

## 2010 DEAD ZONE – ONE OF THE LARGEST EVER

1 August 2010, from Cocodrie, Louisiana

The area of hypoxia, or low oxygen, in the northern Gulf of Mexico west of the Mississippi River delta covered 20,000 square kilometers (7,722 square miles) of the bottom and extended far into Texas waters. The relative size is close to New Jersey. The critical value that defines hypoxia is 2 mg/L, or ppm, because trawlers cannot catch fish or shrimp on the bottom when oxygen falls lower.

This summer's hypoxic zone ("dead zone") is one of the largest measured since the team of researchers from Louisiana Universities Marine Consortium and Louisiana State University began routine mapping in 1985. Dr. Nancy Rabalais, Executive Director of LUMCON and Chief Scientist aboard the research vessel *Pelican*, was unsure what would be found because of recent weather, but an earlier cruise by a NOAA fisheries team found hypoxia off the Galveston, Texas area. She commented "This is the largest such area off the upper Texas coast that we have found since we began this work in 1985." She commented that "The total area probably would have been the largest if we had had enough time to completely map the western part."

LSU's Dr. R. Eugene Turner had predicted that this year's zone would be 19,141 to 21,941 square kilometers, (average 20,140 square kilometers or 7,776 square miles), based on the amount of nitrate-nitrogen loaded into the Gulf in May. "The size of the hypoxic zone and nitrogen loading from the river is an unambiguous relationship," said Turner. "We need to act on that information."

The size of the summer's hypoxic zone is important as a benchmark against which progress in nutrient reductions in the Mississippi River system can be measured. The Mississippi River/Gulf of Mexico Nutrient Management Task Force supports the goal of reducing the size of the hypoxic zone to less than 5,000 square kilometers, or 1,900 square miles, which will require substantial reductions in nitrogen and phosphorus reaching the Gulf. Including this summer's area estimate, the 5-year average of 17,300 square kilometers (6,680 square miles) is far short of where water quality managers want to be by 2015.

Instead of the usual continuous band of low oxygen along the coast, this summer's distribution was a patchwork of several areas. The scientists think that this result is because of recent tropical storm activity. Hurricane Alex crossed mid-Gulf earlier in July and stirred up water everywhere, mixing oxygen into the bottom layer. Low oxygen conditions subsequently returned. Later, Tropical Depression Bonnie scattered workers and ships away from the Deepwater Horizon oil spill area and threatened the beginning of the summer's shelfwide hypoxia mapping cruise. "The threat of high water and seas kept the *R/V Pelican* at the dock one day longer than planned," said Rabalais.

This year the mapping started south of Atchafalaya River and headed west instead of starting at the Mississippi River delta, because of expected high seas on the eastern part of the study area. The research group found a large area of hypoxia to the west, well past Galveston Bay, and far offshore, but did not have time to finish the map there. The ship returned to the Atchafalaya

River area and began working its way to the east. Another large area of low oxygen was found nearer to the Mississippi River delta.

Nitrogen and phosphorus delivered from the Mississippi and Atchafalaya rivers stimulate high rates of algal growth as phytoplankton. When these algae, or fecal material from their consumers, settle to bottom waters, decomposition of this organic matter by bacteria consumes dissolved oxygen. There is little chance for oxygen from the surface layers to penetrate to the bottom, because of a strong layering of fresher, warmer water over the colder, saltier Gulf of Mexico water during the summer. The result is oxygen depletion, with concentrations so low that many types of fish, shrimp and crabs must flee the area or suffocate. The remaining animals that live in the sediments die if the oxygen continues to fall toward zero.

Much of the area where hypoxia occurs on the Louisiana coast had been exposed to oil from the British Petroleum Deepwater Horizon oil disaster. Up to and through the time of the research cruise, there were documented areas of oil sheen seen in satellite imagery west of the Mississippi River. Crew members and scientists were on the lookout for signs of oil, but only found thick oil in the crook of the delta west of Southwest Pass. [Note: work goes on around the clock, so at least 10 hours of sampling each day were in the dark.] Surface water samples intended for hydrocarbon analyses were collected at most stations.

The high biological productivity seen in surface waters to the west of the river was not unusual considering the prediction of size for 2010 and the continued flux of fresh water and nutrients from the river. “It would be difficult to link conditions seen this summer with oil from the BP spill,” said Rabalais, “in either a positive or negative way.” The slicks were not continuous over large areas for extended periods of time, which would be necessary to see the localized effects of toxicity or oxygen drawdown. Rabalais, who accidentally surfaced from a scuba dive into a surface oil slick in May, had seen miles and miles of phytoplankton thick waters before the slick moved in. “The Mississippi River nutrient-enhanced growth of phytoplankton is what fuels the hypoxic zone, and has for many years,” she said.

