

## Beach Update, January 2021

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At long last we have another aerial overflight of the breach, the first since August and after several fall storms. Below are shown zoomed-in photos of the breach from August 26, 2020 and January 8, 2021, both obtained near low tide. The full photo mosaics showing the entire flood delta as well as the breach are available from the project website (<http://po.msrb.sunysb.edu/GSB/>). There have been a couple of significant changes between August and January. The first is that the inlet/exist channel has rotated from the southeast to the southwest. The last time the channel was in this orientation was prior to November, 2016. The other change is that there has been a filling-in on the east side of the breach, cutting off the channel along the eastern interior shoreline as well as expanding into the breach offshore. This filling-in may be the cause of the main channel's rotation to the southwest and suggests that there may have been an increased alongshore sand transport from the east. There has also been a slight retreat westward of the western shoreline. Just north of the breach there has been a filling-in of the channel north of the remnants of Pelican Island. (Pelican Island is still there, although it is only about twice the size of a dining room table at this point.)

The over-washes to the west of the breach appear to be about the same as they were during the summer of 2020 despite several significant storm events, particularly one that occurred around December 17<sup>th</sup> which caused a major jump in salinity in Bellport Bay.

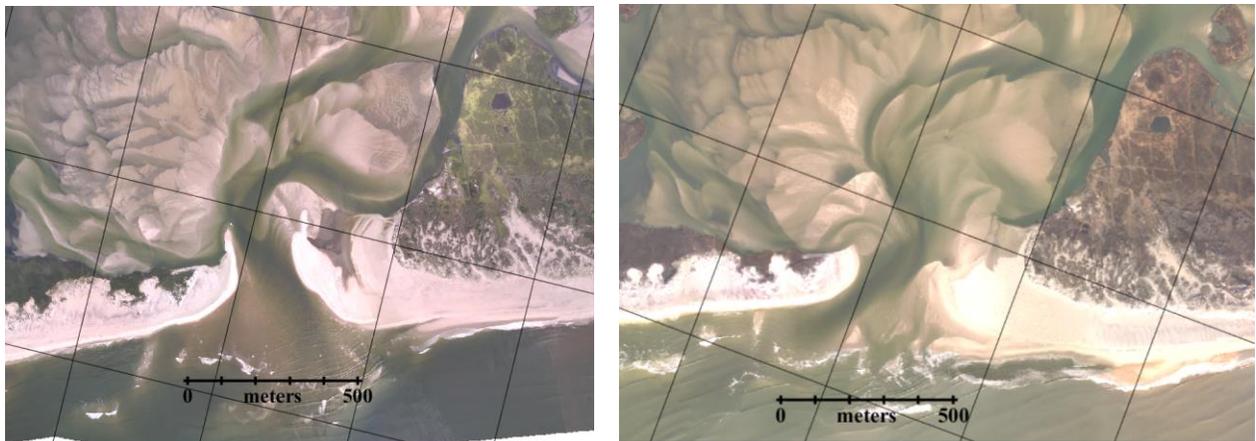


Figure 1, left is the photo mosaic from August 26, 2020 and right is the photo mosaic from January 8, 2021.

The last time we had an opportunity to conduct a thorough bathymetric survey of the breach area was in the summer of 2016, Figure 2. At that time the maximum depths in the main channel were about 6 meters. Roger Flood and I carried out another survey on November 6, 2020, which was a bit hampered by fog and shallows preventing us from covering as much area as before. Figure 2 shows the results of that survey plotted over the recent photo mosaic obtained two months later. Clearly, there have been many changes throughout the area. We tried to follow the general track we had used before but it was

blocked by shoaling, while we entirely missed the more northerly channel that seems evident in the photo. The deepest area, 3 to 4 meters, was along the north shore of the island to the east. This deep narrow channel along the shore has been there since the beginning of the breach. In the main breach channel itself, the maximum depths were only in the range of 2 to 2.5 meters and those were found a little north of the breach opening. Given the foggy conditions during the survey, it is possible we missed the deepest area, but it is unlikely that the maximum depths would be much greater than those we measured.

