Great Lakes Wetlands

Lesson 3

Climate Change ADAPTATION Lesson #3

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Lesson Three: Coastal Wetland Scenarios

How Does Climate Change Affect Great Lakes Coastal Wetlands?

Lesson Overview:
This lesson focuses on the impacts that climate change will have on Great Lakes coastal wetlands. Students will use information from prior lessons to put together scenarios to show climate change impacts on specific wetland types. Scenarios focus on impacts to environment, vegetation, and wildlife.

Focus Questions:

Students will answer these essential questions:

- How will Great Lakes coastal wetlands be impacted by climate change?
- What factors of climate change will affect wildlife and vegetation?
- Will climate change impact wetland types differently?

Next Generation Science Standards:

Cause and Effect: Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)

ESS3.C: Human Impacts on Earth Systems: Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

ESS3.A: Natural Resources: Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

ESS3.D: Global Climate Change: Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)

Stability and Change: Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

Materials:

- Tip of the Mitt Watershed Council Publication, *Climate Change Adaptation for Coastal Wetlands: A Toolkit of Best Management Practices for Coastal Wetlands in Michigan*
- Wetland Background – Student Information Sheet (Lesson 1)
- Wetlands Habitat Chart – Double sided copy (Lesson 1)
- Climate Factor cards
- Climate Impact chart

Time: 1 class period

Objectives:

Students will be able to:

1. Identify climate change factors.
2. Describe the flora and fauna of wetlands.
3. Identify impacts of climate change on specific wetland environments.
4. Communicate the impacts of climate change on coastal wetlands to the public.

Advance Preparation:

1. Make copies of Climate Factor cards (one set per group) and Climate Impact chart (one per student).
2. Have *Climate Change Adaptations for Coastal Wetlands: A Toolkit of Best Management Practices for Coastal Wetlands in Michigan* available digitally or printed copies for student groups.
3. Selected groups for completing chart.

Background Information:

The documents and websites listed below give information on the impact that climate change could have on Great Lakes coastal wetlands. As the climate changes we will see a wide range of changes in the Great Lakes environment, from more severe storm events to variable water levels.

These changes will have various effects on the coastal wetland environments in Michigan. For example, we may see longer growing seasons for vegetation of all sorts, warmer temperatures may lead to later or earlier reproduction seasons for wildlife, and variable water levels may lead to loss of habitat for flora and fauna.

Documents and Websites for Background Information:

Tip of the Mitt Watershed Council: Great Lakes Climate Change Information
https://www.watershedcouncil.org/climate-change.html

Climate Change Impacts – Table 2 and 3 for scenario examples
https://www.researchgate.net/profile/Linda_Mortsch/publication/226519225_Assessing_the_Impact_of_Climate_Change_on_the_Great_Lakes_Shoreline_Wetlands/links/54733d780cf216f8cfaec85e.pdf

Procedure:

1. Review types of wetlands.
    a. Ask students what types of habitats, animals, and vegetation is in each.
2. Share with students that they will be applying what they learned about climate change and its effects on the Great Lakes and applying it to coastal wetlands.
3. Have students get into groups.
4. Have student groups select a wetland type.
5. Have students cut out Climate Impact cards.
6. Have students place cards on chart then discuss and record the impact that the climate factor would have on the wetland environment.
    a. Remind students that some climate changes may result in similar impacts.
    b. Remind students to think about impacts to environment as well as wildlife, vegetation, and humans.
7. Have students share/present their scenarios to the class.

Additional Resources:

North American Lake Management Society: Climate Impacts on Lakes
https://www.nalms.org/home/our-mission/nalms-position-papers/climate-change-impacts-on-lakes/

Union of Concerned Scientists : Climate Hot Map – Global Warming Effects Around the World
http://www.climatehotmap.org/

MDEQ Great Lakes Coastal Wetlands - Background
http://www.michigan.gov/deq/0,4561,7-135-3313_3687-11177--,00.html

Climate Factor Cards

Decreased Lake Ice Cover Variable by lake; Lake Michigan likely to become ice free soonest	**Increased Air Temperature** Summer warming faster than winters	**Increased Rainfall** Up overall, but variable by season: fall and winter much rainier, summers drier	**Snowfall** Increase in lake effect snow, likely decrease in snowfall otherwise
Wind Average wind speeds declining, but may have more high intensity wind events	**Heat Waves** Heat waves are likely to be more frequent, longer lasting, and more severe	**Longer Growing Season** Likely to increase by 3-6 weeks by the end of the century	**Extreme Rains** Frequency of heavy rainfall events increasing year-round
Evaporation and Drought Increase larger in summer; loss of winter lake ice will increase evaporation off lakes	**Decrease in lake level** Decrease likely, but increase also plausible; lake level variability to continue regardless	**Increased Runoff** Up overall, but variable by season	**Increased Lake Temperature** Lake Superior warming fastest; warmer water holds less oxygen for fish and other animals

Climate Impact Chart

Type of Wetland:

Climate Factor	Impact on Wildlife	Impact on Wildlife	BMP