



A Mid-Summer 2019 Report

Tracking The Severn River's Dead Zone

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As residents of Maryland, and more specifically the Severn River Watershed, we take immense pride in our waterways. Fishing, crabbing, swimming, and boating activities are just some of the privileges we get to enjoy on the Chesapeake Bay and the Severn River.

Our summer days are full of never-ending fun in the sun, but how well do you really know our river?

The Severn River Association (SRA) created its Water Quality Program in order to gather more information on the health of the Severn River. The program runs from the end of May through November and tracks water temperature, dissolved oxygen, pH, clarity and salinity of the river to accurately assess its health.

We began the 2019 season by tracking 8 stations, from the south of Round Bay up to Indian Landing. With the help of our volunteer boat captains and crew members, we have now expanded our operations to collect water quality monitoring data at 41 monitoring sites, from Mill Creek, Whitehall Creek, and Lake Ogleton and all the way up the river to Indian Landing.

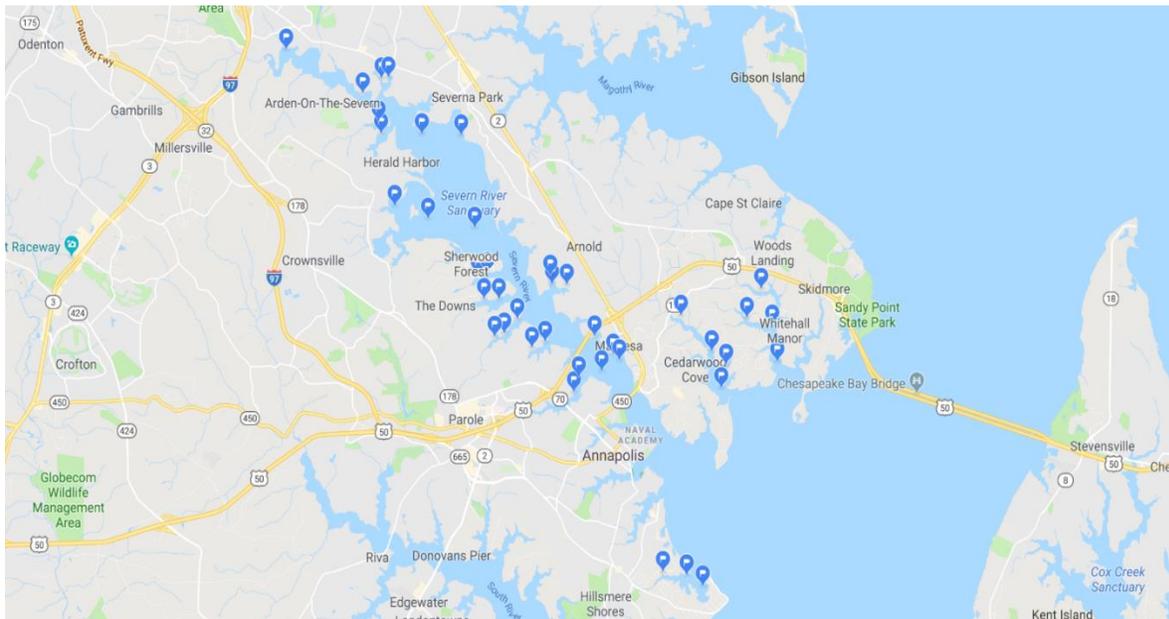


Figure 1 – SRAs Water Quality Monitoring Sites

One of the main concerns we are tracking is the fluctuation of the permanent dead zone that rests at the bottom of Round Bay.

Focusing on the bottom of the river allows us to monitor the stability of our 10-year old program to restore oyster reefs. Working alongside of our partners, the Oyster Recovery Partnership (ORP), Marylanders Grow Oysters (MGO) and the Maryland Department of Natural Resources (DNR), SRA started an annual oyster-repopulation program on the Traces Hollow reef in 2009. In 2018, SRA and ORP greatly expanded restoration efforts by launching Operation Build-A-Reef that planted 47 million baby oysters on three more reefs between the Rt. 50 and US Naval Academy Bridges.

SRA started water quality monitoring operations in 2019 to track conditions on the river bottom where our oysters live. This type of targeted monitoring had never been done before, but thanks to funding support from the Delaplaine Foundation, SRA was able to create a program to monitoring conditions throughout the entire river system to identify possible future sites for oyster reefs and to guard against threats to existing oyster reefs, particularly threats created by low-oxygen and low-salinity conditions.

