REPORT FROM 2025 SHELF-WIDE HYPOXIA CRUISE

LOUISIANA STATE UNIVERSITY
AND
LOUISIANA UNIVERSITIES MARINE CONSORTIUM

AUGUST 6, 2025

The bottom area of low oxygen in Louisiana coastal west of the Mississippi River, commonly known as the 'Dead Zone,' was mapped from July 20 – July 26, 2025, and was estimated to be 11,401 square kilometers (4,402 square miles) (Figure 1). The 2025 size is slightly below average. The size is just under the size of the state of Connecticut, or about seven times the size of Lake Pontchartrain, LA. The area is also over the size of the environmental goal for the Mississippi River/Hypoxia Task Force Action Plan of 5,000 square kilometers (1,931square miles) on a five-year running average. The area mapped is smaller than the predicted area of approximately 14,437 square kilometers (5,574 square miles), but within the margin of error.

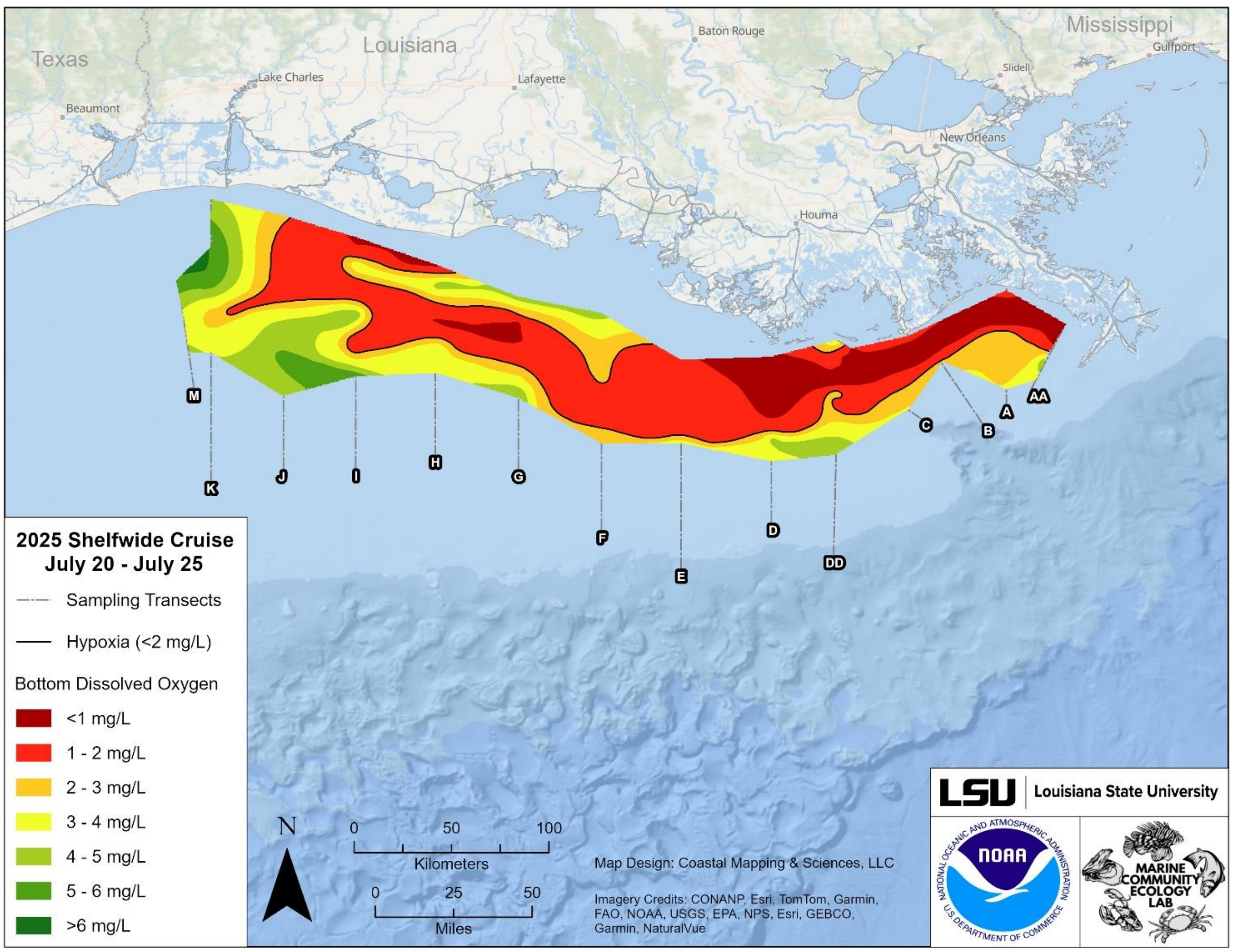

Figure 1. Distribution of bottom-water dissolved oxygen concentration for July 20-26, 2025, west of the Mississippi River on the Louisiana/Texas shelf. The combined area less than 2 mg l^{-1} and 1 mg l^{-1} are the darkest colors and outlined by the black line. Data source: C Glaspie, NN Rabalais*[+], and RE Turner*) *Louisiana State University and [+]Louisiana Universities Marine Consortium. Funding: National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science.*

