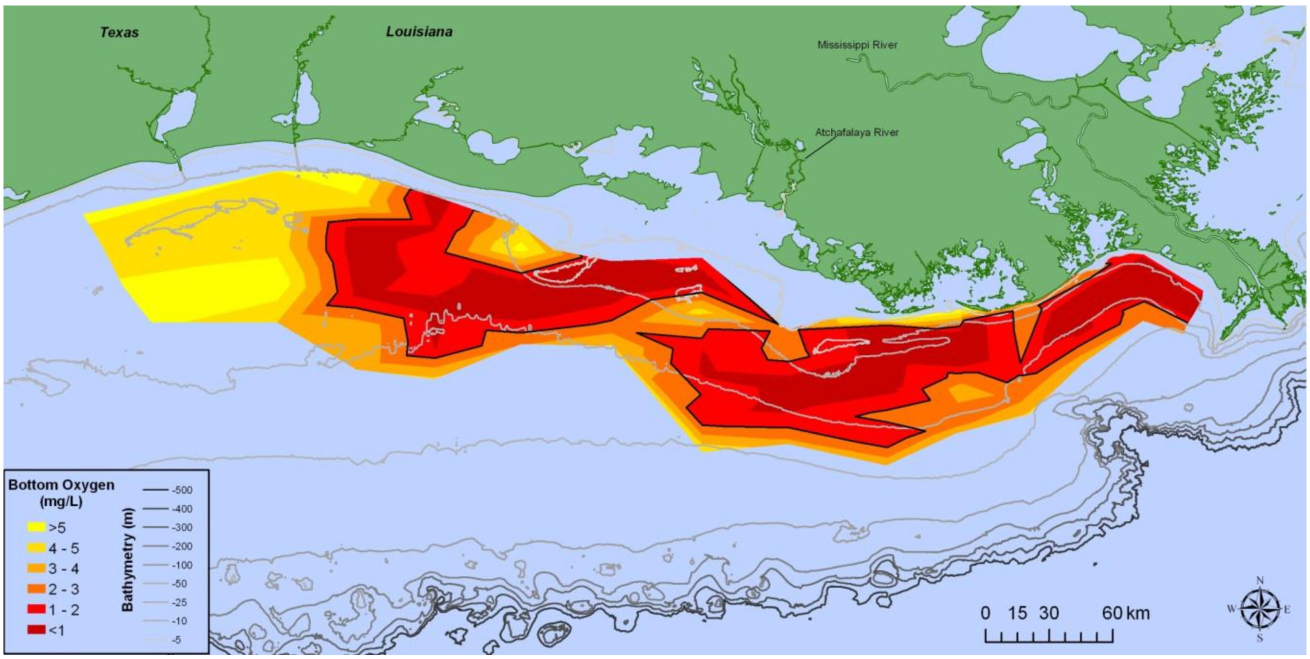
PRESS RELEASE

LOUISIANA UNIVERSITIES MARINE CONSORTIUM
August 4, 2015

SUMMARY

The 2015 area of low oxygen, commonly known as the 'Dead Zone,' measured 16,760 square kilometers (= 6,474 square miles) as of Jul 28 - Aug 3, 2015 at the end of the **31st** such cruise to measure the area of hypoxia (low oxygen) in the northern Gulf of Mexico. Based on the May nitrogen load from the Mississippi River, the area was predicted by Gene Turner, Louisiana State University, to be 15,210 square kilometers (5,875 square miles). The size is larger than the prediction. Continued Mississippi River discharge above average in June and record breaking high discharge in July brought more fresh water and nutrients from the River basin than usual for this time of the year.

