National Water Research Institute

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2008 Clarke Prize Highlights Link between Nutrients and Oxygen Depletion in Coastal Waters

The critical need to improve water quality to control hypoxia, or severe oxygen depletion, was highlighted at the Fifteenth Annual Clarke Prize Lecture and Award Ceremony, held by NWRI, on Thursday, July 10, 2008, in Huntington Beach, CA.

The Clarke Prize was awarded to Nancy N. Rabalais, Ph.D., Executive Director and Professor of the Louisiana Universities Marine Consortium (LUMCON) in Chauvin, Louisiana, for her dedication and outstanding efforts to advocate change in public policy to improve water quality. As part of the award, Rabalais presented the 2008 Clarke Prize Lecture, *Ecosystem Science Informs Sound Policy ... or Does It?,* sharing her expertise on hypoxia and ways to achieve nutrient management from a public-policy perspective.

Hypoxia is a symptom of eutrophication – an excessive increase of nutrient flow into lakes, rivers, and other bodies of water that is often the result of agricultural runoff caused by increased fertilizer application and artificial soil drainage. An area of water can become hypoxic, or severely deoxygenated, when an overgrowth of algae and bacteria is produced by eutrophication and consumes all of the available oxygen in both the sediment and lower water layers. The lack of oxygen, in turn, causes severe damage to marine habitats and marine organisms, significantly impacting commercial and recreational fisheries, as well as the health of coastal environments. For coastal waters such as the Gulf of Mexico, hypoxia is especially severe due to the shallow waters of the coastal shelf and differences in water salinity.

During the Lecture, Rabalais pointed out that although eutrophication can occur through several means, the most extreme changes in oxygen depletion for the Gulf of Mexico have occurred since the 1960s, when nitrate concentration and loads in the freshwater source increased to unprecedented amounts. As a result, large areas in the Gulf of Mexico became "dead zones," which lacked the required amount of oxygen to sustain the ecosystem. This area in the Gulf, said Rabalais, is the second largest human-caused hypoxic zone globally and “an extreme example of deteriorating coastal water quality and the need for nutrient management."

Rabalais's research findings brought to light the severity of Gulf hypoxia and contributed directly to the enactment of Congress' Harmful Algal Bloom and Hypoxia Research and Control Act of 1998, which required the development of a plan for controlling hypoxia in the Northern Gulf.

The Act was followed by the passing of the Integrated Assessment of Hypoxia in the Northern Gulf of Mexico in 1999 and the Action Plan for Reducing, Mitigating, and Controlling Hypoxia in 2001 – both documents highlighting ways to reduce excess nutrient-loading. However, said Rabalais, knowing the nutrient management strategies in the Integrated Assessment and Action Plan "does not necessarily equate to 'action' as defined in the Action Plan ... The linkages among science, policy, and management decisions are tempered, as always, by stakeholder interests."

The ultimate goal, she concluded, would be to promote nutrient management strategies and follow-up with enforcement of nutrient-management outlines. "If we can collectively reduce nutrients to the level of success that pesticides such as dichloro-diphenyl-trichloroethane (DDT) or sources of atmospheric deposition that led to acid rain, then there remains the potential to reverse current coastal water quality degradation while sustaining renewable resources and the economic livelihood of members of society."

Rabalais is the fifteenth recipient of the Clarke Prize, which was established by NWRI in 1993 to recognize outstanding research scientists who have demonstrated excellence in water-science research and technology. The prize includes a medallion and $50,000 award. Copies of the 2008 Clarke Lecture may be downloaded at NWRI's website at www.nwri-usa.org/ClarkeLecture.