The forecasted size was based on the nutrient loads (as dissolved nitrate plus nitrite, NO_3^- and NO_2^-), in May, preceding the hypoxia research cruise. The May 2025 river discharge and calculated nutrient loads indicated an 'average' year, and the estimates for the size of the low oxygen area were average. Forecasting the size in May and measuring in July permits time for phytoplankton to grow, then sink, and loss of dissolved oxygen during bacterial respiration in a stratified water column.

Specifics of 2025 hypoxia cruise

Winds were variable and light for the month of July (Figure 2), primarily out of the south, but some multi-day periods with winds out of the north. Surface water temperatures were extremely high, ranging from 30 to 36 ºC (almost 97 ºF) (Figure 3). Water samples were notably warm when collected, and could be compared to human body temperature at 36-37 ºC.

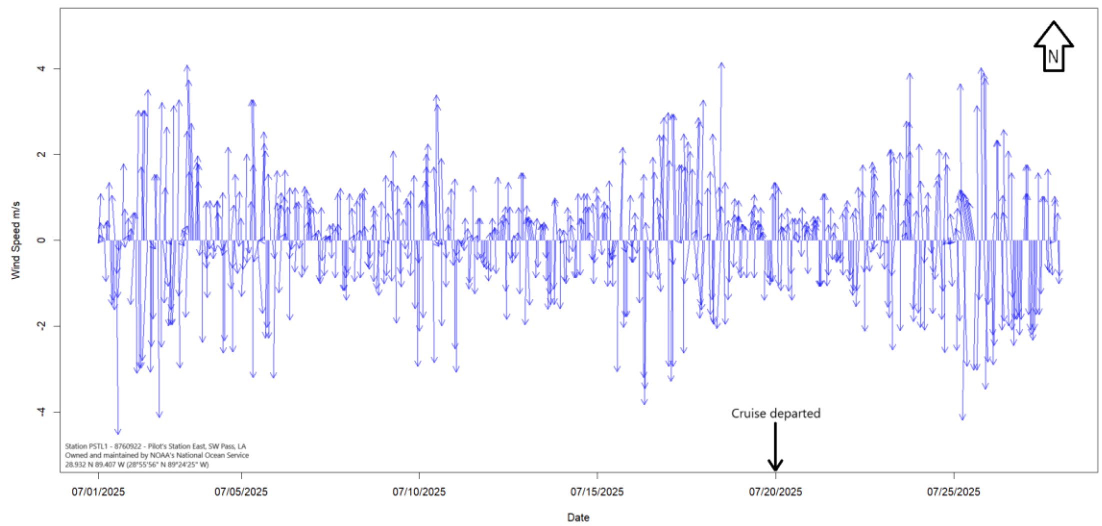

Figure 2. Hourly wind speed and direction for month of July 2025, including before the shelfwide hypoxia cruise and during the cruise beginning on July 20, 2025. Wind speed (m s^{-1}) and direction at SW Pass, LA (the arrows indicate the direction to which the winds were directed).