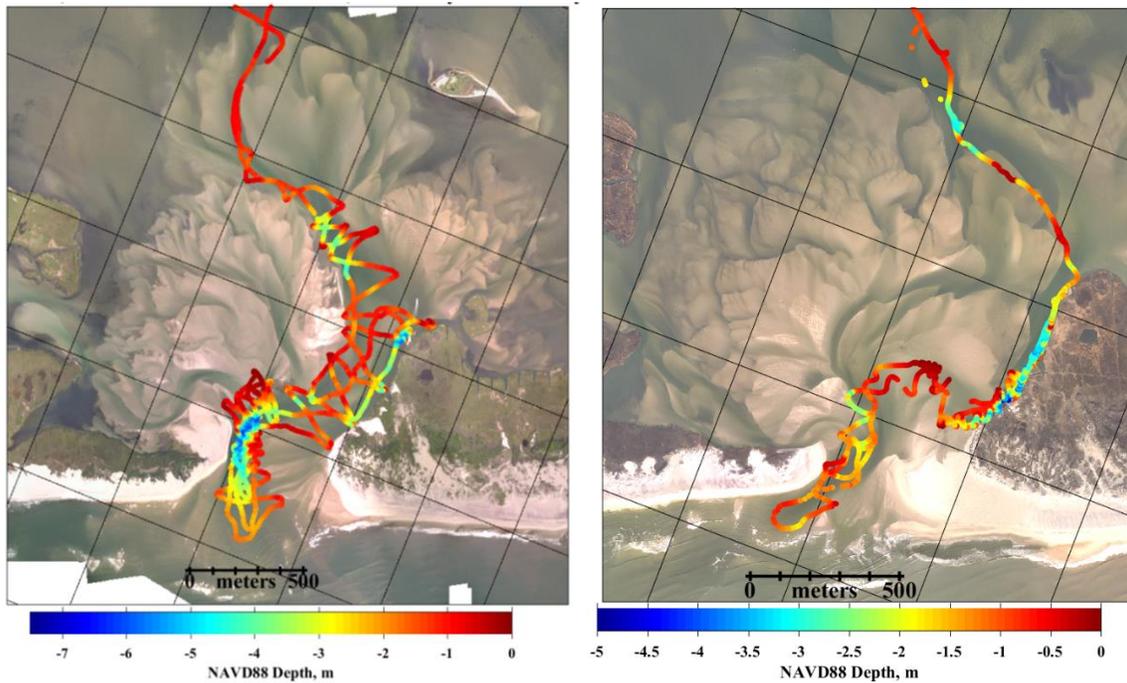


Figure 2, Plot of water depths on the photo mosaics from June 2016, left, and the bathymetric results obtained on November 6, 2020 plotted on the photo mosaic from January 8, 2021, right.

The main reason that we are all interested in what happens to the breach is its impact on the Great South Bay and Bellport Bay in particular. The issues are to what extent the exchange with the ocean has minimized nutrient loading within the bay as well as any potential vulnerability to storm surges. Eight years of water level data have shown that there has been no appreciable change in either tides or storm surges. Thus, the main focus is on the water exchange, and the salinity measured at the Bellport dock is the best indicator we have of that exchange. Ocean salinity south of Long Island is typically around 32 psu (practical salinity units, which are numerically nearly equivalent to parts per thousand), while salinity in Bellport Bay prior to the breach was usually between 24 and 25 psu. In a previous report published two years ago, it was pointed out that there had been a fairly steady decline over the two year period 2017-2018 in salinity at Bellport from around 30 psu to roughly 27 psu. That was a clear indication that the breach was steadily getting smaller and less efficient. Figure 3 shows the salinity record from Bellport for the two years since then, 2019-2020, and it is clear that the steady decrease we had seen before no longer seems to apply. Instead we are seeing wide variations from lows of ~20 psu to highs of more than 30 psu. For almost any one of the events it is pretty clear what is happening. When we have big rain events, the sensor that is located along the north shore shows a marked but temporary decrease in salinity. And when we have a big nor'easter, when Bellport Bay waters are blown

to the west while the ocean rises up against Fire Island, there is fresh injection of saline ocean water. For each event, it takes a while to recover. But compared to the earlier 2017-2018 period, the number and duration of the 30 psu events have decreased while the times and durations of the low salinity events has increased.

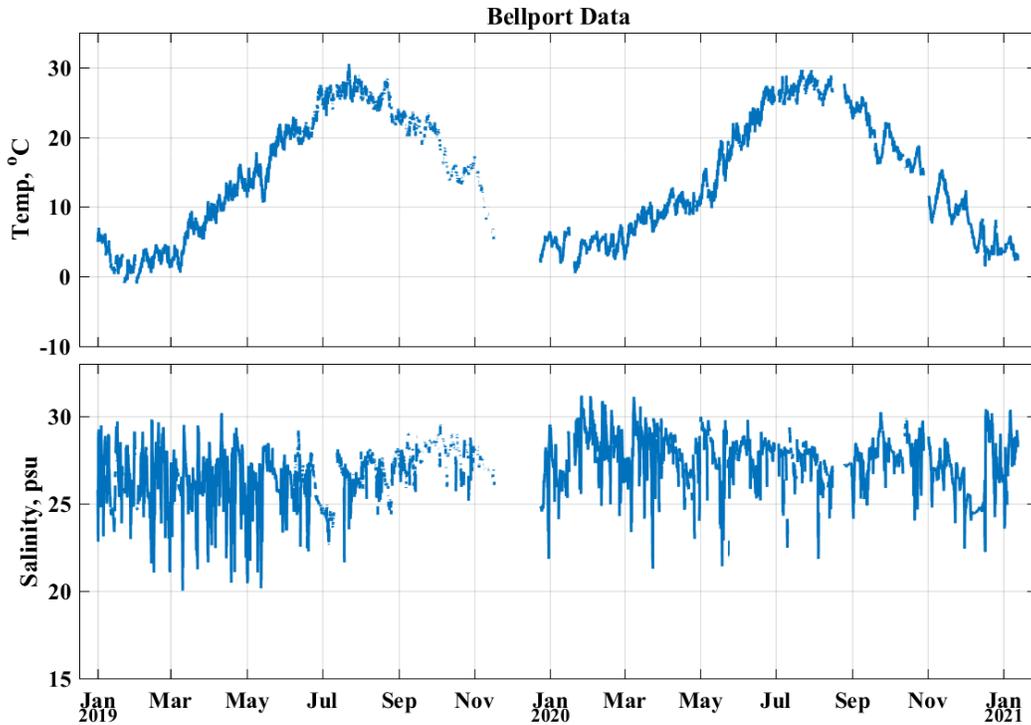


Figure 3, Temperature and salinity record for 2019 – 2020 from the Bellport SeaCat.

So the net result of these observations is that the eight-year old breach continues to exist and continues to inject higher salinity and lower nutrient waters into Bellport Bay, although not at the rate we saw in the first few years. What I find rather surprising is the continued effectiveness of the breach to provide water to the Bay while the channel depths and cross-sectional area of the breach have been reduced to maybe less than half what they were. As we have known from the beginning, the breach will close at some time but it seems to be holding on despite major alterations in its morphology.