Bottom Water Dissolved Oxygen – 2015



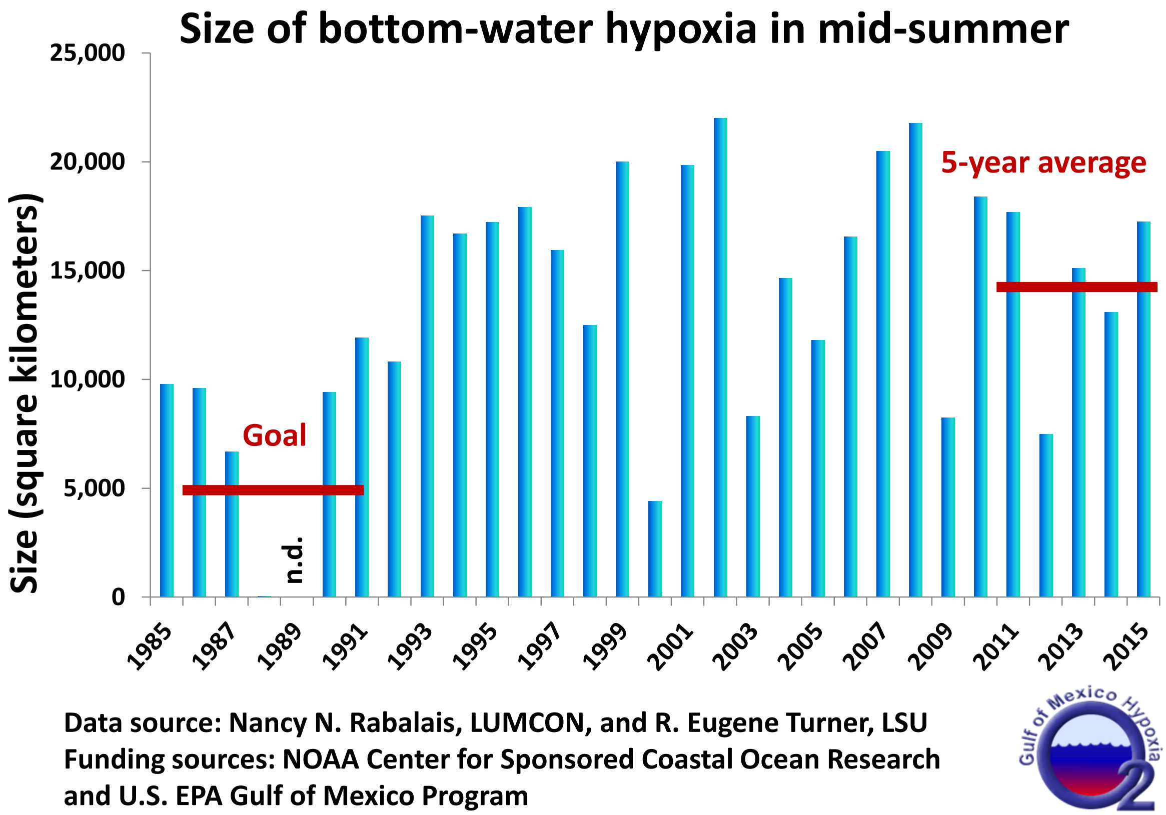
Distribution of bottom-water dissolved oxygen July 28-August 3, 2015 west of the Mississippi River delta. Black line denotes dissolved oxygen less than 2 mg/L.

Data source: Nancy N. Rabalais, LUMCON, and R. Eugene Turner, LSU
Funding sources: NOAA Center for Sponsored Coastal Ocean Research and U.S. EPA Gulf of Mexico Program

This year's 'Dead Zone" is the size of Connecticut and Rhode combined, and is the 11th largest in size since the area has been mapped beginning in 1985. It is 28 percent larger than in 2014.

The average size for the last five years, including this year, is 14,024 square kilometers (= 5,543 square miles) and is three times larger than the environmental target (5,000 square kilometers; 1,991 square miles) approved by a federal/state task force in 2001 and maintained by the same task force in 2008. The 30 year average (less 1989) is 13,752 square kilometers (5,312 square miles.)

MORE DETAILS



Historic size of hypoxia from 1985 to 2015. The complete area was not mapped in 1989(n.d.). The value for 1988 is 42 square kilometers and not visible on the scale.

A notable feature of this year's distribution of low oxygen is the large area with oxygen concentrations less than 1 milligram per liter. The cutoff for hypoxia is 2 milligrams per liter. The less than 1 value area was often very close to 0 milligram per liter, or anoxia. The large expanse of less than 2 milligrams per liter and the waters with even less indicated the severity of hypoxia this year. The low oxygen waters also reached well up into the water column, at least on the eastern area of the map.