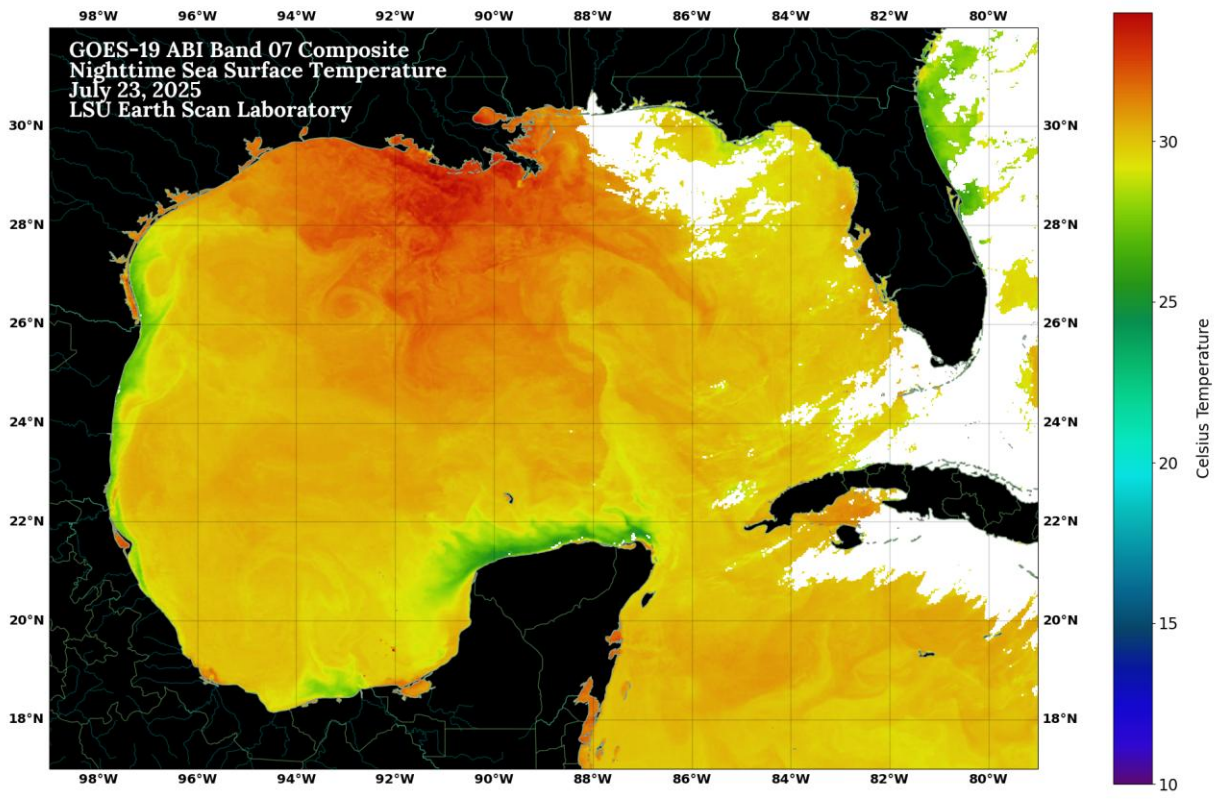

Figure 3. Nighttime Sea Surface Temperature Composite map for July 23, 2025 for the Gulf of America. The highest temperatures are displayed closest to red on the spectrum, and cooler temperatures are closest to the purple area of the spectrum. Data source: Nan Walker) *Louisiana State University Earth Scan Laboratory.*

The main factor likely determining the extent and severity of hypoxia this year was a high level of stratification. Stratification is evident as a density difference between water layers. The water column was highly stratified, with 10 psu salinity and 7 °C temperature difference between top and bottom layers of the water column. Warmer, less saline water was observed over cooler, saltier water. These differences mean the water masses at the surface and bottom are unlikely to mix without some help from a big storm. This stratification means no oxygen can be resupplied to bottom waters.

Hypoxia was widespread and hypoxic waters made up a large volume of the water in the affected area. Hypoxia was found widely from about 10-30 m water depth, and was most common in 20-30 m of water. Where hypoxia existed, it encompassed a third or even half of the water column. Many locations had extremely low dissolved oxygen values and therefore could be considered nearly anoxic (no oxygen) waters. Hydrogen sulfide, which is toxic to animals, is generated in anoxic waters. Where hypoxia was not noted, as per the definition of 2 mg l^{-1}, the bottom dissolved oxygen was still extremely low, and likely excluded most fish. Hypoxic waters were pushed inshore in waters too shallow for us to map from Morgan City to the Bird’s Foot Delta, and offshore of the White and Grand Lakes, southeast of the city of Lake Charles.

We can consider this an extreme temperature year for hypoxia, giving us a glimpse at what rising temperatures might do to the hypoxic zone. The surface area of the hypoxic zone was slightly below average, but still severe in terms of the three-dimensional amount of hypoxic water. There are mechanisms by which higher temperatures may decrease the size of the hypoxic zone, by shifting the plankton key players in the Gulf. Higher temperatures result in smaller phytoplankton and zooplankton, which sink slower and may contribute less to hypoxia. However, stratification keeps hypoxia around, and allows very low oxygen levels to persist in larger proportions of the water column.

