Earth's Systems Interactions

STEMscopes:
Earth has various systems working together to sustain life for the organisms that occupy it. Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes.

Standards that will be addressed:

- **5-ESS2-1:** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- **5-ESS2.A.1:** Earth Materials and Systems: Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

Remember to look at the Science tab on our class website for additional resources, information, and updates.

What's Included in the Packet:

1. Investigative Phenomena
2. STEMscopedia
3. Linking Literacy
    a. Categorize It
    b. Color Coded Notes
    c. Earth's Systems Comic Strip
4. Content Connection Videos:
    a. Weather Patterns
    b. Prevailing Winds
    c. Hurricanes
5. Science Today: What Do You Think?
6. Guided Practice: Card Sort
7. Independent Practice
    a. Mystery Word
    b. Alike and Different
8. Concept Attainment Quiz

Test Date: _____

Investigative Phenomena

Name: _____ Date: _____

Student Wondering of Phenomena:

Record your thoughts about the Student Wondering of Phenomena question in the boxes below.

Before Instruction	During Instruction (Refine your thoughts as you learn more throughout the scope.)	After Instruction

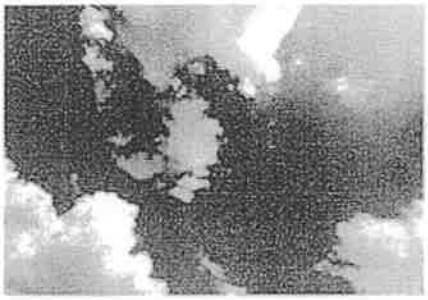
Reflect

Earth is our home. It has the right conditions for life. Besides sunlight, Earth has air, water, and land that work together to support life. In turn, life on Earth interacts with air, water, and land. Imagine for a moment that Earth was different.

- What would Earth be like if it weren't a rocky planet?
- What if Earth had no land?
- What if Earth did not possess an atmosphere?
- What if Earth had no water?

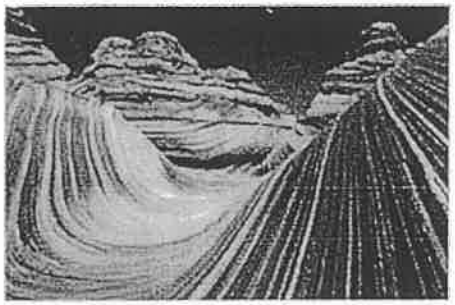
Earth materials and systems – Earth's major systems are the atmosphere (air), the hydrosphere (water and ice), the geosphere (solid and molten rock, soil, and sediments), and the biosphere (living things, including humans)

ATMOSPHERE



HYDROSPHERE

GEOSPHERE



BIOSPHERE

What is the atmosphere?

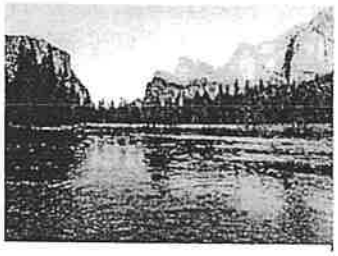
The atmosphere is the gaseous layer that surrounds Earth and makes life possible on our planet. This layer of gas protects us from some of the Sun's rays and provides us with breathable air. The atmosphere and the Sun's energy create the weather patterns on Earth. Earth's atmosphere is a mix of gases that is just right for supporting life!

What is the hydrosphere?

The hydrosphere is the system on Earth that contains all the ice and water. It includes both fresh water and salt water. It includes water in all states—gas (water vapor), liquid (water), and solid (ice).

Water in all states of matter are included in the hydrosphere.

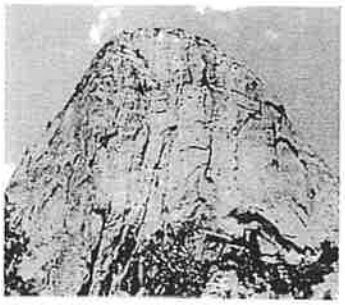
Freshwater bodies, such as lakes and rivers, help make up the hydrosphere. Tributaries that flow to the ocean as well as glaciers that melt into the ocean are also part of this hydrosphere system.