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 totals over 550. 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.

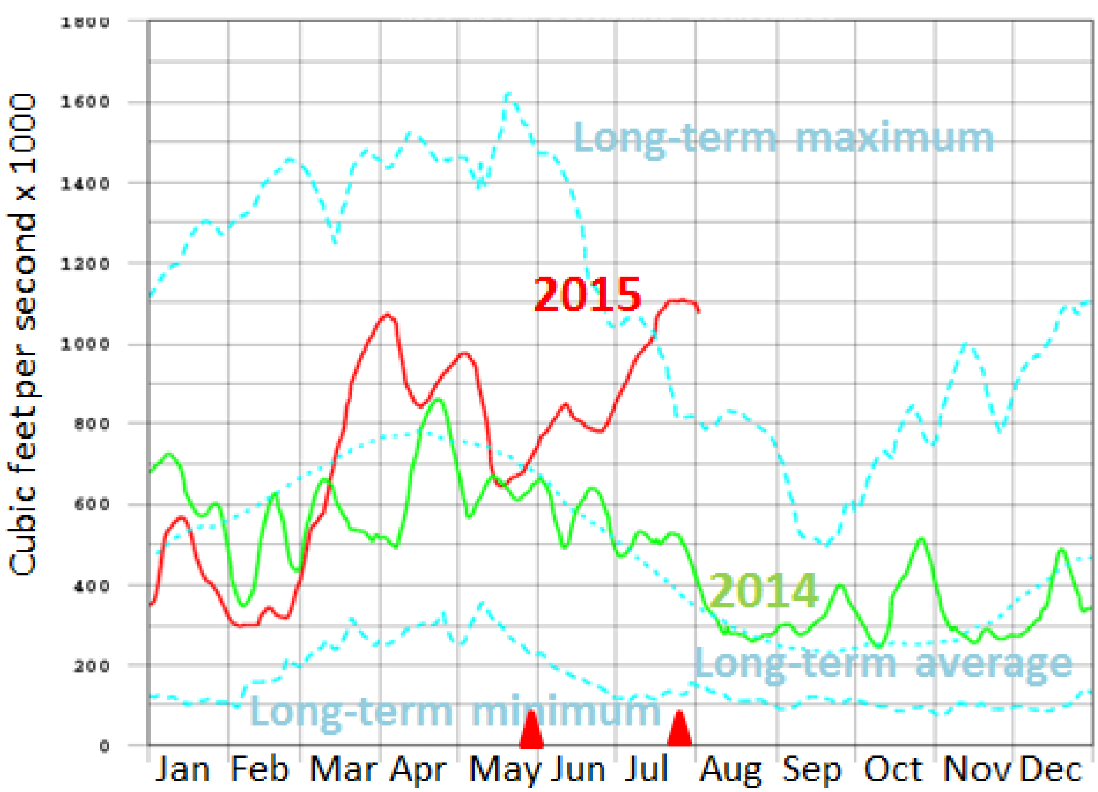
There is a series of coupled cause-and-effect relationships linking the amount of water emptying into the Gulf of Mexico and water quality in the Mississippi River to hypoxia. The fresher, warmer water in the upper layer is separated from the saltier, colder water in the lower layer, resulting in a barrier to the normal diffusion of oxygen from the surface to the bottom. The excess nutrients delivered by the river stimulate high phytoplankton biomass offshore, which fuels the coastal food web but also contributes to high carbon loading to the bottom layer. The decomposition of this carbon by bacteria leads to the low oxygen that is not resupplied from the surface waters.

The amount of nutrient loading from the river increased considerably in the 1960s as a result of more intense agricultural activity in the watershed. The primary driver of the increased nutrient loading is agricultural land use, which is strongly influenced by farm policy. The nitrogen load has stabilized somewhat in the last two decades, but is still increasing. Additionally, the nitrate portion of the total nitrogen load is increasing. This is important, because the nitrate-N concentration and load is proportional to the phytoplankton produced and the subsequent bottom-water hypoxia. Reducing the size of the hypoxic area requires, therefore, changes in land use practices and human intervention. Pilot projects and recent developments demonstrate that this can be done for crops with benefits for farm communities, soil health, erosion reduction, and without compromising yields or profit.

