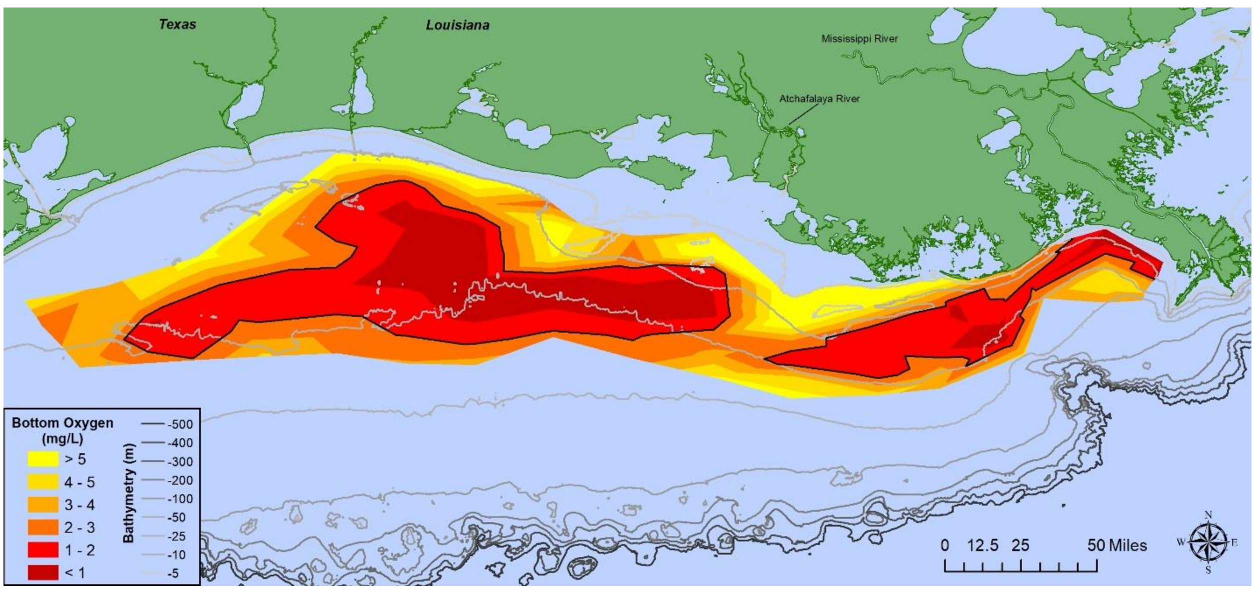
**PRESS RELEASE**

**LOUISIANA STATE UNIVERSITY**
**AND**
**LOUISIANA UNIVERSITIES MARINE CONSORTIUM**

**AUGUST 1, 2019**

The bottom area of low oxygen in Louisiana coastal waters west of the Mississippi River was lower than expected when the forecasted size was predicted based on May nitrate load. The area was 6,952 square miles (18,000 square kilometers), approaching the land area of New Jersey, but well below the predicted size of 8,717 square miles (22,557 square kilometers). The 2019 summer size ranks the eighth largest among the 33 years with similarly mapped areas.

