# 04 Earth Systems and Resources

Content Area: **Science**
Course(s): **AP Environment**
Time Period: **Semester 1**
Length: **2 weeks**
Status: **Published**

## Standards

| | |
|---|---|
| | Systems and System Models |
| | Patterns |
| | Stability and Change |
| | Cause and Effect |
| HS-ESS1 | Earth’s Place in the Universe |
| | Developing and Using Models |
| HS-ESS1-5 | Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. |
| HS-ESS1-6 | Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history. |
| HS-ESS2-1 | Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. |
| | Stability and Change |
| HS-ESS2-7 | Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth. |
| | Constructing Explanations and Designing Solutions |

## Enduring Understandings

Earth’s systems interact, resulting in a state of balance over time.

Earth scientists use the structure, sequence, and properties of rocks, sediments, and fossils, as well as locations of current and past ocean basins, lakes, and rivers, to reconstruct events in Earth's planetary history.

Most of the Earth’s atmospheric processes are driven by input of energy from the sun.

## Essential Questions

How does energy from the sun influence the weather?

How can plate tectonics phenomena be predicted?

## Knowledge and Skills

**Unit 4 Earth Systems and Resources**

### Topic 4.1 Plate Tectonics

#### Knowledge

- Convergent boundaries can result in the creation of mountains, island arcs, earthquakes, and volcanoes.
- Divergent boundaries can result in seafloor spreading, rift valleys, volcanoes, and earthquakes.
- Transform boundaries can result in earthquakes.
- Maps that show the global distribution of plate boundaries can be used to determine the location of volcanoes, island arcs, earthquakes, hot spots, and faults.
- An earthquake occurs when stress overcomes a locked fault, releasing stored energy.

#### Skills

- Explain how environmental concepts and processes represented visually relate to broader environmental issues.

### Topic 4.2 Soil Formation and Erosion

#### Knowledge

- Soils are formed when parent material is weathered, transported, and deposited.
- Soils are generally categorized by horizons based on their composition and organic material.
- Soils can be eroded by winds or water. Protecting soils can protect water quality as soils effectively filter and clean water that moves through them.

#### Skills

- Identify a research method, design, and/or measure used.

### Topic 4.3 Soil Composition and Properties

#### Knowledge

- Water holding capacity—the total amount of water soil can hold—varies with different soil types. Water retention contributes to land productivity and fertility of soils.
- The particle size and composition of each soil horizon can affect the porosity, permeability, and fertility of the soil.
- There are a variety of methods to test the chemical, physical, and biological properties of soil that can aid in a variety of decisions, such as irrigation and fertilizer requirements.
- A soil texture triangle is a diagram that allows for the identification and comparison of soil types based on their percentage of clay, silt, and sand.

#### Skills

- Describe an aspect of a research method, design, and/or measure used.

**Topic 4.4 Earth's Atmosphere**

**Knowledge**

- The atmosphere is made up of major gases, each with its own relative abundance.
- The layers of the atmosphere are based on temperature gradients and include the troposphere, stratosphere, mesosphere, thermosphere, and exosphere.

**Skills**

- Describe characteristics of an environmental concept, process, or model represented visually

**Topic 4.5**

**Knowledge**

- Global wind patterns primarily result from the most intense solar radiation arriving at the equator, resulting in density differences and the Coriolis effect.

**Skills**

- Explain relationships between different characteristics of environmental concepts, processes, or models represented visually: (In theoretical contexts and In applied contexts)

**Topic 4.6 Watersheds**

**Knowledge**

- Characteristics of a given watershed include its area, length, slope, soil, vegetation types, and divides with adjoining watersheds.

**Skills**

- Explain environmental concepts, processes, or models in applied contexts.

**Topic 4.7 Solar Radiation and Earth's Seasons**

**Knowledge**

- Incoming solar radiation (insolation) is the Earth's main source of energy and is dependent on season and latitude.
- The angle of the sun's rays determines the intensity of the solar radiation. Due to the shape of the Earth, the latitude that is directly horizontal to the solar radiation receives the most intensity.
- The highest solar radiation per unit area is received at the equator and decreases toward the poles.

