands for "practical salinity units" which is numerically nearly equivalent to parts per million by weight.) By the middle of 2017 these high salinity events became less frequency. Since January 2018 there has only been a couple of instances greater than 30 psu while the average salinities since March 2018 have been around 28 psu as compared to about 29 psu for the first half of 2017. The red line in the figure is least squares fit to the salinity record and it clearly indicates an overall decrease in salinity within Bellport Bay of about 1.5 psu since January 2017. The precipitation record from McArthur Airport for the rain fall rate this year is nearly identical to that of 2017 so lower salinities are not due to extra rain or fresh water runoff from shore.

You may also notice in Figure 1 that the water temperatures in Bellport Bay during the summer of 2018 appear to be a little warmer than during the previous year. Warming of the waters of the Bay is primarily due to incoming solar radiation and it has not been noticeably less cloudy this year than last. So this is an additional indication of reduced exchange with the ocean which tends to be colder than the Bay during the summer. The ice boaters might be encouraged by this as it means that the Bay will get less relatively warm waters from the ocean this coming winter.

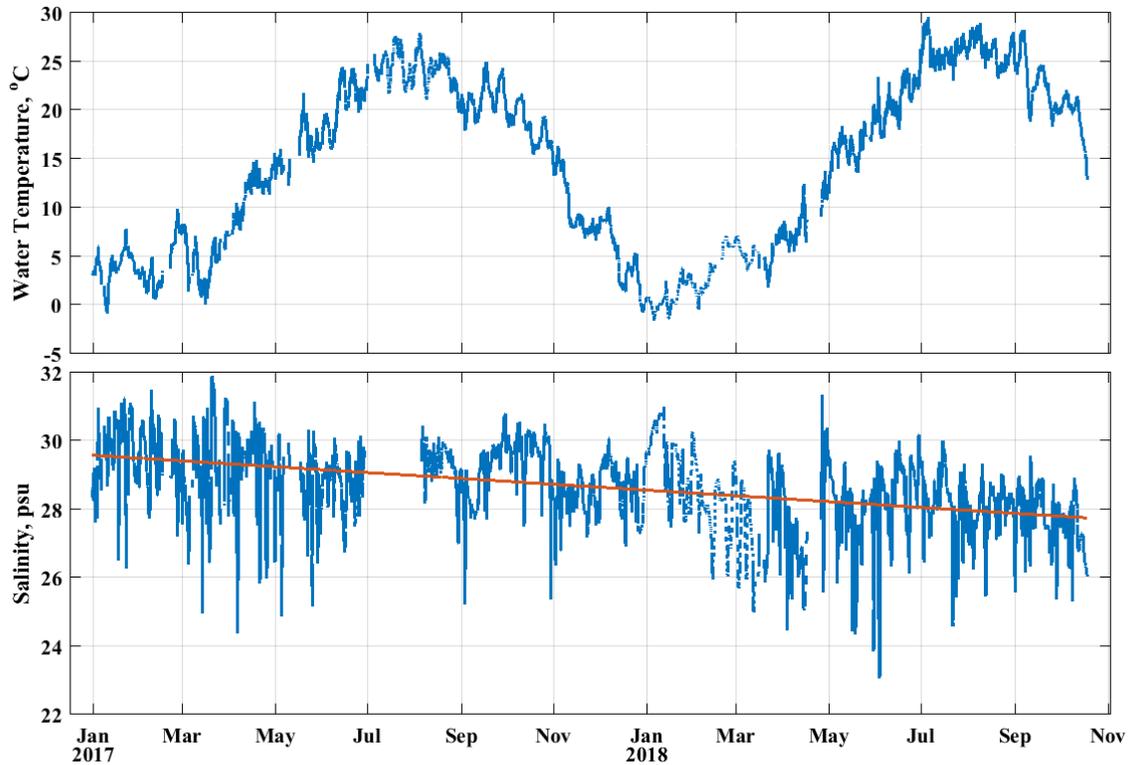


Figure 1, Bellport Water Temperature and Salinity

Now let us look at how the breach itself has changed since January 2017. The monthly aerial oblique photos and photo mosaics are shown on the project website while those from January 2017, January 2018 and October 2018 are shown in Figures 2-4. In these photos it is pretty clear that the overall size of the breach has not changed all that much. But what has changed is the channel through the flood delta - the area north of the breach - which effectively controls the conveyance of waters between Bay and ocean. In January 2017, while the eastern shoreline had intruded into the breach and there was a sand shoal to the north, there still was a single channel that swept along the western shoreline then south of the remains of Pelican Island and up to the northwest pretty well through the flood delta. By January 2018 there were several more shoals within the former channel and even though the shoreline on the eastern side had receded, the pathway into the Bay was clearly more convoluted and restricted. And the channel through the flood delta to the northwest had acquired shoals that were not there a year previous. The latest picture from October 19, 2018 in Figure 4 shows that the eastern shore has again pushed while the conveyance channels have become even more obstructed. This aerial time series clearly suggests that the pathway through the breach and into Bellport Bay has gotten smaller and less efficient. And when the flow slows down because of obstructions and bottom friction, it loses some of its ability to keep sand in suspension and deposition begins to out strip erosion. That is the prescription for closing of a breach.

