

California Native Grasslands Association: Learning About California Grasslands

Lesson Title: *Carbon Sequestration*

Grade level: High school

Lesson Length: 30-50 minutes

Preparation and Materials: Copies of worksheet, pencil

Lesson Goal: Students learn about the process of carbon sequestration, its importance, and how grasslands help to sequester carbon.

Lesson Description: Teacher can incorporate this lesson into sections on environmental issues and climate change, photosynthesis, or nutrient cycling. Students interpret the diagram and read the passage to answer questions. Teacher should guide students to help them understand more difficult concepts and vocabulary. Teacher can lead a discussion or provide a lecture on climate change to stress the importance of carbon sequestration.

Lesson Objectives: Students examine and interpret a conceptual diagram, and answer questions based on their understanding of the diagram and a passage. Students become familiar with vocabulary and application of terms pertaining to carbon cycling. Students learn why carbon sequestration is an important ecosystem service and how grasslands provide this service.

Lesson Background:

Global climate change is a major environmental issue, mainly caused by the burning of fossil fuels, which release carbon dioxide into the atmosphere. Carbon sequestration helps remove carbon from the atmosphere and stores it back in soils. Grassland ecosystems are typically carbon sinks, meaning that they remove more carbon from the atmosphere than they generate. Carbon sequestration by grasslands is particularly important in ameliorating climate change because grasslands cover a large portion of Earth's land (40.5%), and make up the second largest terrestrial carbon pool after forests (World Research Institute, "Grassland Ecosystems", 2000). Management and preservation of grasslands and rangelands can assist in climate change mitigation and provide other vital ecosystem services.

Vocabulary Words:

Biomass – tissue from living organisms.

Carbon sequestration – the process of removing carbon from the atmosphere and storing it underground.

Carbon sink – an ecosystem which stores more carbon than it releases into the atmosphere.

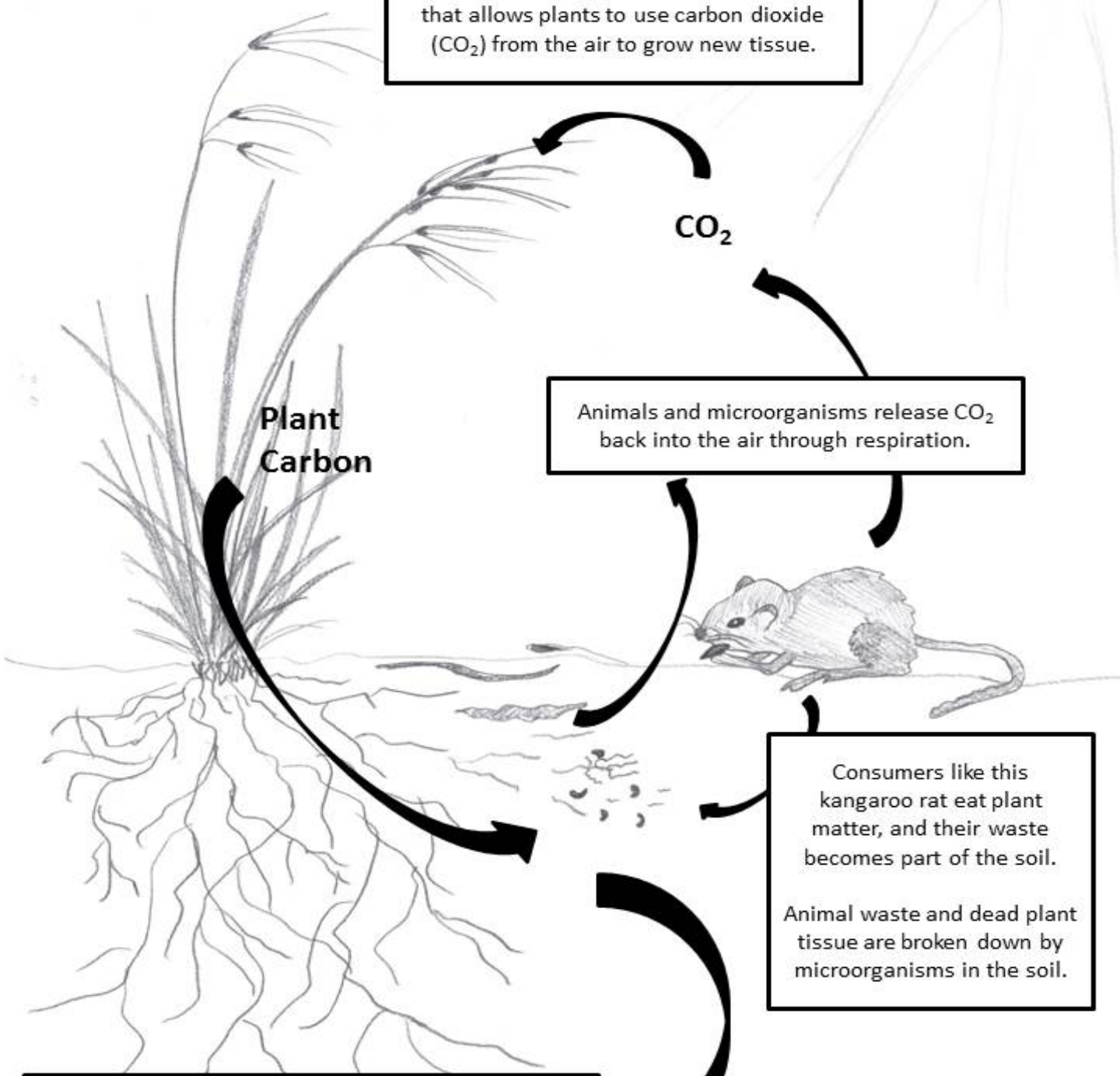
Ecosystem service – a naturally occurring environmental process that directly benefits humans.

