Freshwater Wetlands and Climate Change

Educational Activity

Grade Level: Grade 6 – Grade 8

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Ocean Literacy Standards:

#6: *The ocean and humans are inextricably interconnected.*

Climate Literacy Standards:

#1: *The Sun is the primary source of energy for Earth's climate system.*

#7: *Climate change will have consequences for the Earth system and human lives.*

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What is a Freshwater Wetland?

A freshwater wetland is a special type of ecosystem where the ground is almost always covered by water. Forested swamps are one type of freshwater wetland. You can find wetlands all over the world. A wetland can be a small area, like the size of your backyard, or a very large area, like the Pantanal in South America, the world's largest wetland. It is estimated to cover more than 40 million acres in Brazil and portions of Bolivia and Paraguay.[1] If you want to find a wetland near you, you will need to look for key identifying factors such as dark, wet soil, trees with dark rings around them called watermarks, or water that is not moving.

Figure 1. *The Pantanal in South America is the world's largest wetland. Image credit: https://www.touropia.com/important-wetlands-in-the-world/*

Why are Wetlands Important?

Wetlands are among the most important ecosystems on Earth. They provide habitat for thousands of species of plants and animals, some of which are threatened or endangered. This biodiversity creates a healthy, balanced ecosystem. The soils in a wetland support special plants that are adapted to grow in very wet, "hydric" soils that are devoid of oxygen. With these special plants and soils, wetlands act like a large sponge, helping to alleviate flooding and drought and trapping pollutants that are harmful to humans, like heavy metals or chemicals from stormwater runoff.[2] Wetlands also produce nitrogen gas, which is hard to create, but essential for many organisms.

Freshwater Wetlands on Barrier Islands

Photo by Taylor Martin

Interior freshwater wetlands on Georgia's barrier islands are significant because they provide freshwater habitat in a landscape that is otherwise surrounded by saltwater. Marine Extension and Georgia Sea Grant specialists are working with professors and students to study a freshwater wetland on St. Simons Island. The team monitors water conditions, like pH, temperature, conductivity and dissolved oxygen, changes in water level after rain events, and plant and animal species observed during visits to the site. The ongoing study will help document changes in the wetland's structure and function over time.[3]

Fun Fact: Did you know that all the coal we have on Earth today comes from ancient wetlands? It's true! During the Carboniferous period, sea levels rose and trapped nutrient rich soils from swamps and over millions of years transformed them into coal!

What is Climate Change and What Causes it?

Over the last few hundred years, Earth's climate has undergone big changes, with global temperatures rising 1.9 degrees Fahrenheit since 1880. While that might not sound like a lot, this change in temperature has led to 19 of the hottest years in recorded history occurring in the last 20 years![4] Scientists believe this change is due to an increase in the amount of carbon dioxide (CO_2) and other greenhouse gases entering the atmosphere from industrial activity, transportation and energy consumption. Greenhouse gases act like a thick blanket over the Earth that lets heat in from the sun and traps it underneath. When in balance, this natural process makes Earth habitable.[5] However, more greenhouse gases in the atmosphere trap more of the sun's heat, which causes the Earth to get warmer and warmer, triggering glaciers to melt, sea levels to rise, temperature and pH levels in the ocean to increase, and storms like hurricanes to get more intense.