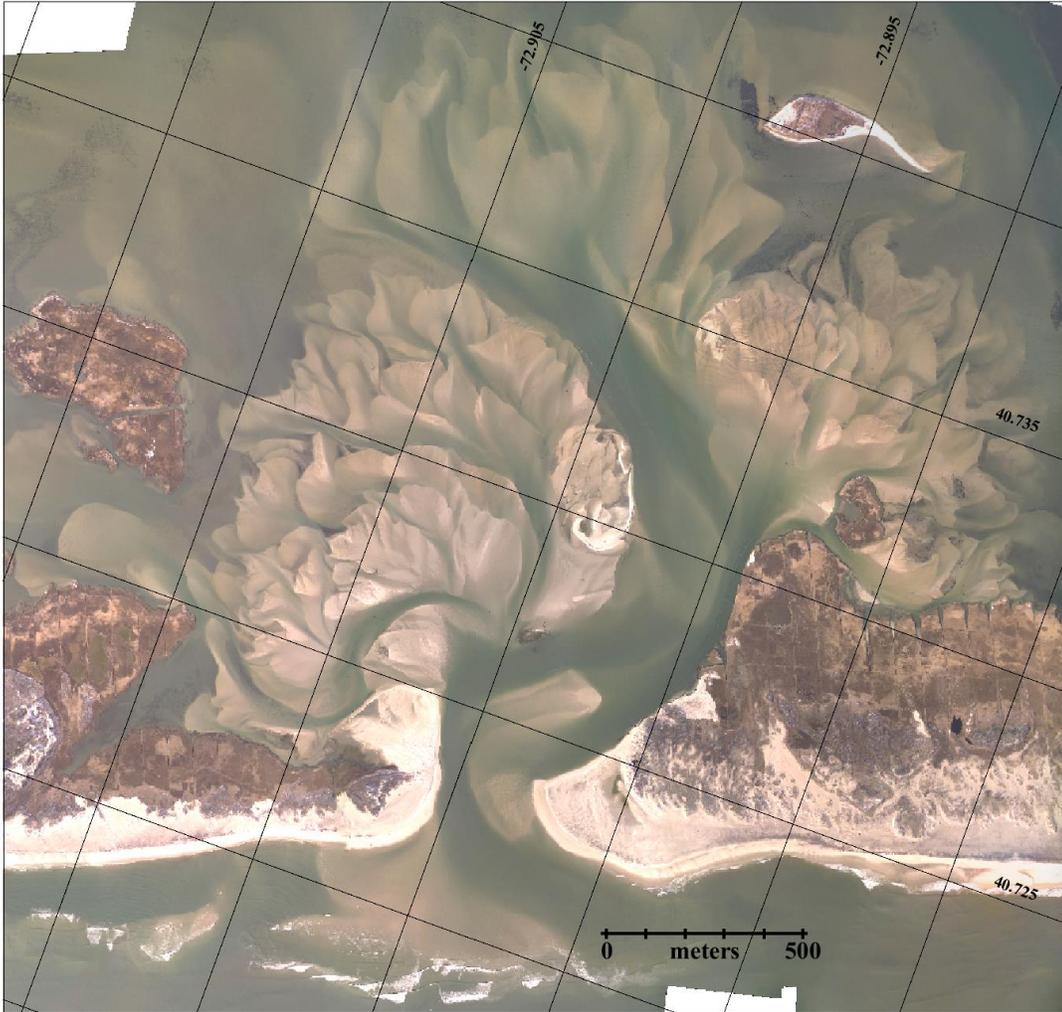


Figure 2, January 15, 2017

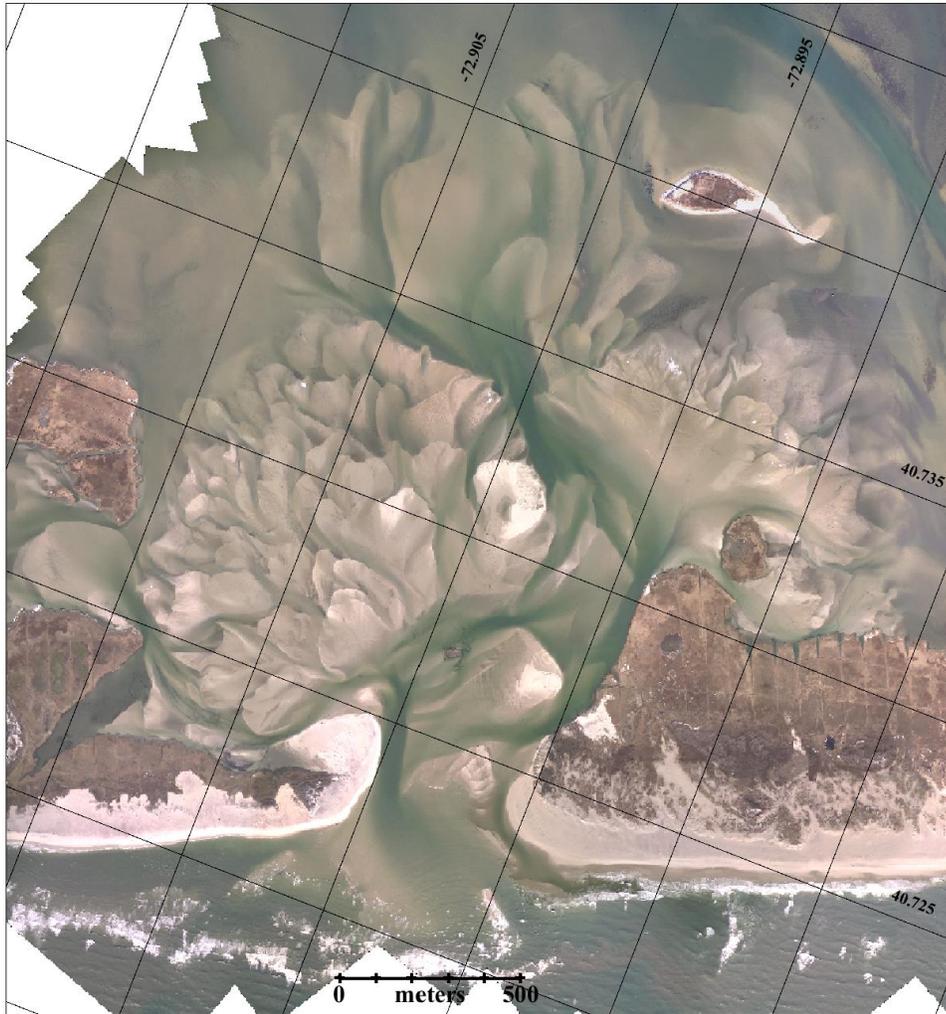


Figure 3, January 27, 2018

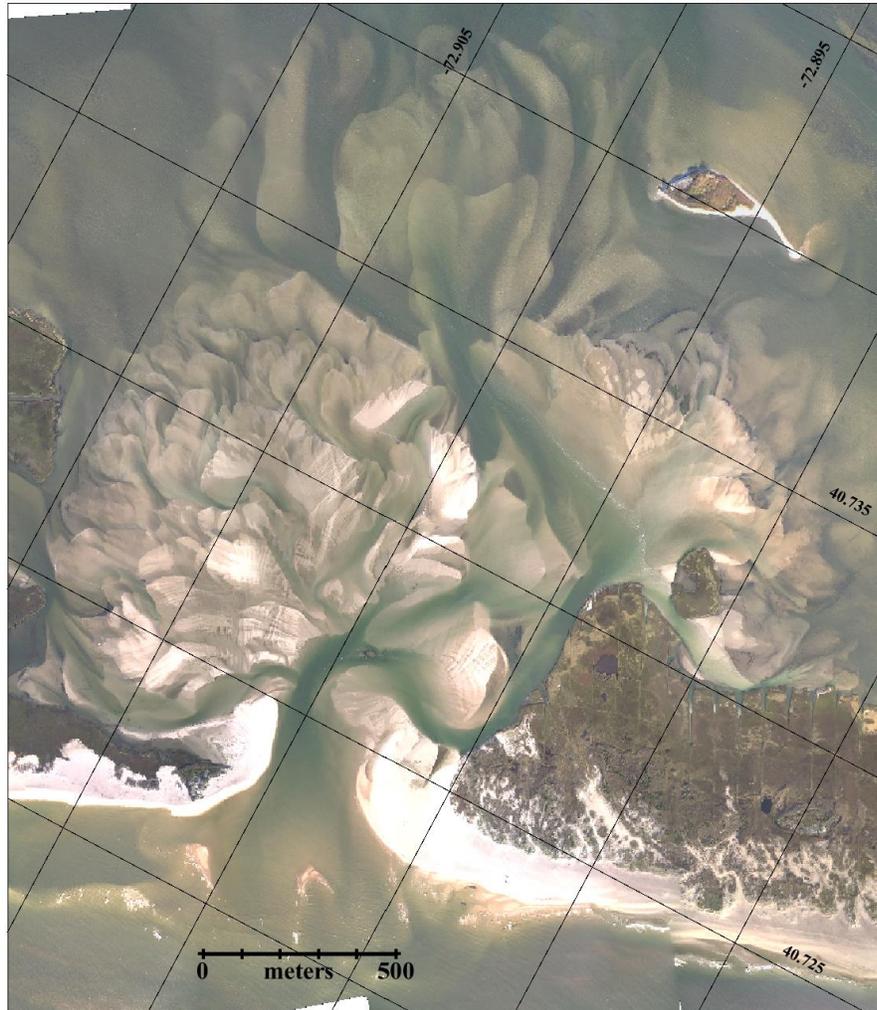


Figure 4, October 19, 2018

So at this point, the bottom line is that after being fairly stable for about 4 ½ years, the breach is in the process of closing. This is something that was inevitable for an undefended inlet through a barrier island and there are many examples of that happening both locally and farther along the coast. Of course the next question is when will it close entirely and that is no more easily estimated now than it ever was. There is beach reclamation activities through shore nourishment to the east along Smith Point Park and west of Moriches Inlet. Sand put up against the shore in that manner is never stable and enters the littoral drift to the west almost immediately. Some of that sand will end up in the breach. Whether the closure happens quickly or is postponed by some major winter storm remains to be seen. Last year's winter nor'easters did not open up the breach to a noticeable degree so I would guess the closure would be sooner rather than later.