Connecticut

By Melodi Smith and Jason Hanna, CNN

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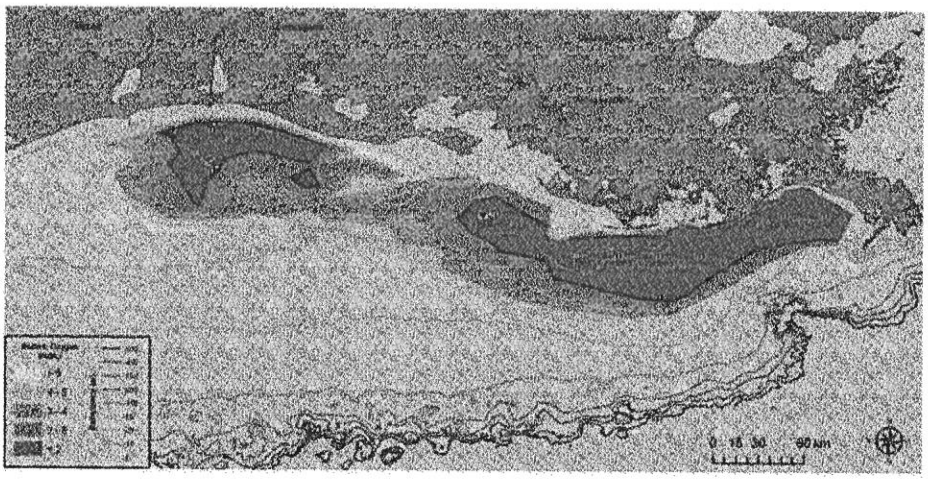


A dead zone in the Gulf of Mexico has formed west of the Mississippi River delta.

Story highlights

The Gulf of Mexico "dead zone" is caused by an algae blooms that suck up oxygen

Scientists first discovered a dead zone in the Gulf in 1972

The number of dead zones across the globe is growing

They cost U.S. seafood and tourism industries $82 million a year, NOAA estimates

The Gulf of Mexico's annual spring-summer "dead zone" is the size of Connecticut -- slightly smaller now than in recent years but nowhere near the trim scientists had sought, researchers said this week.

Scientists' annual survey found an area of 5,052 square miles of "low oxygen water," or hypoxia, off much of Louisiana's coast and part of Texas, the National Oceanic and Atmospheric Administration said Monday.

The zone is formed by nutrients that wash into the Gulf's waters -- largely agriculture fertilizer and wastewater coming down the Mississippi River. These boost algae blooms that suck up the oxygen in deep water, according to NOAA and the U.S. Geological Survey.

Marine life struggles to find enough oxygen to survive within the zone.

Fish and shrimp can migrate to areas with oxygen-rich water, but some life forms in the deep water and ocean floor -- including those that serve as food for the fish and shrimp -- can't get out of the zone and eventually die.

That hurts biodiversity and makes food hard to come by for the fish and shrimp when they return, said the survey's leader, Nancy Rabalais, executive director of the Louisiana Universities Marine Consortium.

Scientists first discovered a dead zone in these waters in 1972, and it has appeared ever spring and summer since, with varying sizes.

This year's dead zone, measured from July 27 to August 2, is smaller than the five-year average of 5,550 square miles, and well under 2002's record 8,481 square miles.

But scientists had set a goal of reducing the zone to 1,900 square miles by 2015 -- and this year's measurement likely means that target won't be met, Rabalais said.

"The average we're targeting against is three times the goal. ... There hasn't been any progress in reaching that goal," she said.

Ways to shrink the zone, she said, would include changing agricultural practices, including the timing of fertilization -- ideas that have worked well on the small scale but not, so far, on the large.

There's been no evidence to show that the Gulf of Mexico oil spill of 2010 had any contribution to that year's dead zone or any subsequent one, Rabalais said.

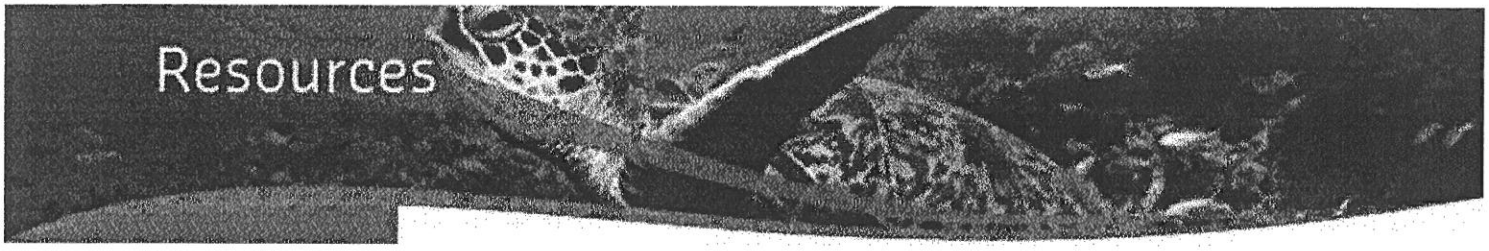
The survey is supported by NOAA and the Environmental Protection Agency.

The Gulf of Mexico dead zone is the world's second-largest caused by humans, Rabalais said. The largest is in the Baltic Sea.

"The number of dead zones throughout the world has been increasing in the last several decades and currently totals over 550," Rabalais said.