To thrive, oysters, clams and most fish require oxygen levels of more than 5.0 mg/L. This report tracks oxygen conditions, particularly the expansion of a “dead zone” of low oxygen that can be lethal to oysters and fish.

What is a dead zone?

According to both the Environmental Protection Agency and the Maryland Department of Natural Resources, a dead zone is any water that has a dissolved oxygen reading of 2.0 mg/L or less. This means that there is an extremely limited amount of dissolved oxygen in the water for and therefore little to no life exists.

Most aquatic creatures prefer oxygen levels of 5 mg/L in the water for them to thrive (see chart at below).

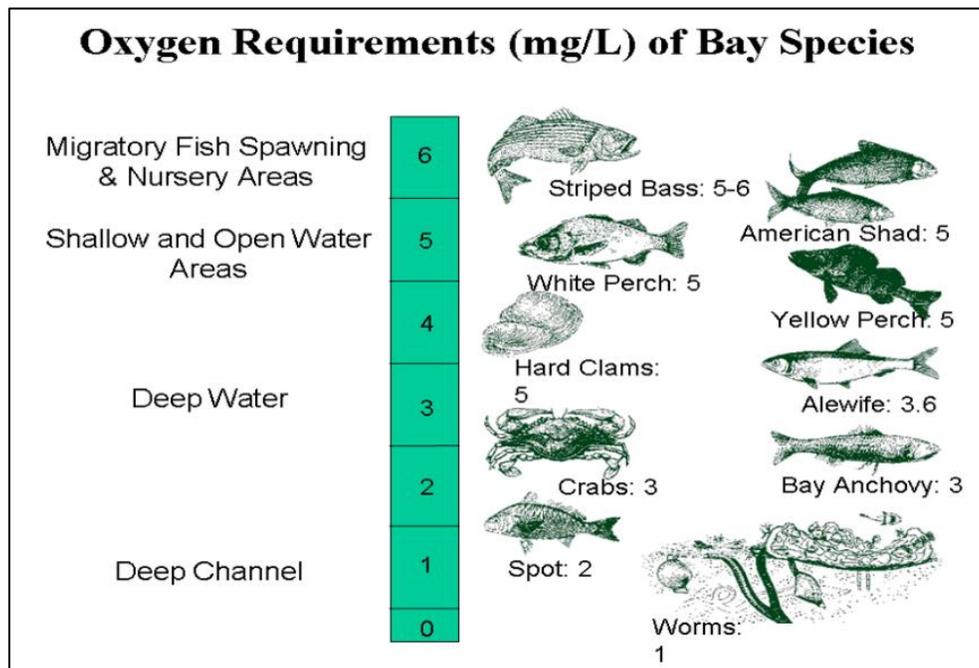


Figure 2. Oxygen requirements for organisms in the Chesapeake Bay

Oxygen levels less than this are stressful and the stress increases as oxygen levels fall. When oxygen levels fall this low, aquatic life either swim away or suffocate.

Tracking The Severn River Dead Zone

From our data collection we were able to determine that the area inside the green outline in Figure 1 is the area of the dead zone at the beginning of the summer. This area measured to be about 0.62 square miles (the area of Oxford, MD) and was only impacting the bottom meter of Round Bay, which in some areas, is as deep as 8 meters.