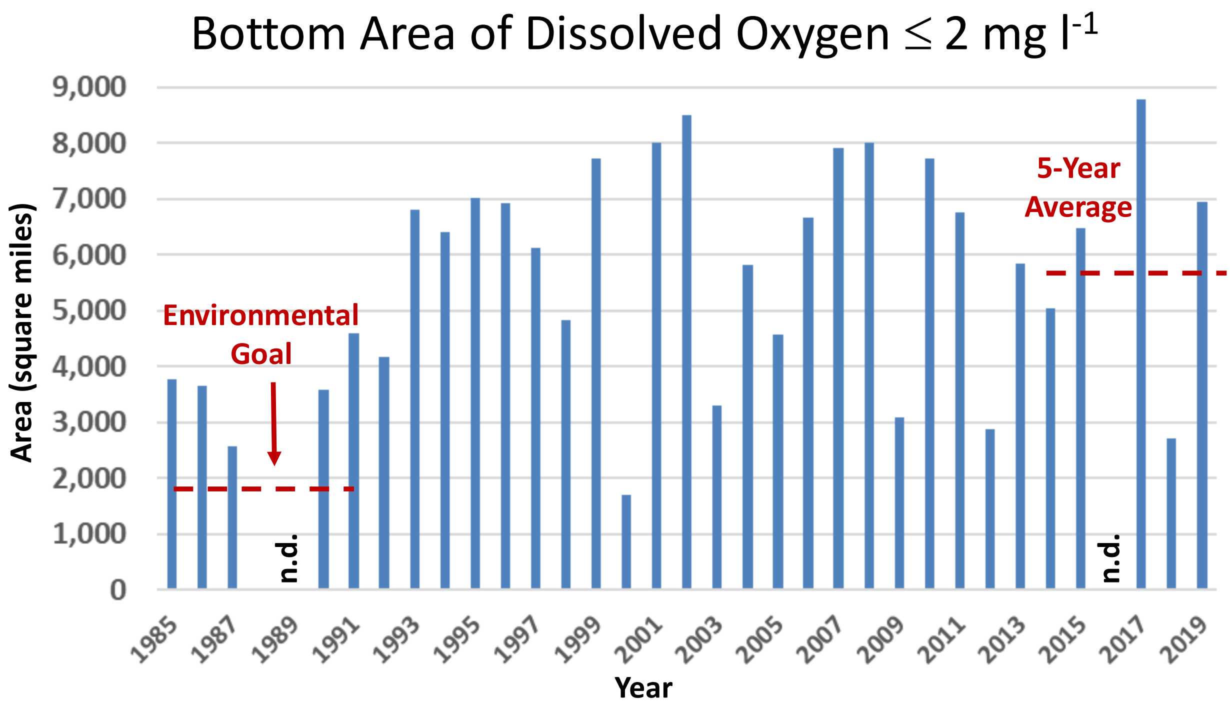



*Distribution of bottom-water dissolved oxygen, July 23 – July 29, 2019. Black line denotes dissolved oxygen ≤ 2 milligrams per liter (mg $l^{-1}$). Data source: N. N. Rabalais, Louisiana State University & Louisiana Universities Marine Consortium; R. E. Turner, Louisiana State University. Funding: National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science.*

The scientists and crew worked from the Research Vessel *Pelican* to map the 2019 summer area of the ‘Dead Zone’ from July 23 through July 29 and returned to the dock on July 31. The ‘Dead Zone,’ as the area of bottom-water considered hypoxic, includes dissolved oxygen levels less than 2 milligrams per liter (equal to 2 ppm). Low oxygen levels were found at 47 of 97 stations from the Mississippi River west along the Louisiana coast to west of Galveston, Texas. Many other water quality and physical oceanographic data were collected along with the bottom-water oxygen values.

The smaller than expected size was the result of Tropical Storm Barry and its remnants as it crossed the central and southwestern coastline of Louisiana in the week before the research cruise. Initial results from other research cruises mapping different areas of the northern Gulf of Mexico at times before the shelf-wide hypoxia mapping research cruise documented a low oxygen area from Matagorda Bay, Texas, to Louisiana coastal waters east of the Mississippi River near the Chandeleur Islands. The waves generated during the storm and in the week following during the mapping cruise likely mixed up shallower water depths and moved the mixed surface water layer deeper into the water column. These physical oceanographic conditions narrowed the range of water depths where hypoxia was maintained during the storm, or returned to hypoxia, after the storm passed.

Current models used to predict hypoxia in the northern Gulf of Mexico are robust for long-term management purposes, but they are not optimized to predict the area for years where short-term weather patterns move water masses or mix up the water column. Field measurements, therefore, remain a necessity to understand the dynamics of hypoxia and contribute to accurate modeling of a changing coastal ocean.