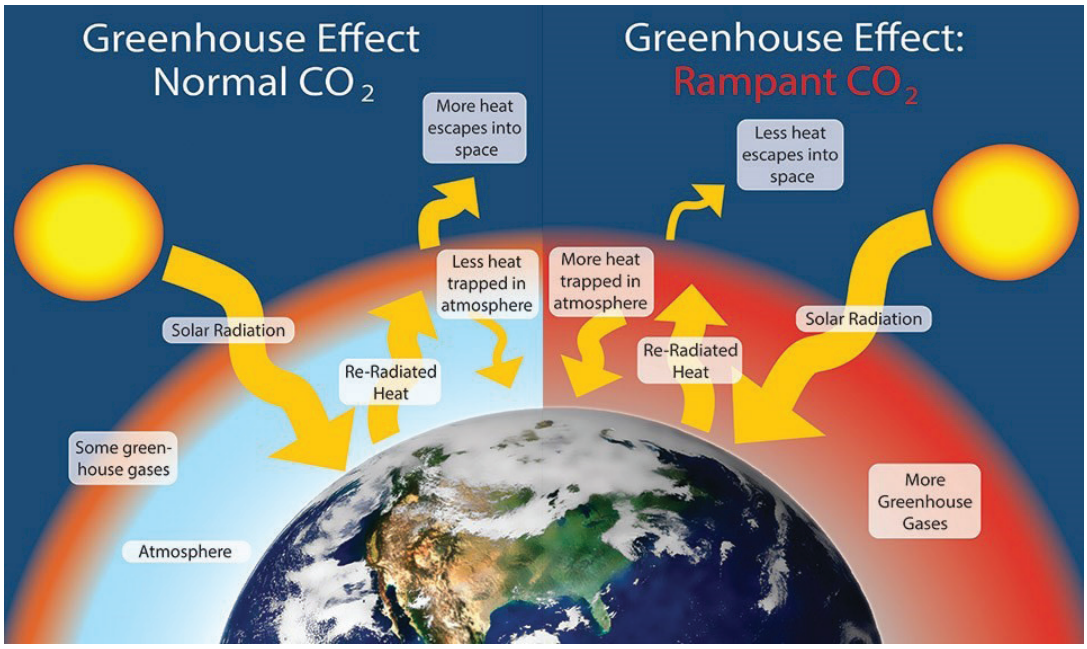

Figure 2. *Excess CO_2 causes heat to build up in Earth's atmosphere.*
Image credit: https://www.nps.gov/goga/learn/nature/climate-change-causes.htm

What Role do Freshwater Wetlands Play in Climate Change?

Wetlands absorb much of the CO_2 put into the atmosphere by human activities. Scientists estimate that wetlands store up to one-third of terrestrial carbon! While this helps regulate climate, if wetlands are destroyed or lost, all that carbon could be released into the atmosphere. Plus, we would lose the many benefits wetlands provide, like biodiversity and flood and pollution control.[6] Freshwater wetlands are not only threatened by human activities like development, but also by climate change. Rising sea levels pose a threat to freshwater wetlands as saltwater intrusion could make the water too salty for some species to live there. Animals that depend on fresh water would have to migrate or they might not survive. Warmer temperatures could cause plants, like algae, to grow faster, which could create a shield over the surface of the water, blocking sunlight from reaching the bottom. Drought, another symptom of climate change, has been shown to make plants less efficient at storing CO_2, which could cause the Earth to warm up even more.[7]

These are just a few examples of how wetlands could be impacted by climate change. Conserving freshwater wetlands helps to protect important habitat that diverse organisms, including humans, depend on!

Questions for Review and Discussion:

1. While on a trip, you see an area that looks like it might be a freshwater wetland. What are three things you could look for to help you decide if it is one?

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2. The head of a construction company wants to fill in a wetland to build a fast food restaurant. What are some benefits of freshwater wetlands you could tell him that might change his mind?

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3. What are three things humans do every day to contribute CO_2 to the atmosphere?

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4. What are two things can you do to limit your CO_2 production and help protect freshwater wetlands?

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5. What is something interesting you learned from this article?

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Glossary of Terms

Barrier Island – Narrow offshore sand deposits parallel to coastlines that can provide protection from storm surge.

Biodiversity – Variety of life in a specific habitat or ecosystem.

Carboniferous Period – Period in Earth's History characterized by rising and falling sea levels and swamp forests.

Conserve – To preserve or maintain.

Ecosystem – Community of interacting plants and animals in an environment.

Endangered – At risk of becoming extinct.

Greenhouse Gas – A Gas that traps and reflects heat (Examples: carbon dioxide, methane).

Habitable – Suitable to live in.

Hydric – Containing moisture (normally refers to soil).

Migrate – To move semi-permanently to a new location.

Protect – To keep safe.

Terrestrial – Land-based; related to Earth.

Threatened – Having an uncertain chance of survival.

Wetland – Area covered by water for the majority of the year, or at least seasonally.

Notes

1. Royal, Anna. "10 Important Wetlands in the World." Touropia, August 22, 2013. www.touropia.com/important-wetlands-in-the-world/.

2. World Wildlife Fund. "What Is a Wetland? And 8 Other Wetland Facts." Accessed June 30, 2020. www.worldwildlife.org/stories/what-is-a-wetland-and-8-other-wetland-facts.

3. National Ocean Service. "Ocean and Climate Literacy: Essential principles and fundamental concepts." National Oceanic and Atmospheric Administration. U.S. Department of Commerce. Accessed June 30, 2020. https://oceanservice.noaa.gov/education/literacy.html

4. NASA. "Climate Change: Vital Signs of the Planet." Accessed June 30, 2020. http://climate.nasa.gov/.

5. BBC News. "What Is Climate Change? A Really Simple Guide." Science and Environment. May 5, 2020. www.bbc.com/news/science-environment-24021772.

6. Australian Government. "Wetlands and Climate Change." Department of the Environment and Energy. 2019. environment.gov.au/water/wetlands/publications/wetlands-climate-change.

7. Lamsal, Pramod et al. "Vulnerability and impacts of climate change on forest and freshwater wetland ecosystems in Nepal: A review." Ambio 2017, 46:915–930. DOI 10.1007/s13280-017-0923-9. Published online June 1, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5639795/.

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