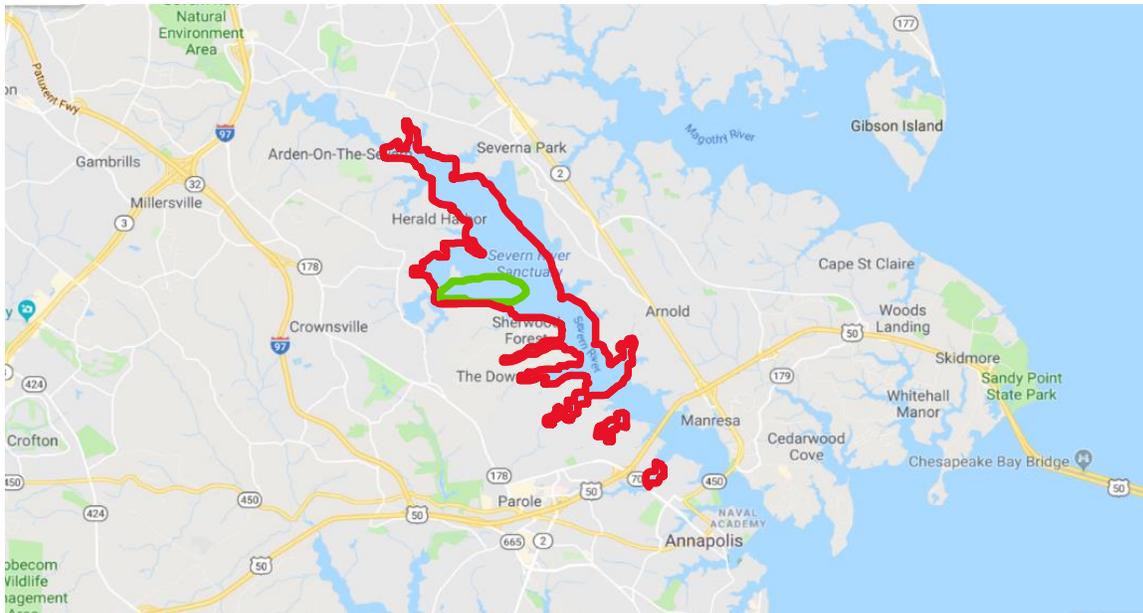


Figure 3. Location of the Dead Zone in the Severn River.

As the summer has progressed, SRA’s Water Quality Monitoring Crew tracked the dead zone weekly in order to determine its growth throughout the Severn River.

As of August 21st, the Severn River dead zone has expanded to reach from the Narrows above Round Bay all the way down to Chase and Clements Creeks. The area of the enlarged dead zone, traced in red in Figure 1, has now increased to be about 5.19 square miles which is comparable to the size of Denton, MD.

Not only has our dead zone grown in area, it has also grown in volume. For example, at our Round Bay South station at the southern entrance to Round Bay, the amount of dead-zone water was 4 meters tall, from the bottom at 8 meters to 4 meters.

On the chart below (Figure 4), you can see this represented as the data points below the dotted red line. In this area, oxygen content in the water was abysmally low, with readings below 0.05 mg/L. This is what scientists call anoxic conditions, extremely low-oxygen content.

Just above it, however, notice that there is about 4 meters near the surface where oxygen content is good (above 5 mg/L).

This phenomenon, the bad and the good in the same water column, is known as “hypoxic squeezing.” This situation forces fish and crabs to concentrate in the shrinking band of near the surface that has better oxygen content.

