

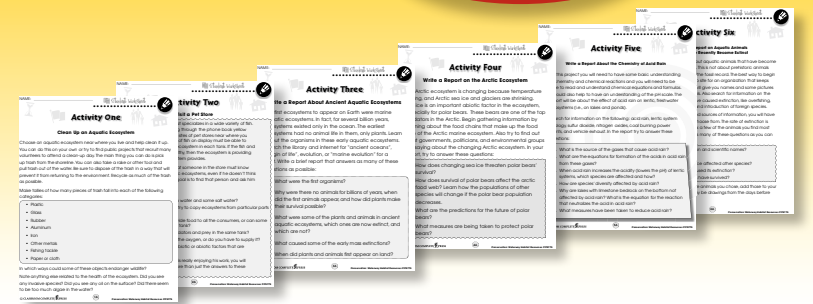
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How Climate Change Can Affect Aquatic Ecosystems

1. Circle the word **TRUE** if the statement is TRUE or Circle the word **FALSE** if it is FALSE.

- a) The greenhouse effect traps ozone in Earth's atmosphere.
TRUE FALSE
- b) Carbon dioxide is a greenhouse gas.
TRUE FALSE
- c) Coal is a fossil fuel.
TRUE FALSE
- d) When Earth gets warmer, ocean level rises.
TRUE FALSE
- e) Animals that cannot adapt to changes may become extinct.
TRUE FALSE
- f) Global warming decreases evaporation.
TRUE FALSE
- g) Rising temperature will cause most salt lakes to get deeper.
TRUE FALSE
- h) Using gasoline as a fuel releases greenhouse gases.
TRUE FALSE

2. Put a check mark (✓) next to the answer that is most correct.

a) Which of these is a fossil fuel?

- A wood
- B ethanol
- C natural gas
- D hydrogen gas

b) Which process determines the evolution of species?

- A water cycle
- B fossilization
- C photosynthesis
- D natural selection



How Climate Change Can Affect Aquatic Ecosystems

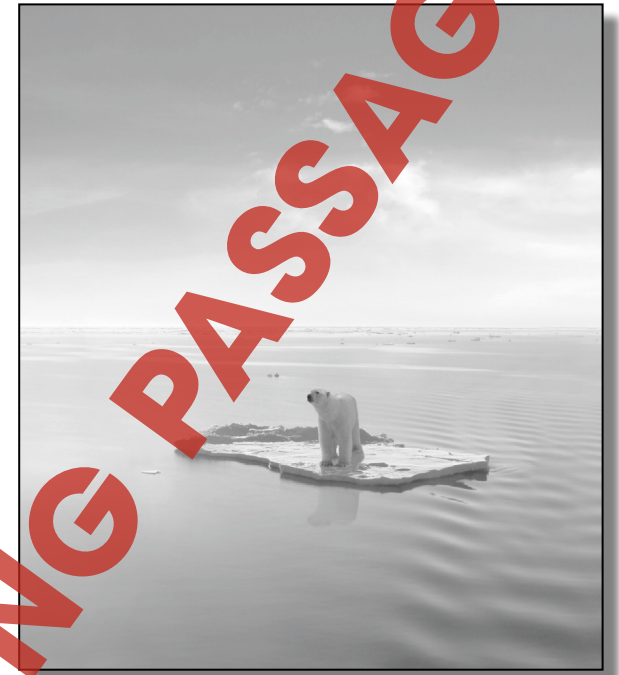
Earth's climate has changed continuously throughout our planet's history. Climate change can be understood by looking at how average global temperature changes. For an aquatic ecosystem, a change in temperature will change other abiotic factors, which leads to a change in biotic factors.

Earth's average temperature is affected by the **greenhouse effect**. **Greenhouse gases** in the atmosphere let light in more easily than they let heat out. This effect causes Earth to be warmer than it would be without these gases in the atmosphere. Carbon dioxide, **CO₂**, is one of the most important greenhouse gases.

The amount of carbon dioxide in the atmosphere has increased greatly over the last 100 years because it is produced when humans burn **fossil fuels**. Because use of fossil fuels has increased greatly, the greenhouse effect has become stronger, and global temperatures have risen.

All the organisms in an aquatic ecosystem have adapted to a certain temperature range. When temperature increases, the plants and animals must either move, **adapt**, or become **extinct**. In the open ocean, fish and other animals can move to cooler areas farther from the equator. Most plants and animals in inland habitats cannot move because they cannot travel overland. Other organisms that cannot move to cooler climates are those that are already living near the North or South Poles.

Adaptation to climate change is not an option for many organisms. For many organisms, the process of adaptation through **natural selection** (that is, **evolution**)



How Climate Change Can Affect Aquatic Ecosystems

1. Put a check mark (✓) next to the answer that is most correct.

a) Which is a greenhouse gas released into the atmosphere when humans burn fossil fuels?