The long-term pattern in the hypoxic zone size shows that there is a greater sensitivity to nutrient loading that is carried over from one year to the next. These 'legacy' effects can be explained as the result of incremental changes in organic matter accumulated in the sediments one year, and metabolized in later years, by changes in the nitrogen form, or long-term climate change.

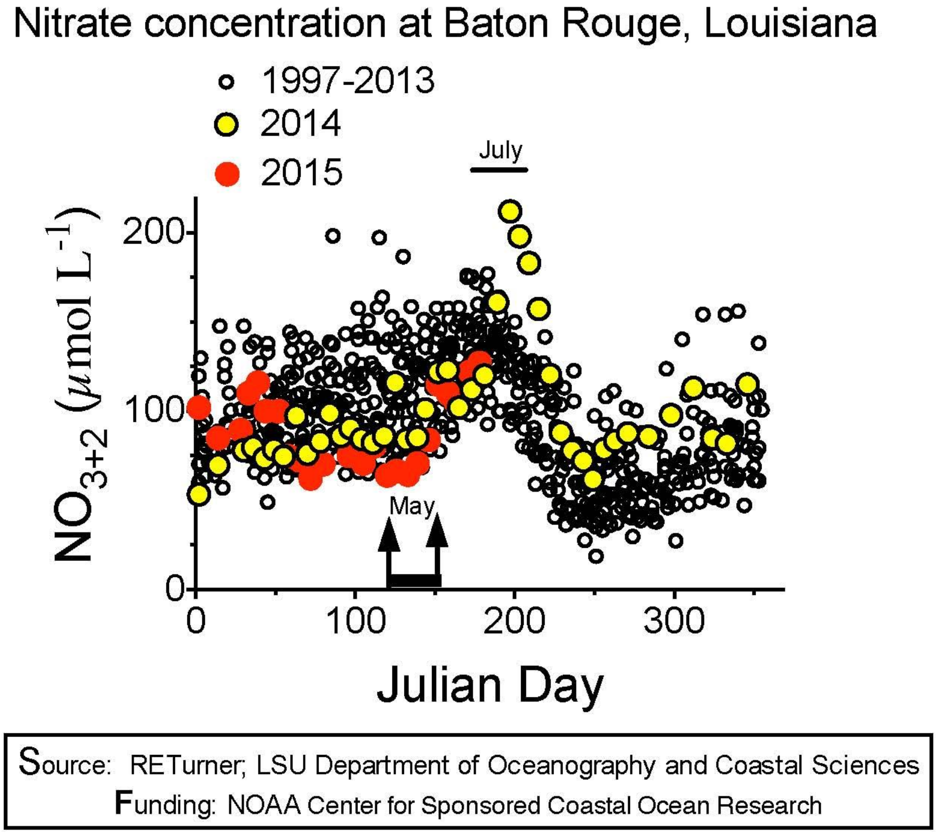
2015 Conditions

The Mississippi River discharge and its associated nutrient load is the single factor that explains most of the variability in the summer size of low oxygen. The May nitrate load was about average compared to the long-term average since 1935. The figure below illustrates with the pointer on the left, the timing of the nitrate load when the prediction was made for the mid-summer cruise. Then heavy and steady rains throughout the watershed drove the June river discharge above the long-term mean and then reached record-breaking high discharge at the time of the cruise (the pointer on the right).



Flow of the Mississippi River at Tarbert Landing since 1935 with discharge for 2015 in red, compared to long-term conditions (http://www2.mvn.usace.army.mil/eng/edhd/tar.gif).