For details of the 2010 hypoxia cruise, visit <http://www.gulfhypoxia.net>

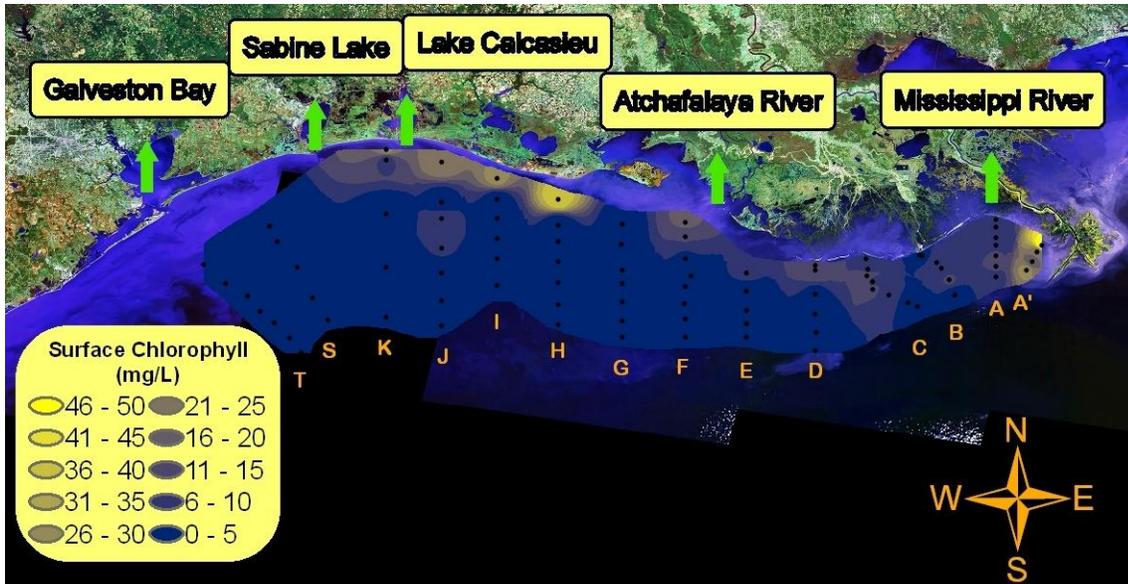
Funding from National Oceanic and Atmospheric Administration, Center for Sponsored Coastal Ocean Research

For further information, contact:

Dr. Nancy Rabalais, [nralais@lumcon.edu](mailto:nralais@lumcon.edu)

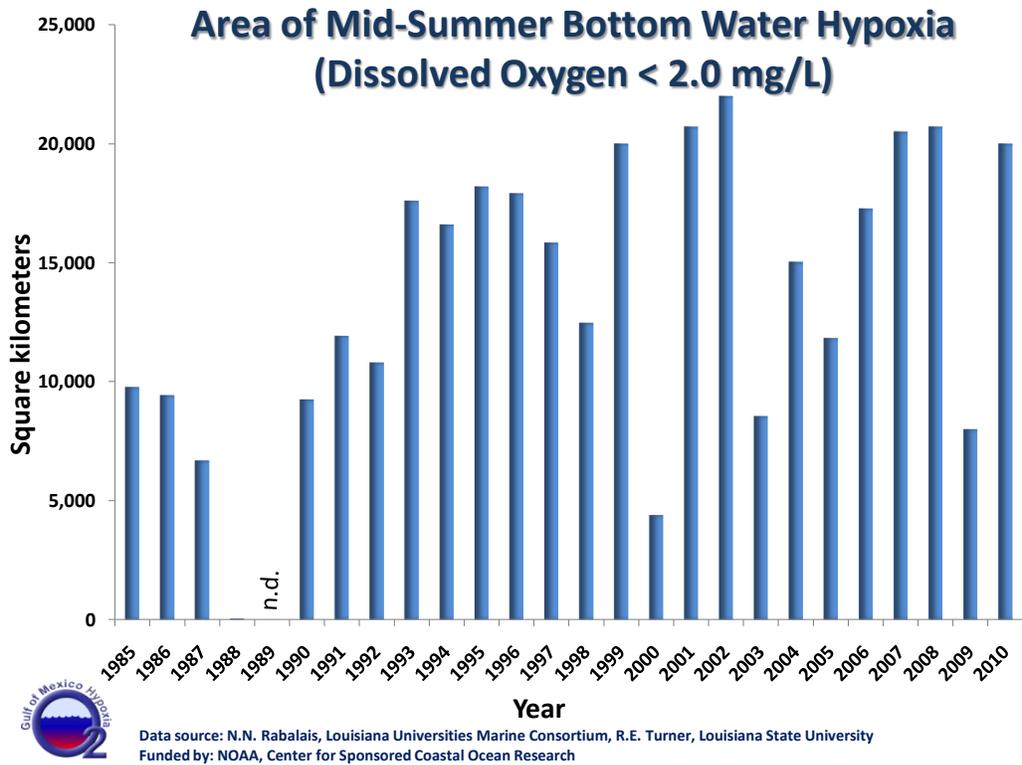
Dr. R. Eugene Turner, [eurne@lsu.edu](mailto:eurne@lsu.edu)