Dead zones amount to an expensive hit for America's fishing industry. NOAA estimates the annual cost of algae blooms to U.S. seafood and tourism industries at $82 million or more.

Can oxygen pump breathe life into ocean 'dead zone?'



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The Gulf of Mexico 'Dead Zone'

Substantial increases in synthetic nitrogen fertilizer production and fossil fuel combustion, and land-use changes involving clearing and conversion, crop cultivation, and drainage of wetlands, among other factors, have significantly altered the global nitrogen cycle. The increased rate of nitrogen input is affecting the quality of the atmosphere and, in many regions, soil, groundwater, lakes and streams, and estuarine and nearshore marine environments.

While nitrogen is essential to the high productivity of estuaries and other coastal regions, an excessive supply can set into motion a cascade of detrimental effects. Microscopic algae (phytoplankton) are stimulated into high production and, if not incorporated into the food web, can form dense growths or blooms. Dead and dying cells sink and are decomposed by bacteria and other microbes. The decomposition process requires, and can remove, substantial amounts of oxygen from the surrounding water and, in conjunction with stratification (where bottom waters are isolated from the atmosphere and hence oxygen resupply), may lead to 'hypoxia' - the condition in which dissolved oxygen is below the level necessary to sustain most animal life.

The Problem

- The largest oxygen-depleted area - or 'dead zone' - in the entire western Atlantic Ocean occurs in the northern Gulf of Mexico on the Louisiana/Texas continental shelf. Stretching westward from the mouth of the Mississippi River in water up to 200 feet deep, it encompassed approximately 7900 square miles in 2007, an area almost as large as the state of New Jersey, and the third-largest ever recorded. The dead zone is a seasonal occurrence triggered by the high influx of nutrient-laden freshwater washing down from the Mississippi with the onset of melting snow and spring rains; it typically forms in May - though sometimes as early as February - and remains until September or October.
- The dead zone forms in one of the most productive fisheries areas of the United States, and has led to increasing concern that catches are being adversely affected - or will be affected if hypoxic conditions continue or worsen.
- While the causes of eutrophication and hypoxic water conditions have been well-characterized, still relatively little is known of their overall impacts in the Gulf of Mexico. In general terms, however, effects of hypoxia include the direct mortality of organisms, including fish and their food base, high losses of benthic or bottom-dwelling plants and animals, reductions in numbers of species, and disruption of fish spawning, recruitment, and migration.

The Causes

- The primary human-related factor in the formation of the dead zone is agriculture. It is estimated that about 1.6 million metric tons of nitrogen - primarily from the highly fertilized agricultural regions of southern Minnesota, Iowa, Illinois, Indiana, and Ohio - enters the Gulf annually from the Mississippi Basin. Close to one million metric tons of this is nitrate (the most important form of nitrogen involved in the creation of the dead zone), an amount some three times more than what was discharged in 1970.
- Agriculture (fertilizer and livestock manure) accounts for 65% of the nitrogen flux to the Gulf; soil erosion, ground-water discharge and atmospheric deposition are estimated at 24% while municipal (mainly wastewater treatment systems) and industrial point sources contribute some 11%.
- High losses of wetlands and riparian areas throughout the U.S. - in large part due to agricultural expansion - have exacerbated the problems associated with nutrient pollution. Wetlands and riparian vegetation, such as forests, are important natural 'sinks' in that they can retain nitrogen or convert nitrate to nitrogen gas.

The Context

- The northern Gulf of Mexico has undergone significant change over the last decades due to human activity. Along with nutrient pollution and eutrophication, impacts have accrued from: fisheries, especially the extreme levels of bycatch and the damage to seabed habitats associated with shrimp trawling; destruction of wetlands related to flood control measures and construction of shipping channels; chemical pollution; and introduced species.
- While there is concern that hypoxic conditions in the northern Gulf of Mexico are resulting in a decline in Gulf of Mexico fisheries productivity, studies have been unable to detect an impact. While this can be seen as positive, scientists have also noted that this does not mean that an impact hasn't occurred, or that serious detrimental changes to fisheries will not occur if conditions continue or worsen. Rather, the complexity inherent in ecological systems, and the confounding effect of numerous stressing agents - such as fisheries and wetland loss - make it extremely difficult to delineate clear cause-and-effect relationships.
- Recent analyses consider that a 50% reduction of nitrogen loading to the Gulf is possible if a variety of efforts are implemented. These include: modification of farm practices towards the more efficient use of fertilizer and manure; creation and restoration of wetlands and riparian ecosystems; reflooding of former wetlands; controls on nitrogen discharges from sewage treatment plants and industries; and changes in flood control measures throughout the Mississippi Basin. The reversal of hypoxic conditions is, however, likely to be slow and many decades of scientific monitoring may be required in order to verify system recovery.
- The increase in the availability and mobility of nitrogen has only more recently become an issue of global significance and scientific concern. Effects worldwide include threats to human health in the form of high nitrate levels in drinking water, losses of important trace nutrients in soil, the formation of acid rain and photochemical smog, and a variety of impacts in coastal waters including increases in harmful algal blooms and declines in commercial fisheries. In addition, nitrogen in the form of nitrous oxide is a contributor to the 'greenhouse effect' as associated with climate change.

Further Reading

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