Very low salinity surface water was widespread in the mapped area (Figure 4), and multiple instances of both freshwater and marine harmful algal bloom (HAB) species were noted, at levels indicative of a bloom. It was not observed if the HABs were actively producing the toxins that cause illness. Species found included Microcystis, Karenia, and Pseudo-nitzschia sp. Other than stations near the Mississippi River near Southwest Pass, and stations with blooms, the surface water surface chlorophyll concentrations were indicative of generally low phytoplankton biomass, less than 5 µg chlorophyll l^{-1} (Figure 5).

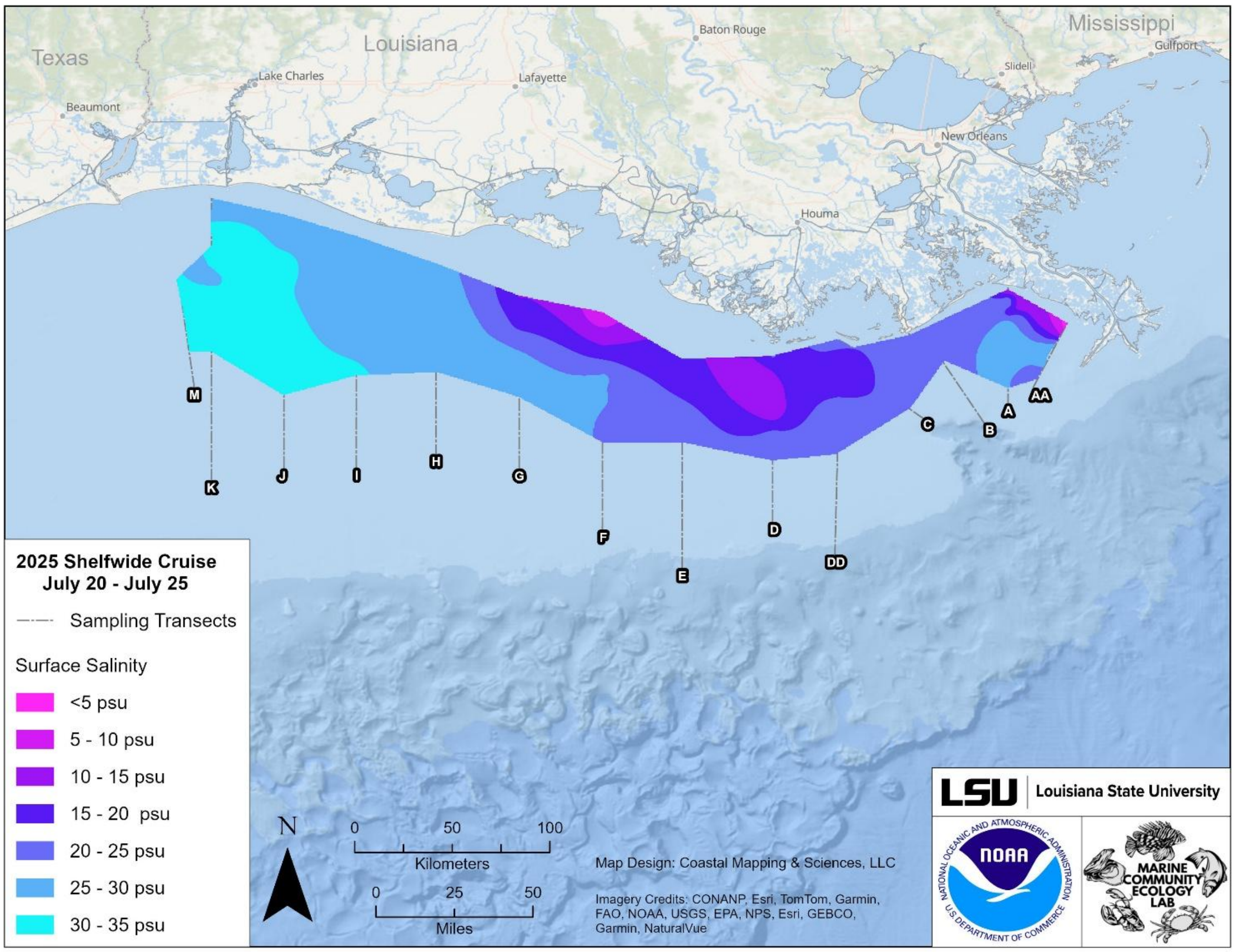

Figure 4. Surface water salinity (psu) for July 20 – July 26, 2025.