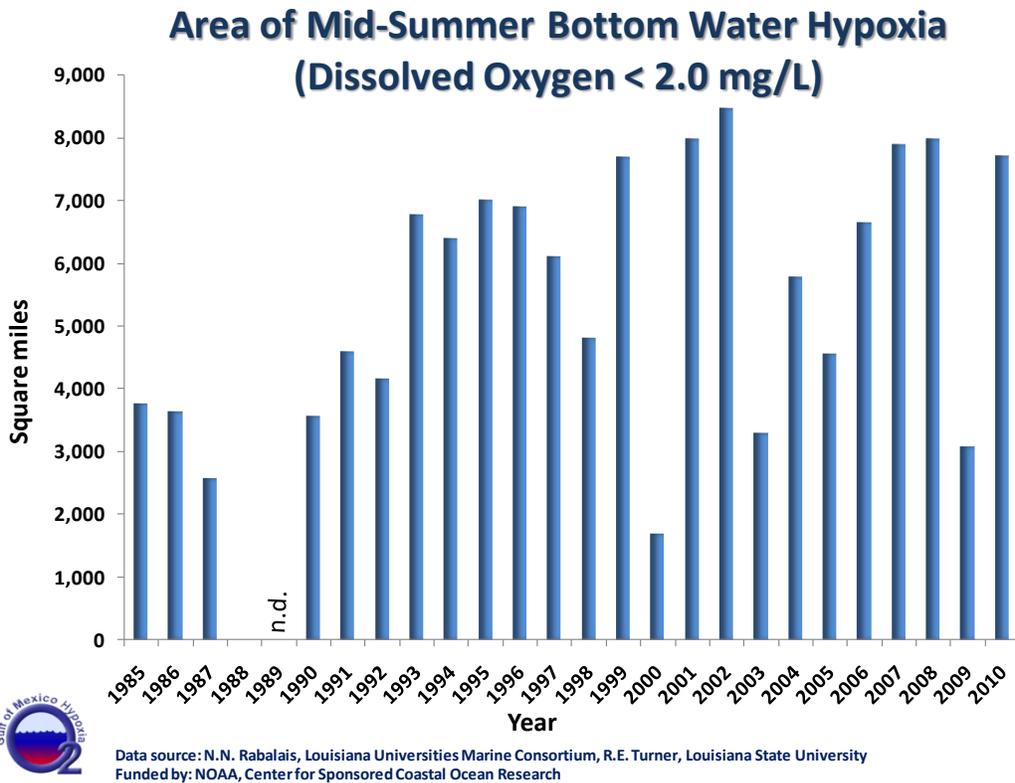


Data source: N.N. Rabalais, Louisiana Universities Marine Consortium, R.E. Turner, Louisiana State University  
 Funded by: NOAA, Center for Sponsored Coastal Ocean Research

