Nitrogen Cycle

Disclaimer: Kit supplies can be purchased from Filtraponics contact filtraponics@gmail.com for more details

Learning objective
We want your students to be able to relay the importance of the nitrogen cycle and how it relates to their developing world.

Strategy
We want to try and reach all of the students through all paths of learning whether it be visual audial or hands on. So we will convey our message in the following way: we will start by intriguing them, give them the reason why it is important. Now describe how it works. Finally conduct the experiment.

Activities
We will be testing the water of different sources and comparing them to each other. Second will follow up by answering questions and checking the knowledge of our audience

Assessment
The assessment also lies with in the question and the audience's ability to reiterate the knowledge back to the presenter

Prompt

Let's start with relating this to this audience's area or even their personal lives.

Possible hooks

- “Are you aware of the Des Moines water crisis? “
- “Who knows anything about fertilizer for crops?”
- “Does anyone know why Des Moines water works would sue local farmers?”

Small Discussion on the topic of Des Moines water Crisis

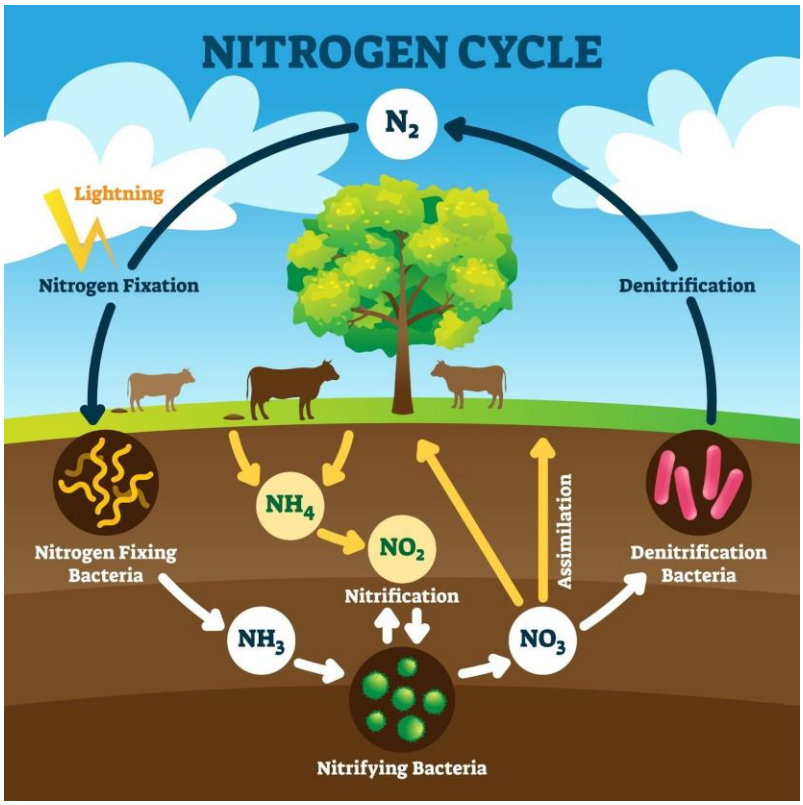
Des Moines water Crisis

Elmer, MacKenzie. “Des Moines Water Won't Appeal Lawsuit.” *Des Moines Register*, Des Moines Register, 12 Apr. 2017, https://www.desmoinesregister.com/story/news/2017/04/11/des-moines-water-works-not-appeal-lawsuit/100321222/

Eller, Donelle. “Des Moines Water Works fears drought, toxic algae will limit supplies as summer water demand explodes” *Des Moines Register*, Des Moines Register, 11 may ,2021 https://www.desmoinesregister.com/story/money/agriculture/2021/05/11/des-moines-iowa-drought-water-works-warns-shrinking-water-supply-weather-toxic-algae-raccoon-river/5040856001/

Nitrogen Cycle

A nitrogen imbalance is what causes our nitrogen issues.



The diagram above helps visualize the nitrogen cycle as it naturally occurs.

NH4 also known as ammonium is a chemical produced by animal waste. In Iowa we fertilize most of our fields with nitrogen supplements or manure. When there is excess

nitrogen or if it rains relatively soon after application, nitrogen won't be accepted into the soil. This causes runoff and pollution of our waters. This is what causes large amounts of algae and some fish deaths.

(Above: Algae in Iowa State's Lake LaVerne)

(If your fish tank has green algae you can point out that 'our system has excess nitrogen because algae is forming, maybe we should feed our fish less food, so that there is less excess fertilizer for our plants')

Why is this important well this imbalance not only affects our area but the whole world

Mississippi watershed

Nearly all of the water in the midwest winds up in the mississippi at some point
And all of that water drains into the gulf of mexico

Experiment

Define three water sources one of which being your Filtraponics system.. Have the students complete a description of the water and its qualities. Finalize with a nitrogen test.