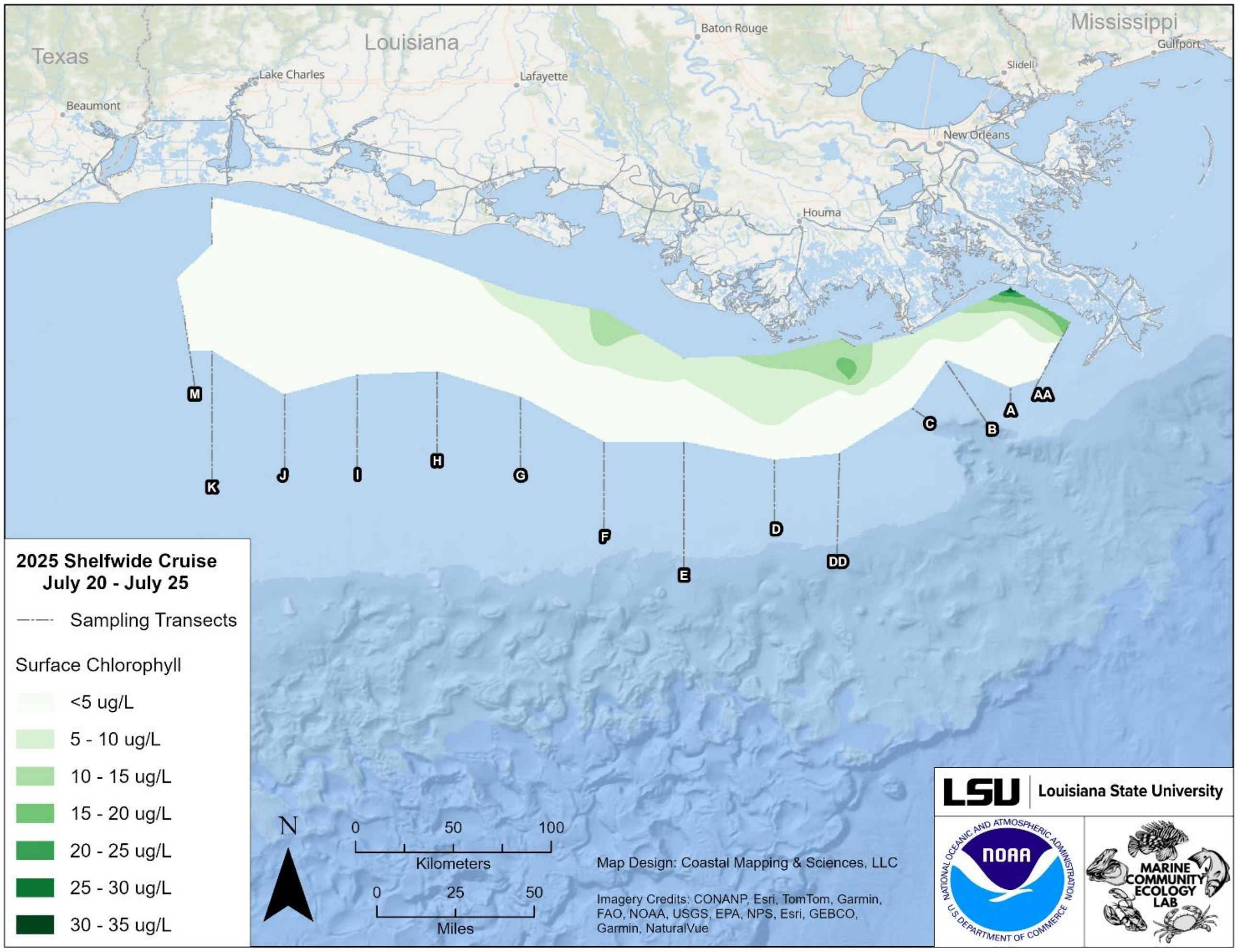

Figure 5. Surface water chlorophyll biomass (µg l^{-1}) for the period July 20 – July 26, 2025.

