United States
Environmental
Protection Agency

Hypoxia & Wetland Restoration

What Is Hypoxia?

Hypoxia is the condition in which dissolved oxygen is below the level necessary to sustain most animal life. For many members of an aquatic community, hypoxia is like drowning, because life-giving dissolved oxygen levels in a body of water drop much lower than normal. Hypoxia often occurs when high concentrations of nutrients enter water as a result of human actions.

Just as on land, nutrients like nitrogen and phosphorus, which are found in fertilizer, stimulate plant growth in water. In water, algae is the predominant plant. Although algae is integral to a healthy aquatic ecosystem, addition of nitrogen and phosphorous beyond natural levels can lead to the formation of large, unattractive algal mats on the surface of lakes and algal blooms in lakes and coastal waters. The decomposition of algal blooms consumes oxygen, and the resulting low oxygen condition, or hypoxia, is inhospitable to many aquatic organisms that then must flee or die.

Where Does Hypoxia Occur?

Hypoxia occurs throughout the world. In the United States, the largest known area is off the Louisiana Coast (see sidebar). Other known areas in the United States are the Long Island Sound and the Chesapeake Bay. Hypoxia can occur naturally; however, there is no doubt that human activites have increased the frequency, areal extent, and severity of hypoxia around the world. Although nutrient enrichment is the primary contributor to hypoxia, landscape changes such as the loss of coastal and freshwater wetlands that naturally remove nutrients from the water also contribute to the problem. Many of the original freshwater wetlands and riparian zones that were connected to streams and rivers are now gone.

The Gulf Dead Zone

The Gulf of Mexico is the largest area of hypoxia in the United States. In the summer of 2002, the hypoxic zone measured larger than ever before. In fact, it covered an area greater than the size of Massachusetts. Hypoxia in the Gulf of Mexico has raised considerable concern throughout the United States because many people in coastal states make their livelihood fishing in the Gulf and many Americans vacation on the Gulf. It is also an indication of the quality of the waters that feed the Gulf, including the Mississippi River Basin. The nitrogen concentration in Mississippi River Basin water has doubled since the 1950s.

The six major sub-basins of the Mississippi River Basin and the Gulf of Mexico. Nutrients transported from these areas contribute to Gulf of Mexico hypoxia.

Mitigating Hypoxia Through Wetland Restoration

There is growing interest and expertise in the field of wetland restoration. Federal, state, tribal, and local agencies, as well as private and nonprofit groups, are working not just to slow wetland loss, but to actually increase wetland acres. This trend is good news for hypoxia-affected waters since some wetlands can significantly reduce the amount of nutrients reaching our inland and coastal waters. Restoring these wetlands can help reduce nutrient loading to our nation's streams and rivers. The following two examples highlight such efforts.

Effects of Hypoxia

- **More expensive water treatment**
- **Threat to commercial fisheries**
- **Harmful algal blooms and shellfish toxicity**
- **Unattractive or smelly water**
- **Fish kills**
- **Damage to ecosystems and wildlife, including "dead zones"**
- **Decreased diversity of aquatic plant and animal life**

Ducks Unlimited

Winter ricefield management protects the Gulf of Mexico from sediments and nutrients.

Hunters Increase Wetland Acres

The conservation group Ducks Unlimited is working with rice farmers to provide habitat for migrating birds at a critical time of year. Farmers flood their fields between crops creating temporary wetlands that are needed by the birds and that also reduce the concentration of nutrients in runoff water. Much of this same runoff water will finally make its way to the Gulf less laden with harmful concentrations of nutrients. Ducks Unlimited hopes to enroll 150,000 acres of such wetlands in Arkansas alone. This win-win situation benefits farmers, waterfowl, and downstream water users.

Iowa and the US Department of Agriculture (USDA)

Iowa farmers, in coordination with USDA, are presently hard at work creating and restoring 9,000 acres of wetlands that are strategically located and designed to be especially effective at removing nutrients and herbicides from agricultural fields. Their project targets the Raccoon River which produces one of the highest nitrogen loads in the Mississippi River Basin. Not only will this project improve conditions in the Gulf of Mexico, but it will also protect drinking water in Iowa.

Lynn Betts, USDA NRCS

Restored Wetland in Northeastern Iowa

What Can You Do?

To protect your local waters and those downstream, you can take some precautions:

1. *Use fertilizers on your farm prudently, and on your yard and garden sparingly or not at all. When you do use fertilizers, be sure to follow application time and amount recommendations closely. One useful tool to avoid over-applying (which can also be bad for plants) is a soil test. A test kit can be obtained from your local USDA extension office. Find yours at: www.reeusda.gov/1700/statepartners/usa.htm*
2. *Protect the wetlands and stream-side vegetation on your own property and in your community. Visit a wetland near your home and learn about its contributions to your local watershed.*
3. *Help restore a wetland or a stream bank. Visit EPA's restoration website at www.epa.gov/owow/wetlands/restore*
4. *Properly maintain septic systems.*
5. *Support local efforts to reduce contamination of the water in your community. The first step is to determine the condition of water supplies and local streams in order to identify and then mitigate or eliminate sources of pollutants.*

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Office of Water

For more information, call EPA's Wetlands Helpline at 1-800-832-7828, or visit www.epa.gov/owow/wetlands

Wetland Resources

Selected Refences:

EPA's Mississippi River Basin Webpage .....www.epa.gov/msbasin

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CENR. 2000. *Integrated Assessment of Hypoxia in the Northern Gulf of Mexico.* National Science and Technology Council on Environment and Natural Resources, Washington, DC. www.nos.noaa.gov/pdflibrary/hypox_final.pdf

National Oceanic and Atmospheric Administration (NOAA). 1998. *Oxygen Depletion in Coastal Waters* by Nancy N. Rabalais. NOAA's State of the Coast Report. Silver Spring, MD: NOAA. state-of-coast.noaa.gov/bulletins/html/hyp_09/hyp.html