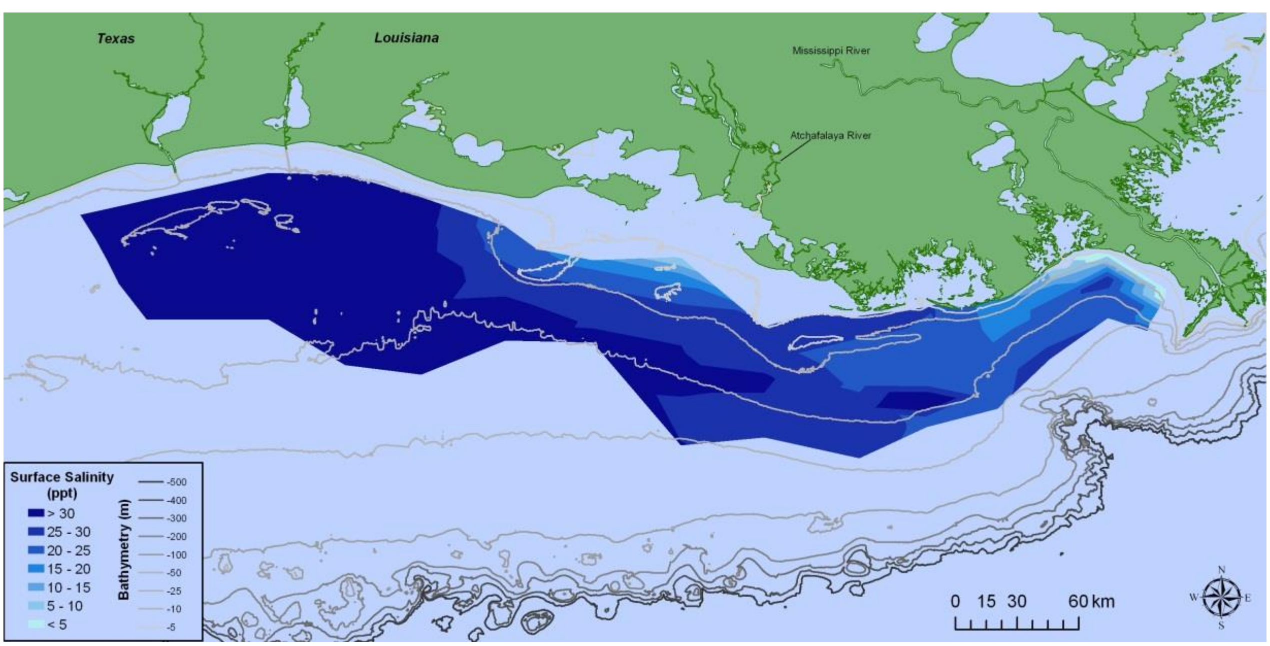
The nitrate load continued to increase and was not diluted by the extra water.



The concentration of nitrite+nitrate (NO_{2+3}) at Baton Rouge, Louisiana, from 1997 through June 24, 2015. The data for2014 and 2015 are shown separately.

Conditions favorable for the formation and maintenance of hypoxia, water column stratification and nutrient-enhanced algal growth, continued well up to the time of the cruise and are still present over much of the study area. The late burst of nutrient loading and freshwater discharge generated lush conditions for phytoplankton growth off the Mississippi and Atchafalaya Rivers. The amount of Mississippi and Atchafalaya fresh water can be seen in the figure below with

Distribution of the surface salinity along the Louisiana shelf, July 28 – August 3, 2015.