East of the Mississippi River 2025 hypoxia cruise

The science crew and the RV Pelican also worked the waters east of the Mississippi River off Louisiana, Mississippi, and Alabama for the second year in a row. An area of hypoxia (low dissolved oxygen) to the east side of the Mississippi River is not unheard of to fishers, resource managers, and scientists. The measured area of bottom-water low dissolved oxygen is illustrated in Figure 6. The size of the bottom-water hypoxic area east of the Mississippi River is approximately 734 square miles, or 1,901 square kilometers.

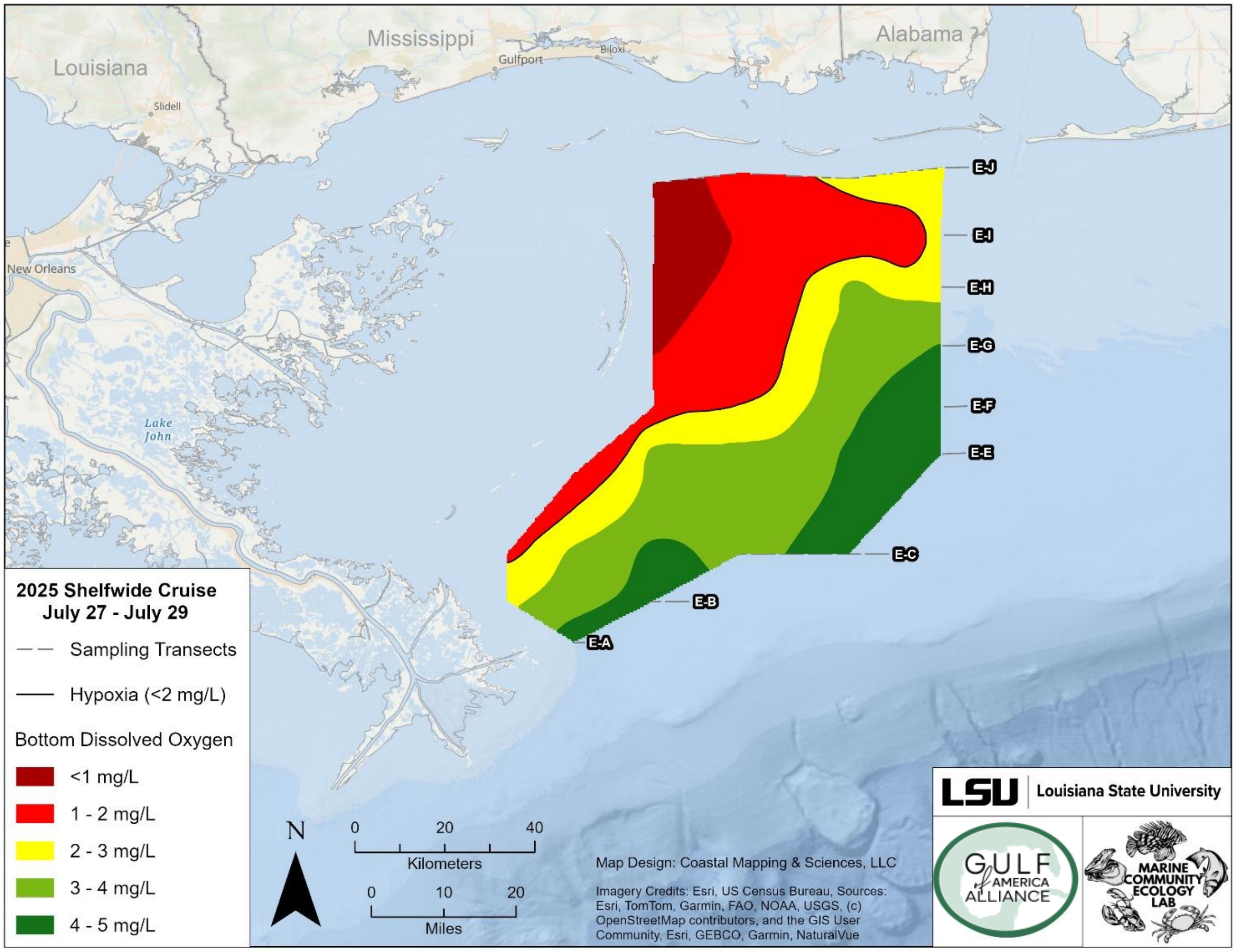

Figure 6. Distribution of bottom-water dissolved oxygen concentration for July 27 – July 29, 2025, east of the Mississippi River and areas of Louisiana, Mississippi, and Alabama. The combined area less than 2 mg l^{-1} and 1 mg l^{-1} are the darkest colors and outlined by the black line. Data source: C Glaspie, NN Rabalais*+, and RE Turner*) *Louisiana State University and +Louisiana Universities Marine Consortium. Funding: National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science.*

Fresh water from the Mississippi River delta flows into areas to the west and east of the river and delta, overcoming local river inputs into the northern Gulf of Mexico. Winds and currents move this fresh water along with water from local rivers onto the Louisiana, Mississippi, and Alabama coasts.