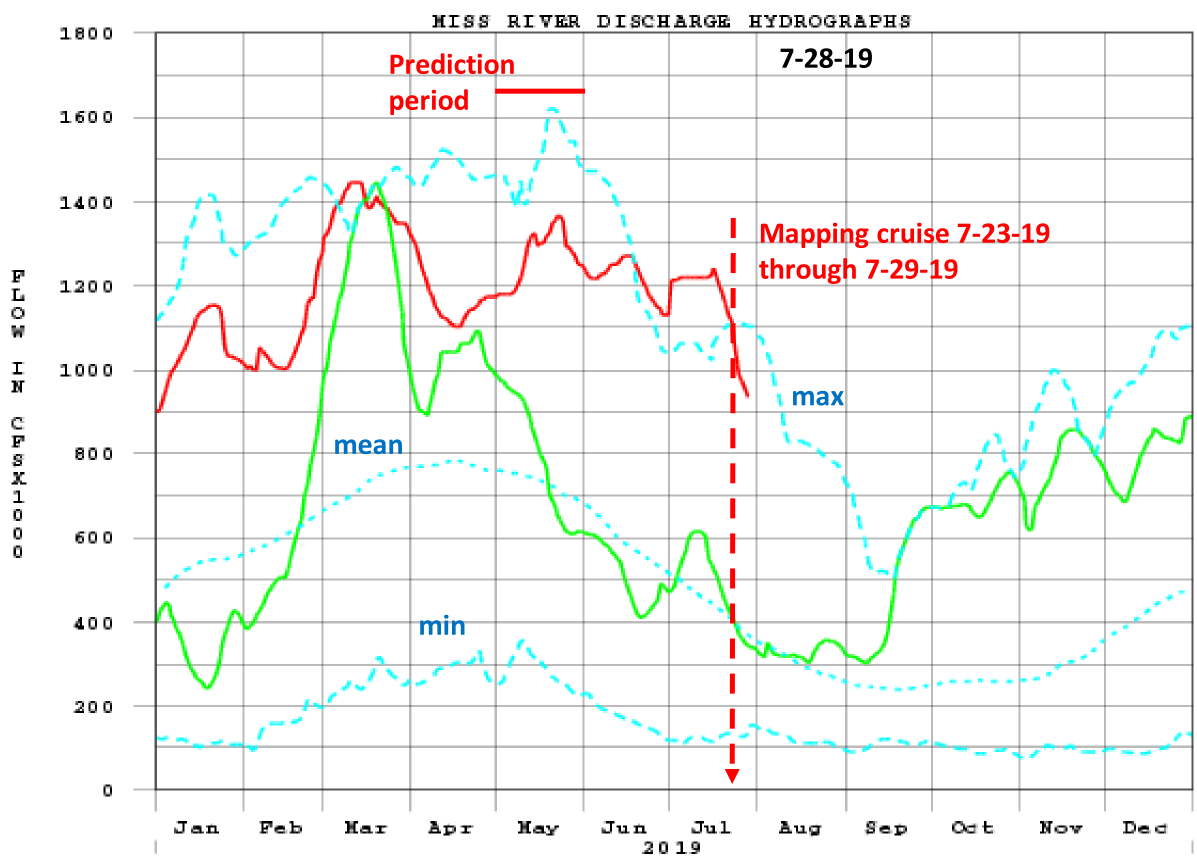



*Historic size of hypoxia from 1985 to 2019. There are no data (n.d.) for 1989 and 2016. The value for 1988 is 15 square miles and barely visible on the scale. The environmental goal of the Hypoxia Task Force is an area of 1,900 sq km or less over a 5-year average by the year 2035.*

Low oxygen areas are sometimes called 'Dead Zones' because of the absence of commercial quantities of shrimp and fish in the bottom layer. The number of Dead Zones throughout the world has been increasing in the last several decades and currently is in more than 500 coastal water locations. The Dead Zone off the Louisiana coast is the second largest human-caused coastal hypoxic area in the global ocean and stretches from the mouth of the Mississippi River into Texas waters and less often, but increasingly more frequent, east of the Mississippi River.

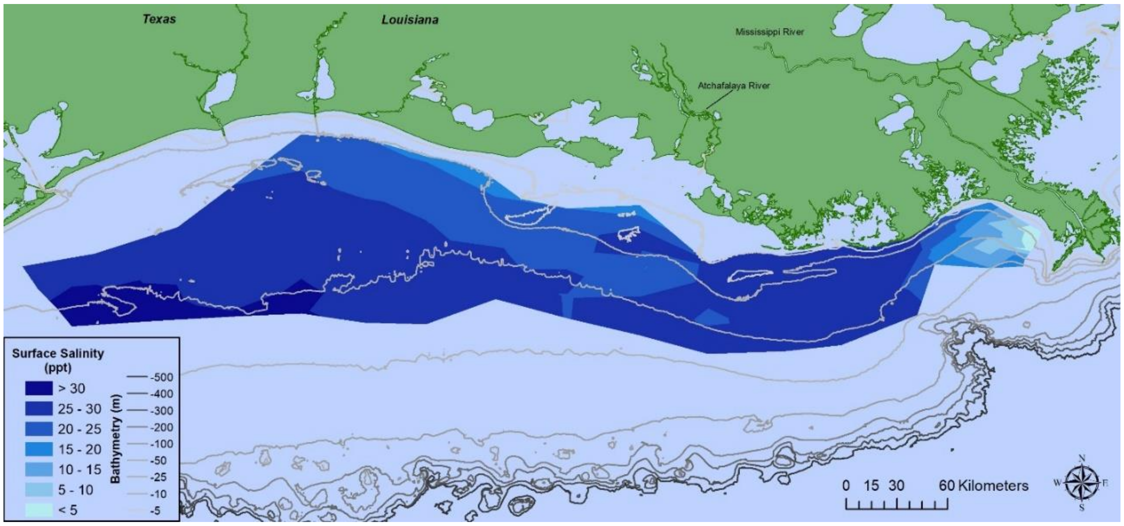
Hypoxic water masses form from spring to fall on this coast because the consumption of oxygen in bottom water layers exceeds the re-supply of oxygen from the atmosphere. The reaeration rate is slowed by stratification of the water column which is dependent on the river's freshwater discharge and the warming of surface waters. Nitrogen and phosphorus from the Mississippi River stimulate the growth of phytoplankton in the surface waters. The overwhelming supply of organic matter consumed by bacteria in the bottom layer is from the downward flux of organic matter produced in the surface layer. The organic matter production rate is directly related to the nitrogen supply rate from the Mississippi River watershed. The transport to the bottom layer is the result of sinking of individual cells, zooplankton fecal pellets, or as aggregates of cells, detritus and mucus.