- A ozone
- B methane
- C carbon dioxide
- D calcium carbonate

b) Climate change affects all of these, **except**:

- A sea level
- B rainfall patterns
- C volcanic activity
- D course of ocean currents

c) Which of these is **most likely** to increase in population if all the ice in the Arctic Ocean melts?

- A fish
- B seals
- C whales
- D polar bears

2. Draw a line from each word or words on the left to its meaning on the right.

- | | | | |
|---|-------------------|------------------------------------|---|
| 1 | evolution | transmits light and holds heat | A |
| 2 | evaporation | change through natural selection | B |
| 3 | extinction | disappearance of a species forever | C |
| 4 | greenhouse effect | water changing from liquid to gas | D |

How Climate Change Can Affect Aquatic Ecosystems

3. Answer the questions in complete sentences.

a) Describe the relationship between fossil fuels and climate change.

b) Explain why polar bears are part of an aquatic ecosystem.

Extensions & Applications

a) Explain why an ocean fish could adapt to global warming more easily than a fish living in a small freshwater lake.

b) Explain how greenhouse gases are similar to glass in a greenhouse in terms of light and heat.



Activity Three

Write a Report on Coral Reefs

Coral reefs support one of the most diverse, colorful, and interesting ecosystems in the oceans. They are so rich in life, that they have been called the rainforests of the ocean.

Ask your teachers for books or web sites on coral reefs, or search the web and library yourself. Search for "coral reef" first. After you have taken a first look at the information you gathered, look for live exhibits of coral reefs. Unless you live in the tropics, there will be no reefs near your house. The next best thing would be an exhibit at a public aquarium that is meant to represent a reef ecosystem. Be sure to pick up any literature they have and talk to any of the staff that knows about reef life. You might also try a large pet store with a large collection of tropical fish. Ask if they have a tank of fish that live around reefs.

In your report try to answer as many of these questions as you can. You may also go beyond the questions if you find something interesting.

1. Where are coral reefs located geographically and in depth below sea level?
2. How are reefs formed? Describe the animals called corals.
3. What are the producers and consumers around a coral reef?
4. What are the predator-prey relationships?
5. What natural processes and human activities endanger coral reefs?
6. What is being done to protect coral reefs?

It will be easy to find colorful pictures to illustrate your report.



Crossword Puzzle!

Word List

- ABIOTIC
- ACID RAIN
- ADAPT
- DEBRIS
- EVOLUTION
- EXTINCT
- FISH
- FRESH
- GREENHOUSE GAS
- INVERTEBRATE
- LOTIC
- MARINE
- MUSSEL
- NATURAL SELECTION
- OVERFISHING
- OXYGEN
- PHOTOSYNTHESIS
- PRODUCER
- RUNOFF

Across

1. The type of ecosystem located in the ocean.
4. Zebra _____s have invaded the Great Lakes.
7. What a species must do to survive an environmental change.
10. Gradual change of a species over time.
11. The nonliving factors in an ecosystem.
14. _____ ladders are installed at some dams.
16. What can happen to a species if it can't do 7 across.
17. The type of water that is less than 1% salt.
18. The result of releasing nitrous oxide and sulfur dioxide.
19. These compounds in the atmosphere help hold Earth's heat.

Down

2. Water leaving a farm field and entering a stream.
3. The process that allows 10 across to happen.
5. The word to describe an ecosystem in flowing water.
6. The role of plants in an ecosystem.
8. Ocean trash.
9. The process that only 6 down can do.
12. Spineless creatures.
13. Catching fish faster than they can reproduce.
15. A product of 9 down that all animals need.

(Note: For answers of more than one word, do not put a space between the words.)



Comprehension Quiz

Part A

Circle the word **TRUE** if the statement is TRUE or Circle the word **FALSE** if it is FALSE.

1. Biotic and abiotic factors cannot share the same ecosystem.
TRUE **FALSE**
2. The first ecosystems were in the ocean.
TRUE **FALSE**
3. Oxygen is a greenhouse gas.
TRUE **FALSE**
4. Melting sea ice has made it easier for polar bears to adapt to the Arctic.
TRUE **FALSE**
5. Burning some fossil fuels can cause acid rain.
TRUE **FALSE**
6. Human activities brought most invasive species to freshwater ecosystems.
TRUE **FALSE**
7. Coral reefs are endangered by human activities.
TRUE **FALSE**

Part B

Put a check mark (✓) next to the answer that is most correct.

- a) Which is a product of photosynthesis?
- A oxygen
 - B nitrogen
 - C carbon dioxide
 - D sodium chloride
- b) Which are the most important producers in most aquatic ecosystems?
- A algae
 - B bacteria
 - C fish
 - D invertebrates
- c) What is the basic cause of most extinctions?
- A predators
 - B overpopulation
 - C natural disasters
 - D failure to adapt to change

Changes in Fresh Water Aquatic Ecosystems Caused by Human Activity

Commercial Waste

Over Fishing

Waste from Livestock

Residue from a Power Station

Industrial Harbor

Discarded Trash