Impacts of the Mississippi River plume and other fresh water influences are seen to the east of the river concerning surface water salinities (Figure 7) and chlorophyll biomass (an indicator of phytoplankton production) (Figure 8).

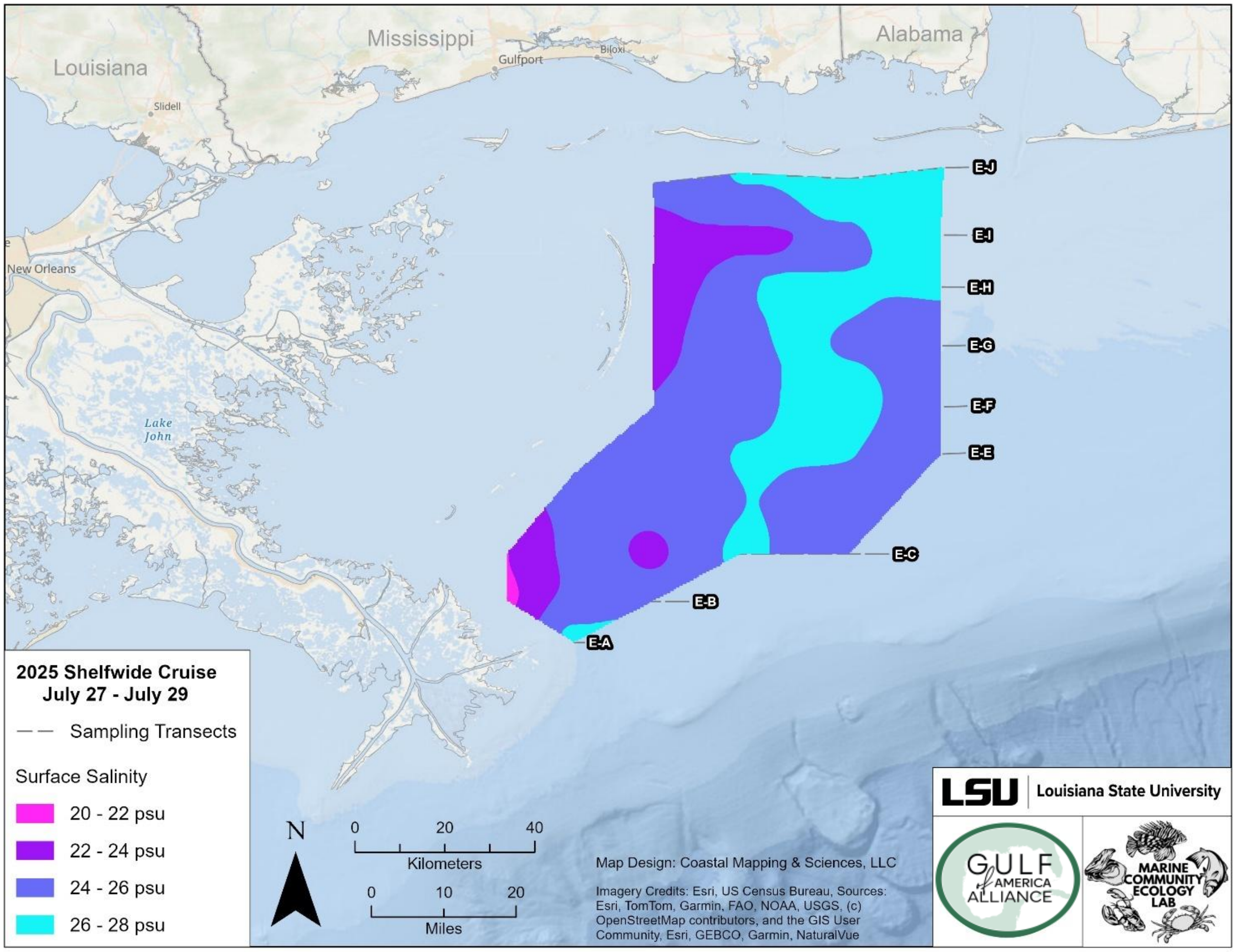

Figure 7. Surface salinity in practical salinity units (psu) for the period July 27 – July 29, 2025.

