LESSON 5

Teacher Guide

Climate and the Forest
(90 Minute Lesson Plan)

THE CALIFORNIA FOREST FOUNDATION

This lesson can be completed in the classroom, or at home using teleconferencing (such as Zoom, Skype, Google Meet, Facetime, etc.) and/or shared documents (such as Google Docs) during group activities such as discussions and group projects. Sections requiring use of one of these remote-access tools have been marked (*). Before beginning this lesson, explain to your students how you would like them to participate in these group activities if your class will be completing the lesson at home.

Today's Topic: Climate and the Forest

NGSS 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Introduction to Climate and the Forest (10 minutes)*

Have students watch the video, Climate and the Forest. Ask students to make note of the different ways forests and climate are connected and how changes in one affect the other. Then, ask students to describe the role of carbon in the relationship between the climate and the forest.

Read and Respond

What Is Climate (5 minutes)

Students should complete the short reading to learn about what climate is and how it is related to the forest.

Carbon and Forests (5 minutes)

Students should complete the short reading to learn about the carbon cycle and how carbon moves through the forest.

Climate Variations (5 minutes)

Students should complete the short reading to learn about how forests adapt to changing climate conditions.

Earth's Spheres (5 minutes)

Students should complete the short reading to learn about the four spheres of Earth and how they interact with California forests.

Student Response (5 minutes)*

As students complete the passages, have them join a group discussion about what they learned. These can be small groups or the whole class, depending on your class size and needs. If completing this lesson in the classroom, you could also have the students break into short discussions after each reading rather than waiting until all readings are complete.

Possible discussion questions:

What Is Climate?

- What is the difference between climate and weather?
- How can a forest affect the local climate?
- How can albedo affect the climate?

Carbon and Forests

- Why are older trees better at sequestering and storing carbon than younger trees?
- How does the release of carbon from dead and harvested trees affect the surrounding forest?
- How could you argue that wood products are better for the environment than plastic products?

Climate Variations

- Why are healthy forests able to withstand changes in climate better than unhealthy forests?

Earth's Spheres

- Why is the atmosphere important to a forest?
- Why is the biosphere important to a forest?
- Why is the geosphere important to a forest?
- Why is the hydrosphere important to a forest?

Research

Who Owns and Manages California's Forest? (10 minutes)

Direct students to appropriate websites or texts to determine current percentages of California forest ownership, or provide this data for students to use to complete this section.

One such resource is Forest Research and Outreach from the University of California. This page is static, but is a good starting point to find additional information about the percentages of ownership. Another appropriate website could be the USDA.

Students should then complete the short reading on California's forest ownerships to learn more about how California's forests are owned by different groups of people with different needs.

California Forests and Earth's Spheres (15 minutes)

Have students research the relationship between the forest and Earth's spheres. They will use their research to create a model describing the interactions between the atmosphere, biosphere, geosphere, hydrosphere, and forest. They will use their models to explain what can happen when one of the spheres becomes unbalanced.

Next, direct students to perform online research about the relationship between Earth's spheres and the forest at the following websites:

- California Forest Foundation
- CalFire
- California Department of Parks and Recreation
- American Forests: Restoring California's Forests

- Science Findings: Climate Change and California
- University of California Agriculture and Natural Resources
- World Wildlife Fund

Students should think of ways that Earth's different spheres interact. They may come up with natural events (fog, rain storms, floods, fog, soil moisture, etc.) or think of human-created events (buildings, recreational activities, etc.) or some combination of both.

Making a Poster of Earth's Spheres

Making Models (5 minutes)

Students will take the information they learn and create a poster containing a model of the relationship between Earth's spheres. Then, have the students display their posters. Provide time for all classmates to read the posters. Encourage the students to discuss the similarities and differences between their model and their classmates' models. If time permits, you can have students make changes to their posters after the class discussion, if warranted.

Student models should include all four spheres, but can vary from student to student. Each model should be centered around forests.

What Did You Learn?

Assessment Questions (5 minutes)

Have students complete the following assessment questions to allow students to apply what they have learned. Note: correct answers are in bold; questions that are not multiple choice provide an example student response.

1. What kind of forest stores the most carbon over longer periods of time?

a. A forest that is primarily made of old trees
b. A forest that is primarily made of young trees
✓ c. **A forest that is a combination of young and old trees**
d. A forest that is very densely packed with any type of tree

2. Which phrase describes climate?

a. Day-to-day conditions of an area
b. Changing of conditions in an area
✓ c. **Typical conditions of an area**
d. Extreme conditions of an area

3. How can forests affect the climate? Select all that apply.

✓ a. **Carbon sequestration**
✓ b. **Transpiration**
c. High albedo
d. Underground water

4. Write two examples for what in the forest can be found in each of Earth's spheres.

Atmosphere **carbon dioxide, wind scattering leaves, oxygen, etc.**

Biosphere **trees, bushes, flowers, birds, insects, animals, etc.**

Geosphere **the rocks on the ground, the soil holding the trees in place, the minerals in the soil, etc.**

Hydrosphere **rain, moisture in the soil, underground water, water vapor, fog, clouds, etc.**

5. What is described in the carbon cycle?

a. Storage of carbon in forests
b. Flow of carbon throughout the atmosphere
c. Amount of carbon trees can absorb
✓ d. **Movement of carbon through the spheres**

Apply to the Real World

Group Activity: Discussion (20 minutes)*

Have students complete the group activity to promote the sharing of opinions and working together.

Explain to students that forests are important to the climate, not only for California but the world. By studying the relationship between carbon and California forests, you can better understand the role of forests in the climate.

Break the students into an even number of small groups, and assign each group to either Discussion 1 or Discussion 2. Instruct the students to discuss the prompt and write a one-page response. Once groups have completed their discussions and writings, bring the class back together so that each group can present their ideas. Encourage students to think about what each group presented and how their ideas can be incorporated into their own.

Discussion 1

Ask the students in this group what types of projects they could undertake for enhancing the capacity of forests and wood products to be able to better sequester carbon.

Discussion 2

Ask the students in this group how they would respond to a neighbor who thinks that forests that are left alone are the best for sequestering carbon. Have them write their arguments that allow them to illustrate that in the long run, managed forests, along with the use of biomass for fuel and wood products, actually store more carbon.