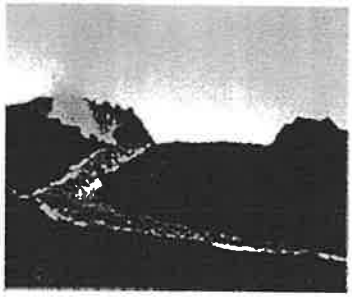


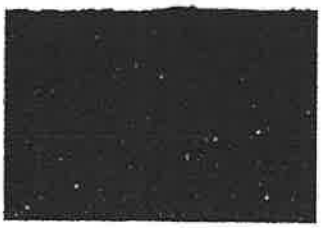
Rivers and lakes are two parts of the hydrosphere.

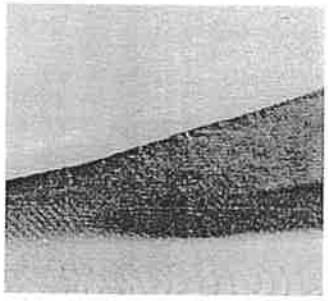
What is the geosphere?

The Earth's geosphere is made up of all the solid and molten rock, soil, and sediments found on the planet. You can't see all of our geosphere, because most of the solid and molten rock are found under Earth's surface. The ocean floor is also part of the geosphere, but it lies so far underneath Earth's oceans that few creatures ever get to see it. The geosphere can be very useful! We use soil to plant crops and make bricks. We use minerals from rocks to create a variety of products.



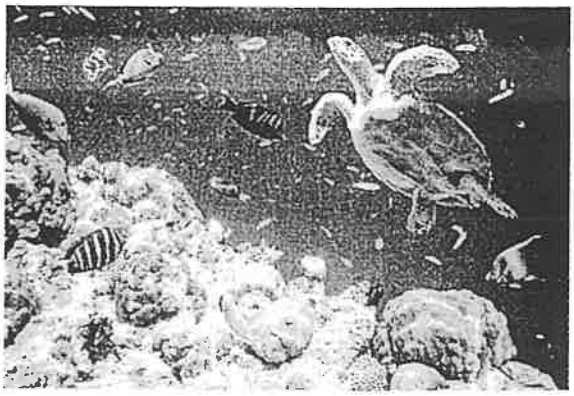






Mountains (solid rock), lava (molten rock), soil, and sand (sediment) are examples of the geosphere we can see. Most of the geosphere is under the surface of the land or water.

What is the biosphere?
The biosphere is the system on Earth that contains all livings things, including humans. Look at the ecosystem in the picture. What plants and animals do you see? Any plants and animals in an ecosystem are part of the biosphere.



What Do You Think?

How do Earth's systems interact?
Each system interacts with each other system in a variety of ways.

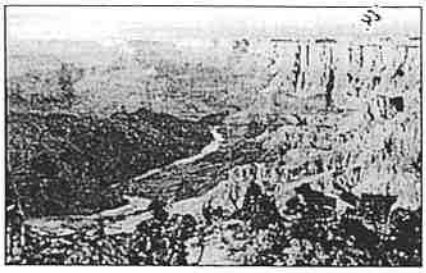
Look back at the ecosystem above. Do you see examples of any other systems in the picture?

Earth's systems cannot work all by themselves. These systems constantly interact! The plants and animals in the picture above depend on the water around them. What sphere includes animals? The biosphere! Which sphere includes water? The hydrosphere! The ocean supports a variety of ecosystems where different organisms live. This is an example of the hydrosphere and biosphere interacting!