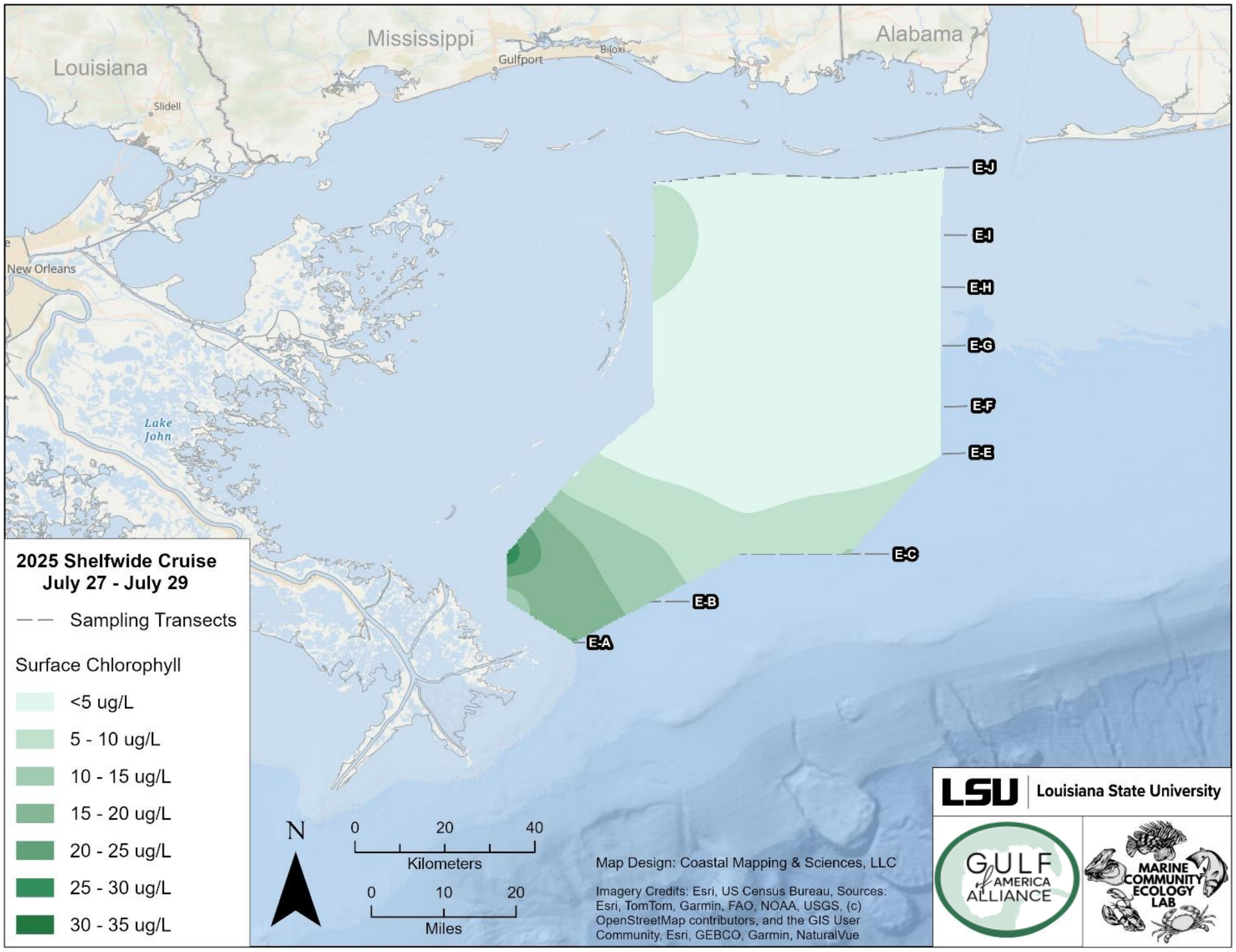

Figure 8. Surface phytoplankton biomass as measured by chlorophyll (µg l^{-1}) for the period July 27 – July 29, 2025.

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