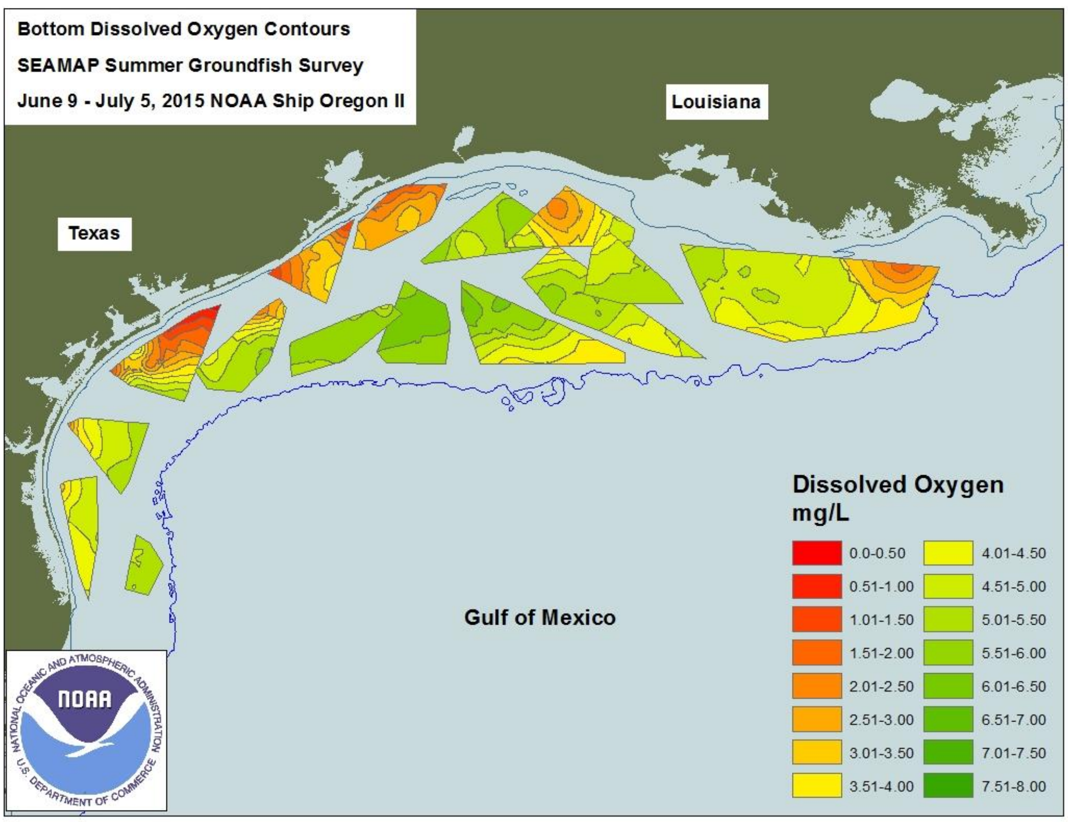


much lower surface water salinities across at least two-thirds of the study area. Winds from the west were pushing the lower salinity water to the east, so that the western part of the study area was not as affected by the influx of fresh water as it had been earlier in the summer.

A norther passed across the study area on July 30 with winds up to 38 knots, and may have contributed to the mixing of more shallow inshore waters.

For much of the two weeks prior to the mapping, the winds were from the west and pushed the water from the Atchafalaya River to the east of its delta. This also provided for a less stratified (layered) water column on the western part of the study area and less low oxygen.

Survey cruises along the Louisiana-Texas shelf earlier in the summer identified several areas of low oxygen waters off the Texas coast and the western Louisiana coast. A team of researchers from Texas A&M University found coastal low oxygen waters in the vicinity of the Brazos River. Heavy rains caused major flooding in the Colorado, Brazos and Trinity rivers in June. The National Marine Fisheries Service as part of their fisheries SEAMAP cruises on the *Oregon II* identified several areas of low oxygen waters along the Texas coast and the western Louisiana coast. The low oxygen off the western Louisiana shelf and the upper Texas coast dissipated by July 28, when the present cruise was conducted.



The multiple inputs of data available to explain the distribution and nature of the hypoxic water mass are compelling. Hypoxia is a recurring environmental problem in Louisiana (and sometimes Texas and Mississippi) offshore waters. Long-term research and observations are the best ways to test and calibrate ecosystem models, to recognize the dynamic nature of our changing environment(s), and to improve the basis for sound management decisions.

The annual measurement of the hypoxic area also 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. Maintaining such a valuable ecological dataset can be difficult. However, without these continued observations and related research and modeling, the ability to predict changes in the ecosystem resulting from nutrient mitigation efforts in the Mississippi River watershed will be stymied.

For further information, contact:
Dr. Nancy Rabalais, nrabalais@lumcon.edu, 985-851-2801 wk, 985-870-4203 c, or
Dr. Gene Turner, euturne@lsu.edu, 225-578-6454 wk

Graphics by Leslie Smith, Nancy Rabalais, and Gene Turner.

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

Funding sources for this year's cruise are:
National Oceanic and Atmospheric Administration, Center for Sponsored Coastal Ocean Research
U.S. EPA Gulf of Mexico Program