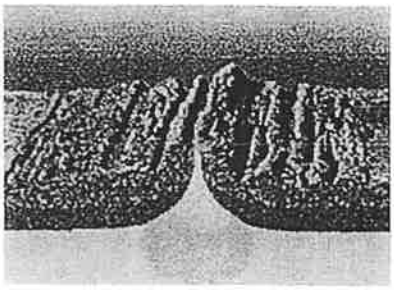
How do the atmosphere and biosphere interact?
Think about the variety of environments around the world. Some are hot and dry, some experience a lot of rain, and some are very cold. These environments have different climates. A climate is the average weather conditions of an area over a long period of time. Weather is the current conditions in the atmosphere, such as the temperature, air pressure, and precipitation. The conditions of the atmosphere over time influence the types of organisms that can live in a certain environment.

Reflect

How do the hydrosphere and geosphere interact?
The hydrosphere affects the geosphere by weathering and eroding rock and soil. This erosion is caused by precipitation, moving rivers, and ocean waves. Water can cool molten rock to form new land.



The Grand Canyon was formed by powerful forces of water as the Colorado River weathered and eroded the rock.



Ocean water cools the magma that seeps through the ocean floor, adding new land to Earth's surface.

The force of the ocean is especially powerful in shaping landforms. Tsunamis can change an entire landscape in minutes. Other waves and tides gradually shape landforms.

Tall mountains can cause one side of a mountain to receive tremendous rainfall while the other receives almost none—like the desert above.

The geosphere interacts with the hydrosphere by being a barrier to water in some areas of Earth. For example, tall mountains can block rainwater from reaching certain areas, creating deserts. This is called the *rain shadow effect.* The mountain is so tall that it pushes the rain cloud up high into the atmosphere. The cloud rises so far that the water vapor inside it condenses and falls to the ground as precipitation. The water is squeezed out of the cloud before it can pass to the other side of the mountain. This causes one side of the mountain to get plenty of rain while the other side stays dry.

Try Now

With all you have learned about all of Earth's interacting systems, can you guess which organism in the biosphere causes the most change in the hydrosphere, atmosphere, geosphere, and even the biosphere?

If you said "humans," you are right. Find a partner and take a moment to brainstorm all the ways that humans interact with each of Earth's systems.

Atmosphere	Hydrosphere	Geosphere	Biosphere

After you are finished, get together with another set of partners and share your lists. Discuss whether human interactions are mostly helpful or harmful and why.

Find a small group and play a card game to review Earth's systems. For materials, you will need four note cards of one color.

Instructions:

- On each of the four note cards of one color, write one of the following categories: **hydrosphere**, **atmosphere**, **geosphere**, and **biosphere**.
- Mix up the cards and place them facedown on a desk or table. Do this again between each turn.
- Take turns. When it is your turn, draw two cards. Then, depending upon the cards you drew, explain out loud how each of the two Earth systems interact. Be specific!
- Make sure you listen attentively to each person. The more you listen, the more you learn!

HYDROSPHERE ATMOSPHERE GEOSPHERE BIOSPHERE

Name: _____ Date: _____

Categorize It

Record how your class sorted the objects on the sticky notes. Use the examples you listed as a class to create your own description of each system below.

Biosphere	Hydrosphere
Examples: Description:	Examples: Description:
Atmosphere	**Geosphere**
Examples: Description:	Examples: Description:

Name: _____ Date: _____

Color Coded Notes

Directions: Use the note-taking guide to fill in definition, description, and characteristics of Earth's systems.

Define Geosphere:	Define Hydrosphere:
Geosphere Characteristics:	Hydrosphere Characteristics:
Define Biosphere:	Define Atmosphere:
Biosphere Characteristics:	Atmosphere Characteristics:

Linking Literacy

Name: _____ Date: _____

Earth's Systems Comic Strip

Use each box below to draw and describe one of Earth's systems. Be sure to include the hydrosphere, biosphere, geosphere, and atmosphere.