The annual forecast of the size of the 'Dead Zone' in the northern Gulf of Mexico for late July 2019 was for 8,717 square miles square miles of the bottom of the continental shelf off Louisiana and Texas. Various models use the May nitrogen load of the Mississippi River as the main driving force to predict the size of this hypoxic zone in late July. The Mississippi River had two large peaks in discharge and nitrate loads in March and again in May through July when the daily discharge was well above the long-term average since 1935. The Bonnet Carré Spillway was opened twice in 2019 in March and during the second peak to alleviate flooding in New Orleans. The bays to the Bonnet Carré Spillway were just beginning to be closed on July 22 before the shelfwide hypoxia cruise.

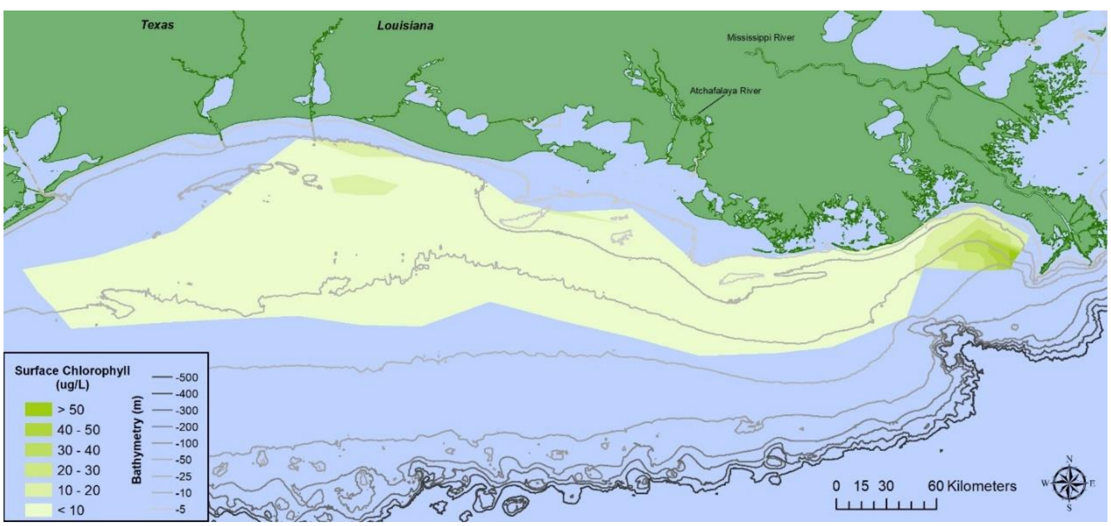



*Flow of the Mississippi River at Tarbert Landing, LA, since 1935 with discharge for 2019 in red and 2018 in green compared to long-term conditions (http://www2.mvn.usace.army.mil/eng/edhd/tar.gif).*

Surface water salinities were below what is normally seen in July when Mississippi River discharge is seasonally low. Typical surface salinities above 30 were rare and found on the western end of the mapped area. Although the oxygen conditions were not as low as expected, with the continued fresher waters supporting stratification, it is quite possible that a large hypoxic zone will continue to reform in the next week.




Chlorophyll *a* biomass values, as an indicator of phytoplankton amounts, were unremarkable other than some high values in the fresher waters just west of the Mississippi River delta. Higher chlorophyll *a* biomass corresponded with the outflow of the Mississippi River. The percent of oxygen saturation at many of these stations exceeded 170% oxygen saturation above what would be expected at the measured temperature and salinity levels of those surface waters. This translates to high primary production rates.




The annual measurement of the hypoxic area provides a critical scientific record of the trend of hypoxia in the Gulf to determine whether efforts to reduce nutrient loading upstream in the Mississippi River Basin are yielding results. The observations and related research and modeling are the critical components to observe and predict if changes resulting from nutrient mitigation in the Mississippi River watershed are fruitful.

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*Graphics by Leslie Smith and Nancy Rabalais*

*Visit the Gulf Hypoxia web site at www.gulfhypoxia.net for maps, figures, additional graphics and more information concerning this summer's research cruise and previous years' cruises.*

*Funding source for this year's cruise:*
*National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science*