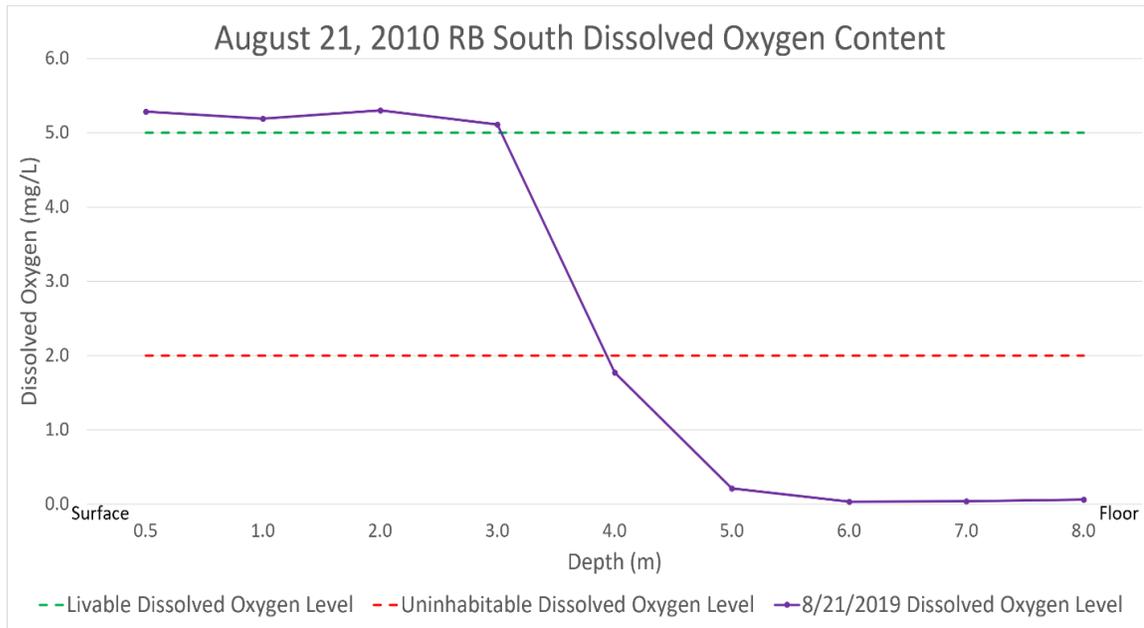


Figure 4. Oxygen levels at Round Bay South

The dead zone repeats at most of the monitoring sites we visit in the Severn River above the Rt. 50 Bridge. It shrinks and grows daily and impacts our underwater ecosystems. One fisherman we met during one of our tours told us that crabbing is the worst he has seen in 10 years because of the dead zone on the bottom where crabs reside. Crabs, as noted in Figure 2, need at least 3 mg/L of dissolved oxygen in order to survive.

Dead zone conditions do occur naturally during warmer months. However, the expansiveness of the dead zones in the Severn, as in the Chesapeake Bay in general, is exacerbated by increased nutrient pollution from stormwater runoff from urban and suburban areas and agricultural runoff from rural areas.

Some good news: Another area we have been monitoring this summer is between the Route 50 and the U.S. Naval Academy Bridges where our oyster restoration reefs are located. These are the yellow stars in the following chart (Figure 5).

The blue dots are some of our WQ monitoring stations inside creeks, which are experiencing dead zones this summer.

Oysters Safe From Dead Zone

From our data collection, we have determined that the dead zone does not reach or impact our oyster reefs. In fact, we have seen the best water quality in these areas than anywhere north of the USNA Bridge. In these areas, oxygen levels are close to the 5 mg/L level.

This is great news. Our data indicates that our oysters are surviving.

However, according to oyster samples taken and analyzed by Audrey McDowell with the University of Maryland’s Paynter Lab on April 23, the oysters’ growth is stunted due to a mix of

low oxygen and low salinity conditions over the winter of 2018-2019. While this combination was not lethal for our oysters, it was stressful and the stress does limit their grow.

By monitoring these 4 locations this year, we can confirm that the dead zone has not impacted the oysters (as of late August) and that the oysters are doing well as we track the conditions surrounding our restoration reefs.



Figure 5. Yellow Stars mark locations of oyster restoration reefs.

There is a location near the Round Bay Community known as Eaglenest Point that was included in the 1911 Yates survey of active oyster reefs in the Severn River.

From comparing data from Eaglenest Point with data from the four oyster reefs between the Rt. 50 and USNA Bridges, we can see that oysters could also thrive at Eaglenest Point. Water quality at Eaglenest Point consistently matches conditions where oysters live between the bridges.

Severn's Salinity Rebounding

To add to the good news in the Severn River this year, we are now seeing a rebound in salinity levels in late summer 2019.

Our river is normally a brackish river system, typical of the Chesapeake Bay, where salinity levels are normally found in the 8 to 15 practical salinity units (psu) range. Due to the immense rain we received last year, salinity levels in the Severn River collapsed. Throughout 2018 and into early 2019, our river exhibited more as freshwater, with salinity levels hovering in the 4 to 6 psu range.

This low-salinity condition is what encouraged the explosion of the dark false mussels just about everywhere underwater. The dark false mussel thrives in waterways when salinity is less than the 5-6 psu range. So last year's drop in the Severn River's salinity was perfect for an explosion of these bivalves.

Like oysters, these mussels also filter water, so the Severn River's clarity has benefited by the arrival of the dark false mussel and this clarity has help produce the largest crop of underwater grasses in the Severn River in more than 30 years.

By summer's end in 2019, our salinity levels are reaching normal brackish water levels, with readings in the 8 to 10 psu range, indicating a more inviting habitat for crabs and oysters. We'll be keeping an eye out for how this affects the dark false mussel.

While the dead zone is posing a threat to our underwater ecosystems, the phenomenon is cyclical and should retreat as water temperatures decline. With the return of colder water, higher salinity and better oxygen content over the fall and winter, the Severn River ecosystem will hopefully return to a healthier state where our oysters can thrive.

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