- The solar radiation received at a location on the Earth's surface varies seasonally, with the most radiation received during the location's longest summer day and the least on the shortest winter day.
- The tilt of Earth's axis of rotation causes the Earth's seasons and the number of hours of daylight in a particular location on the Earth's surface.

**Skills**

- Describe characteristics of an environmental concept, process, or model represented visually.

**Topic4.8 Earth's Geography and Climate**

**Knowledge**

- Weather and climate are affected not only by the sun's energy but by geologic and geographic factors, such as mountains and ocean temperature.
- A rain shadow is a region of land that has become drier because a higher elevation area blocks precipitation from reaching the land.

**Skills**

- Explain relationships between different characteristics of environmental concepts, processes, or models represented visually.

**Topic 4.9 4.9 El Niño and La Niña**

**Knowledge**

- El Niño and La Niña are phenomena associated with changing ocean surface temperatures in the Pacific Ocean. These phenomena can cause global changes to rainfall, wind, and ocean circulation patterns.
- El Niño and La Niña are influenced by geological and geographic factors and can affect different locations in different ways.

**Skills**

- Describe environmental problems.

Make connections to other units by considering:

Earth's systems interact, resulting in a state of balance over time. Most of the Earth's atmosphere and its characteristics are due to energy from the sun.

Key vocabulary you need to know

| | | |
|---|---|---|
| Plate tectonics | Thermosphere | Ocean Current |
| Albedo | Exosphere | Ocean Conveyor Belt |

Troposphere

Stratosphere

Mesosphere

Tsunami

Plate boundary

Transform fault

Boundaries: convergent and divergent

Volcano

Atmosphere

El Nino/ ENSO

La Nina

Trade Winds

Coriolis Effect

Gyre

Soil

Leaching

Weathering

Soil Horizons: O, A,E, B, C, Bedrock

Permeability

Porosity

Rain Shadow

Headwaters

Climate

Weather

Earthquake

Soil texture: sand, silt, clay

Salinization

Desertification

Desiccation

Conservation Reserve Program

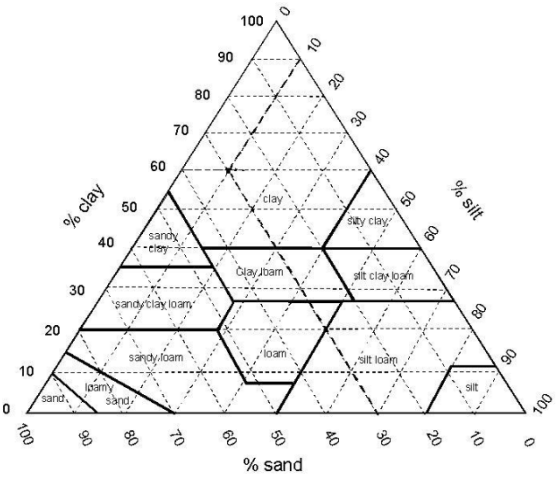
Watershed

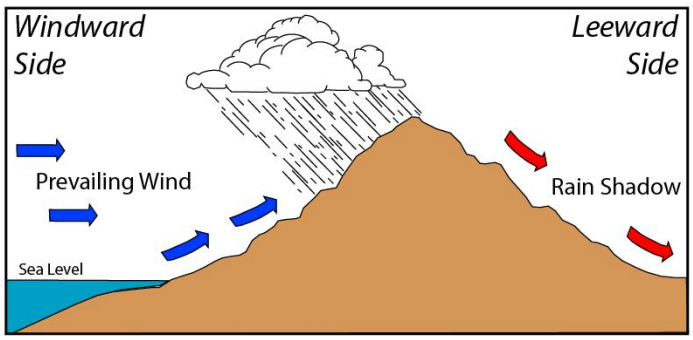
Solar Radiation/ Solar Insolation

Tributary

Floodplain

Figures/ Equations to know



## Transfer Goals

Explain how Earth systems impact the distribution of resources like soil and minerals.

Relate natural events to impacts on ecosystems or human populations

## Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing

## Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing