**You are Now Entering the Dead Zone**

It is a dimension as vast as the ocean and sparked by human agriculture. It is the middle ground between light and shadow, between life and death, and it lies between the pit of man's farms and the summit of his knowledge. This is the dimension of reality. It is an area which we call the **Dead Zone**.

Hypoxic or dead zones are one result of eutrophication, an ecological imbalance that occurs because of excess nutrients like nitrogen and phosphorus. Nitrogen is used by algae and other phytoplankton (small, passively drifting marine plants - often microscopic) for reproduction. When there is an excess of nitrogen a period of rapid population growth can occur (known as an algal or phytoplankton bloom). When organisms in the plankton bloom die, they sink and are decomposed by bacteria. The decomposition process consumes oxygen and depletes the supply available to other marine life. If aeration is limited, stratification of dissolved oxygen occurs and a hypoxic zone can form on the bottom.

Eutrophication Virtual Lab

<https://biomanbio.com/GamesandLabs_old/EcoGames/ecodetectives%20peril%20river.html>

1. What is the relationship between algae concentration and dissolved oxygen in a water body?
2. Why is low dissolved oxygen a problem for aquatic ecosystems?
3. Which hypothesis do you think is most likely to explain what is causing the loss of biodiversity in Peril River? Explain why using EVIDENCE from data you collected in EACH investigation.
	1. Hypothesis 1 Findings:
	2. Hypothesis 2 Findings:
	3. Hypothesis 3 Findings:
4. What plan(s) might you propose to restore Peril Lake back to optimal conditions.
	1. Is this an example of top-down or bottom up control?
5. Get Mrs. Tyler’s Initials showing you have completed the activity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Concept Check**

Good video to explain eutrophication: <https://www.youtube.com/watch?v=6LAT1gLMPu4>

1. Define eutrophication.
2. What two nutrients are primarily responsible for eutrophication?
3. What are some of the causes of eutrophication? How are humans involved in this?
4. Explain IN DETAIL the steps of eutrophication.
5. What are some ways humans can help reduce the impact on local lakes, rivers, streams, etc. that could lead to eutrophication?

**The Gulf Of Mexico:**

Visit the following link to learn more about a current hypoxic zone that has been created via eutrophication in the Gulf of Mexico and answer the questions below. Use the tabs on the righthand side to find the answers.

<https://www.epa.gov/ms-htf/northern-gulf-mexico-hypoxic-zone>

* 1. Where are the excess nutrients coming from that create the hypoxic zone in the Gulf of Mexico?
	2. Hoe does the stratification of water contribute to hypoxic zones in the Gulf of Mexico?
	3. When was the hypoxic zone first documented?
	4. When was the first action plan to control eutrophication in the Gulf of Mexico put into place?
	5. Why is it important to reduce hypoxic zones? What impacts are seen in the lakes? On us?

Hypoxia Viewer:

Visit the following link to see current DO levels in the Gulf of Mexico:

<https://www.ncddc.noaa.gov/website/Hypoxia/viewer.htm>

1. Around which states/cities are DO levels lowest?
2. Can you provide a guess as to why this might be?
3. Are there any areas that seem to be doing pretty well around the Gulf of Mexico in terms of DO?

NASA Ocean Color Data:

Visit the following database to learn more about the distribution of phytoplankton in the ocean: <https://oceancolor.gsfc.nasa.gov/cgi/browse.pl?sen=am>

1. What is causing the green color in the oceans?
2. Where is the green color most concentrated around the globe as a whole? In the U.S.?
	1. Explain a potential reason for why you are observing what you observe.
3. Pick a month (ex: Feb) and look at the concentration of green regions starting from 2003 up to the present. Do you notice any trends in the concentrations of phytoplankton over the years?
4. How is nutrient runoff connected to phytoplankton levels?