Photosynthesis – the process by which plants use sunlight to acquire carbon from the atmosphere for growth.

Respiration (aerobic) – a process in which organisms use oxygen in a reaction to produce energy for themselves, creating carbon dioxide as a waste product.



Plants, like this purple needle grass, use sunlight to power photosynthesis, a process that allows plants to use carbon dioxide (CO₂) from the air to grow new tissue.



Animals and microorganisms release CO₂ back into the air through respiration.

Consumers like this kangaroo rat eat plant matter, and their waste becomes part of the soil.
Animal waste and dead plant tissue are broken down by microorganisms in the soil.

Some carbon from dead plant matter, waste material, and root excretions remains stored in the soil as organic matter and soil particles. This is called "carbon sequestration."

Carbon Sequestration Worksheet TEACHER'S KEY

1. What is photosynthesis?

The process by which plants use sunlight to acquire carbon from the atmosphere for growth.

2. From what source do plants get carbon?

Plants acquire carbon dioxide from the atmosphere.

3. Carbon from plants can either be transformed back into CO₂ in the atmosphere through a process called respiration, which is performed by microorganisms and animals, or it can be stored in the soil in a process known as carbon sequestration.

4. What is a “carbon sink”?

A carbon sink is an ecosystem which stores more carbon than it releases into the atmosphere.

5. What is an ecosystem service?

An ecosystem service is a naturally occurring environmental process that directly benefits humans.

6. Why is carbon sequestration important?

Carbon sequestration is important because it removes carbon from the atmosphere, which contributes to global climate change, and stores it in the soil.

7. How is carbon sequestration an ecosystem service?

Grasslands naturally sequester carbon from the atmosphere into soil. This benefits humans because reducing climate change is important for many reasons (these can be discussed as part of a complementary lecture or discussion), such as keeping earth's temperatures within the right range, preventing species extinctions, reducing sea level rise, preventing desertification, maintaining our current land uses such as agriculture and forestry, etc.

8. Why are grasslands important for carbon sequestration?

Grasslands store the second largest amount of carbon on land, and cover a large amount of earth's terrestrial surface.

