"Corn Belt States Create Nutrient Reduction Strategies to Address Gulf of Mexico Hypoxia." *Resilient Agriculture.* Aug. 2914: 12-13. Print.

Corn Belt States Create Nutrient Reduction Strategies to Address Gulf of Mexico Hypoxia

Sustainable Corn Project scientists are seeking to make agriculture more resilient by studying farm management practices that minimize losses in carbon, through soil erosion, and nutrients, such as nitrogen, during heavy rains. The scientists bring expertise and knowledge from their research in their individual states, including work on state nutrient reduction strategies.

Since 1985, the size of the hypoxic zone in the Gulf of Mexico has been measured every July via a cruise on the Pelican, a ship operated by the Louisiana University Marine Consortium under the direction of Dr. Nancy Rabalais. The hypoxic zone, colloquially referred to as a "dead zone," is an area where nutrient-enriched waters coming from freshwater rivers and streams in the watershed cause excess growth of plants which, in turn, deplete oxygen levels as they decompose. As a result marine organisms and the habitat they depend upon become oxygen starved and can no longer support the diverse aquatic life of the region. Last year's annual cruise revealed an area of low oxygen level of about 5,800 square miles, an area roughly the size of Connecticut. Significant sources of the nutrients that flow into the Gulf originate from agricultural row crop land in the Corn Belt.

To address this environmental problem, the multistate and multi-agency Mississippi River/Gulf of Mexico Watershed Nutrient Task Force was created in 1997. Their mission is to understand the causes and effects of the hypoxic zone and to coordinate activities to address it. In their 2008 Action Plan the task force called for the states in the Mississippi/Atchafalaya River Basin to develop strategies to achieve comprehensive reductions in nitrogen and phosphorus by 2013. A number of states have developed these plans. Many of them, including the state of Iowa, have undertaken an

< The Mississippi and Atchafalaya Rivers deliver vast quantities of sediment from the heart of the North American continent to the Gulf of Mexico every spring and summer. In the spring of 2011, NASA captured this photo where at least some of that sediment could be seen from space.

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assessment of the effectiveness and costs of conservation practices to achieve reductions in nitrogen and phosphorus loading to the Gulf.

The science assessment developed by the team from Iowa identifies the type of practices that are most cost effective and the extent of the coverage needed to achieve the target nutrient reductions. "While developed for Iowa, much of the science will be directly applicable to other states in the Corn Belt," says Catherine Kling, one of the scientists on the Iowa science assessment team. Kling is a distinguished professor of agricultural economics at Iowa State University's Center for Agricultural and Rural Development and a principal investigator on the Sustainable Corn Project team.

Three categories of nitrogen and phosphorus reduction practices were identified and described in that effort: infield management practices, edge-of-field practices, and land-use changes. Infield management practices are actions that can be taken within a field to reduce the loss of nutrients from that field. Commonly advised practices such as cover crops, reducing nitrogen application rates, type, and timing fall into this category for nitrogen reduction and reduced tillage is a key option for phosphorus. Edge-of-field practices include buffers for phosphorus and wetlands targeted for water quality improvement for nitrogen. Bioreactors, an emerging technology to treat nitrogen, also are in this category. Finally, the planting of perennial crops for biofuels and the reintroduction of prairie plants on land previously planted in row crop are examples of land-use changes to reduce both nitrogen and phosphorus. "It is worth noting that in general, infield management actions are both less effective in reducing nutrient losses and less costly on a per acre basis than either edge-of-field practices or land-use changes. An important exception to this is cover crops, which is an effective management option, but relatively costly," says Kling. (A summary of the assessment findings can be found at https://store.extension.iastate.edu/Product/Reducing-Nutrient-Loss-Science-Shows-What-Works.)

The science assessment provided an important basis for understanding the change to the landscape that will be needed in agriculturally intensive landscapes. This analysis suggests that low-cost infield options by themselves will not be adequate to meet the water quality goals of the Hypoxia Task Force and that reliance on previously used best management practices will not be adequate. Historically, conservation practices such as no-till or reduced till, contour farming or terracing were designed to address soil erosion and, because phosphorus tends to move with soil, are often effective at retaining that nutrient. However, nitrogen moves with water and practices that may be very effective for phosphorus can have little or no impact on reducing nitrogen losses.

Kling says to successfully address the nutrient enrichment problem coming from agricultural fields, "a major change in the landscape will be needed. New practices and new crops will be needed, new land uses such as wetlands will have to be constructed in locations targeted to achieve nutrient cycling, and all of this will come at a cost."

The task force is calling for voluntary approaches to achieving this landscape transformation. "That means that producers will have to willingly adopt practices that reduce their bottom line and/or conservation programs will need to substantially increase their funding," says Kling.

^ Winter rye cover crop emerging in corn before harvest. Cover crops have been shown to reduce nitrate transport by 30-60 percent. Photo by Chad Ingels.

> For effective functioning, grassed waterways must be properly sized and constructed and have routine inspections and regular maintenance; otherwise, over time, gullies form on either side of the waterway as shown here. Photo by Richard Cruse.