Equipment

Testing strips
Water containers
Water sources (tap water, water with fish feed, tank water, water with dirt, outside water source)

Step 1

Develop a Hypothesis and make observations


Step 2

Add three different water sources to separate containers for testing.

Step 3

After collecting your three different water samples we will be testing their hardness, PH, Nitrite, and Nitrates. We do this by utilizing the test strips.

Step 4

Draw our conclusions

Conclusion

How do we fix this problem?
By rebalancing the nitrogen cycle.

How by slowing the water down so the denitrifying bacteria, and assimilation can get to them. These methods included better field drainage solutions to send the water through more ponds and lakes and even bioreactors.

Questions

Think critically about the nitrogen cycle and determine at which step the imbalance occurs?

How might this problem affect you personally?

Studies show an increase in algae growth alongside the excess nitrogen leading to low oxygen levels. Why might this be?

Farmers apply excess nitrogen for their crops to still be able to have plenty even if some is lost. What would tell them in order to reduce the nitrogen leaving their fields?

Name 3 professions you could see high nitrogen levels in water sources and why?

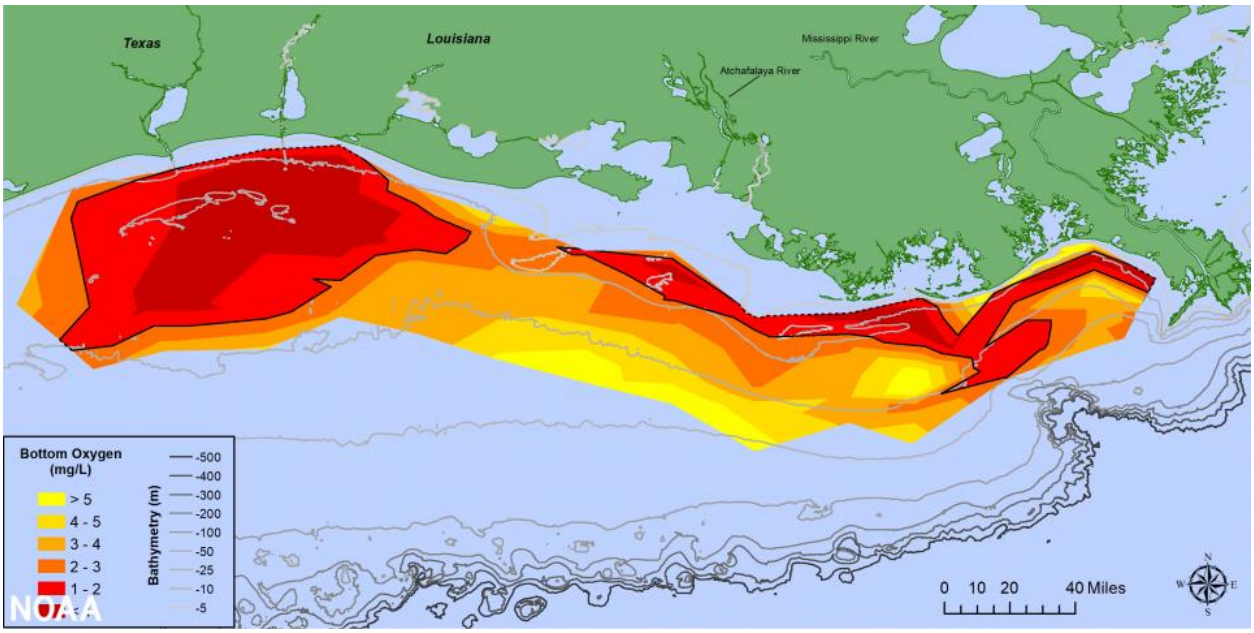
Works Cited

Mississippi gulf dead zone

EPA, Environmental Protection Agency, https://www.epa.gov/ms-htf/northern-gulf-mexico-hypoxic-zone#:~:text=The%20hypoxic%20zone%20in%20the,the%20hypoxic%20zone%20is%20measured.

“Larger-than-Average 'Dead Zone' Expected for Gulf of Mexico.” *Larger-than-Average 'Dead Zone' Expected for Gulf of Mexico | National Oceanic and Atmospheric Administration*, 3 June 2020, https://www.noaa.gov/media-release/larger-than-average-dead-zone-expected-for-gulf-of-mexico.mexico.

“Ocean Dead Zones.” *Sailors for the Sea*, 7 Feb. 2020, https://www.sailorsforthesea.org/programs/ocean-watch/ocean-dead-zones.



(mississippi watershed)

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“What Is the Nitrogen Cycle and Why Is It Key to Life?” *kids.frontier.org,* Miriam R. Azel

https://kids.frontiersin.org/articles/10.3389/frym.2019.00041#:~:text=The%20nitrogen%20cycle%20is%20a,cycle%2C%20nitrogen%20must%20change%20forms.