Content Connections Video

Name: _____ Date: _____

Weather Patterns

1. What was created high up in the Himalayan Mountains? (Pause 0:26)

_____

_____

_____

2. What kind of weather did the Himalayas cause for the deer? (Pause 0:35)

_____

_____

_____

3. Draw a picture of one kind of weather you saw in the video. (Pause 0:46)

Content Connections Video

Name: Date: Group:

Prevailing Winds

1. Hundreds of years ago what did people use to help them sail across the ocean? (Pause 0:17)

_____

_____

_____

_____

2. What are prevailing winds? (Pause 0:23)

_____

_____

_____

_____

3. What directions can prevailing winds travel? (Pause 0:44)

_____

_____

_____

_____

Content Connections Video

Name: Date: Group:

Hurricanes

1. Hurricanes can have wind speeds up to (Pause 0:40)

2. Hurricanes form over which oceans? (Pause 0:54)

3. How are hurricanes formed? (Pause 1:24)

4. Explain the Coriolis effect. (Pause 1:40)

5. When is a tropical storm considered a hurricane? (Pause 1:58)

6. Describe a hurricane form the air. (Pause 2:19)

7. Explain what happens when a hurricane hits land. (Pause 3:04)

Science Today

What Do You Think?

1. What happens to the ocean during an El Niño?

_____

_____

_____

2. Describe how this change in the ocean affects the typical weather in California.

_____

_____

_____

3. What two spheres are interacting when the ocean affects the weather?

_____

_____

4. Go back through the article. Highlight or underline every part where you notice two or more spheres interacting. Be sure to label which spheres are involved.

Guided Practice

Name: _____ Date: _____

Earth's Systems Card Sort

Organize the cards in the chart below so that each row represents one of Earth's spheres.

Sphere	Description	Interacts with . . .	. . . to Cause	Reasoning

Independent Practice

Part II: Mystery Word

Directions: Each column has a series of clue words. Read through each series to try to figure out the mystery word they all describe.

1. Clouds, condensation, ocean, rivers, glaciers, groundwater H _ _ _ _ _ _ _ _ _ _ E	6. Relationship, influence, erosion, dependence, change I _ _ _ _ _ _ _ _ _ N
2. Seasonal, temperature, average, weather, generally, yearly C _ _ _ _ _ E	7. Living, plant, animal, creature, life form, individual O _ _ _ _ _ _ M
3. Living, nonliving, interaction, biosphere, organisms E _ _ _ _ _ _ _ M	8. Atmosphere, heat, dryness, hourly, forecast, rain, wind, daily W _ _ _ _ _ R
4. Hill, mountain, lake, beach, island, waterfall, glacier L _ _ _ _ _ _ M	9. Earth, core, mantle, rocks, sediments, system G _ _ _ _ _ _ _ E
5. Forest, lake, pond, field, valley, air, water, organisms, system B _ _ _ _ _ _ _ E	10. Sky, gases, system, surrounding Earth, oxygen A _ _ _ _ _ _ _ _ E

Independent Practice

Name: _____ Date: _____

Part I: Alike and Different

Directions: Write how the pairs of words are alike and different.

1. Climate and weather

Alike: _____

Different: _____

_____

2. Ecosystem and biosphere

Alike: _____

Different: _____

_____

3. Landform and geosphere

Alike: _____

Different: _____

_____

4. Hydrosphere and atmosphere

Alike: _____

Different: _____

_____

5. Ecosystem and interaction

Alike: _____

Different: _____

_____

Concept Attainment Quiz

Name: _____ Date: _____

Part I: Vocabulary Matching

___ Sand or small pieces of rock broken down by weathering and deposited on the land or at the bottom of a body of water

___ Feature on the surface of Earth, such as a mountain, hill, dune, ocean, or river

___ Actions by one thing that have an effect on a different or separate thing

___ A community of living and nonliving things in their natural environment

A. Ecosystem

B. Interactions

C. Sediments

D. Landform

Part II: Identification

Use the word bank to fill in the blanks below.

Hydrosphere	Geosphere	Biosphere	Atmosphere

1. The river water from the _____ caused the rocks from the _____ to erode and form a canyon.

2. The _____ is not the only system that is affected when when a forest fire breaks out. Forest fires affect the atmosphere by releasing smoke and gas, and they affect the _____ by changing the numbers and types of living things that live in the affected area.