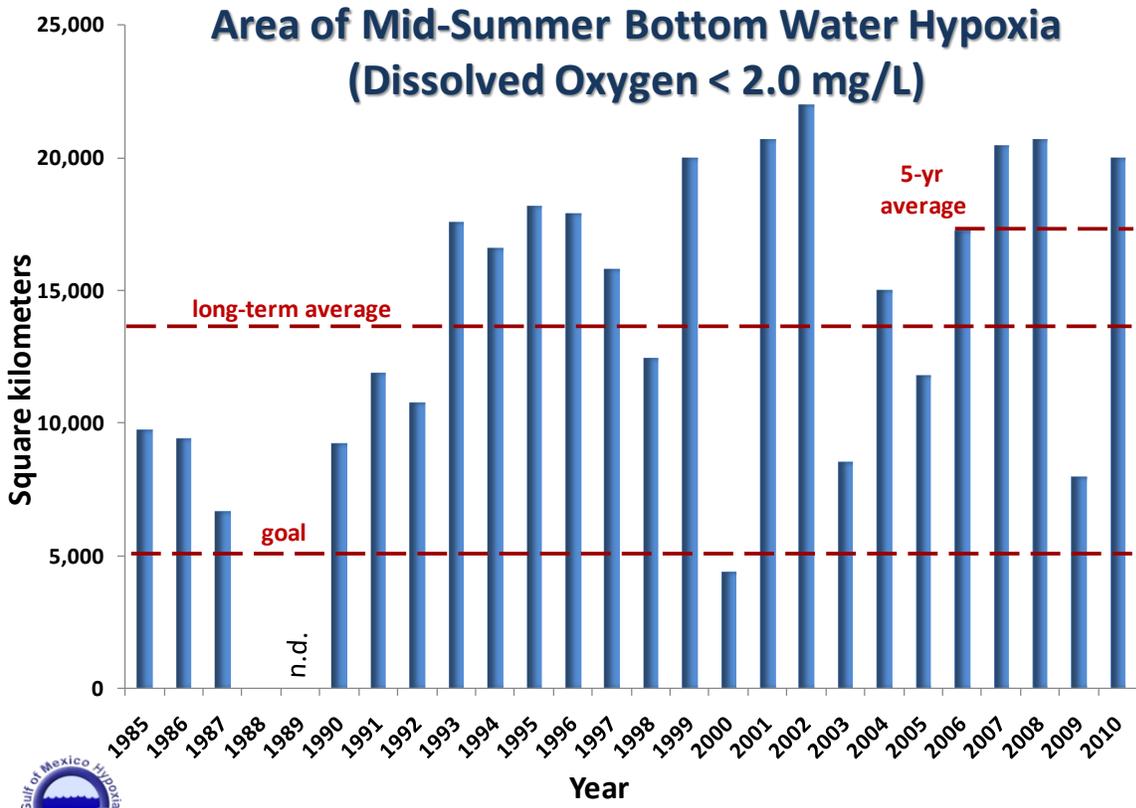
Surface water chlorophyll *a* values, which indicate how much phytoplankton is in the water. Note that chl *a* values mirror the inputs of fresh water and nutrients from the Mississippi and Atchafalaya rivers.



Time series of bottom-water hypoxic area since 1985.

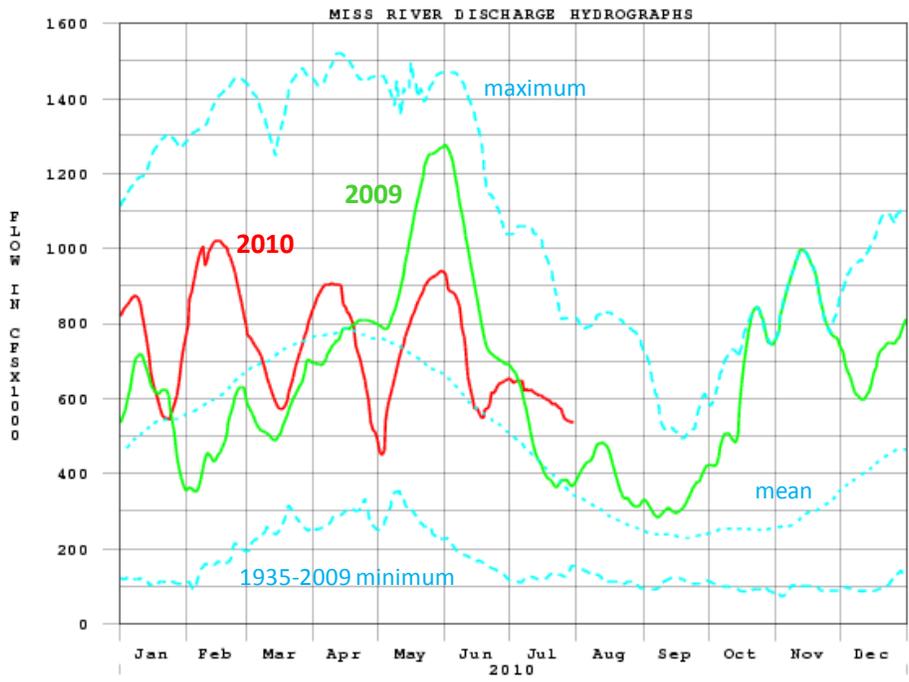


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Time series of bottom-water hypoxic area since 1985. Landmarks for Hypoxia Action Plan indicated with red dashed lines.



Mississippi River discharge in cubic feet per second at Tarbert Landing through the end of July 2010.  
<http://www.mvn.usace.army.mil/eng/edhd/tar.gif>