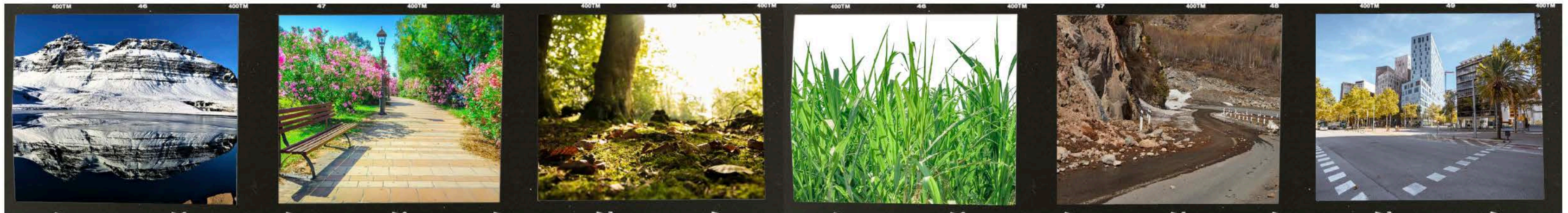




NASA Spotlight Interactive Lesson: Does Land Cover Matter?



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NASA Spotlite Interactive Lesson: Does Land Cover Matter?

What are NASA Spotlites?

NASA Spotlites are 90-120 second student-produced video segments that address common science misconceptions as determined by reputable assessment sources such as the National Assessment of Educational Progress (NAEP), National Science Foundation (NSF) Factual Knowledge Questions, and the Misconceptions-Oriented Standards-based Assessment Resources for Teachers (MOSART).

NASA Spotlites are designed to increase scientific literacy in a standards-based classroom. By producing Spotlite videos, students gain production experience, as well as deepen their understanding of science content. Approved NASA Spotlites can be found at the NASA eClips website.

<https://nasaclips.arc.nasa.gov/>



5E Lesson Model

NASA eClips™ Guides use the 5E constructivist model developed by Biological Sciences Curriculum Study. Constructivism is an educational philosophy that promotes student-centered learning where students build their own understanding of new ideas. The 5E instructional model consists of five stages for teaching and learning: Engage, Explore, Explain, Extend (or Elaborate), and Evaluate.



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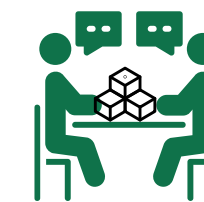
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NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Lesson Overview

Science Misconceptions

Land cover does not matter.
Land cover does not change.

Standards

Next Generation Science Standards

ESS2: Earth's Systems

ESS2A: Earth Materials and Systems

ESS2D: Weather and Climate

ESS3: Earth and Human Activity

ESS3.C Human impacts on Earth systems

Objective

As a result of watching Spotlight videos, learning the vocabulary collaboratively, and exploring how different surfaces absorb solar radiation and water, students will identify / describe the different types of land cover in their community and explain the role land cover plays in the Earth system.

Materials

Assessment

Per student:

- copy of pretest and posttest
- Frayer Model Activity

Per classroom:

- chart paper for posting final vocabulary definitions

Per small group:

- copy of a digital Frayer Model (alternatively, this can be printed)

Explore

For each group of students:

- infrared thermometer
- 2 plastic containers
- 2 wooden blocks or 2 blocks of clay of equal size that will fit in half of the plastic containers
- ice cubes
- water
- computers with internet access
- colored construction paper (black, white, green, yellow)

Safety

- Review digital citizenship before students use online resources.
- Make sure students wear safety goggles to protect their eyes.
- When outside for an extended period of time, make sure students protect their skin from UV rays.
- Stress and practice safe use of the infrared thermometer.

Target Vocabulary

Earth's energy balance
ecosystem
erosion
deposition
geosphere
landform
stewardship
temperature
topography
urban heat island
weathering

Time Frame

Between two and five 45-minute class periods:

Day 1 - Engage and Explore*

*Optional data collection over a week or more

Day 2 - Explain and Elaborate/Extend

Day 3 - Evaluate



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Background Information

All of Earth's systems are interdependent. A change in one of the spheres: atmosphere (air), hydrosphere (water), lithosphere (land- which includes soil or pedosphere,) and biosphere (life), can impact the other spheres.

Earth's surface includes the land, water and structures.

Surface temperature varies depending on the ground cover and the time of day.

Surface temperature affects all aspects of the Earth's Energy Budget.

Not all surfaces have the same temperature.

Surface temperature data can help us understand:

1. seasonal changes in Earth's surface;
2. rate of heat and moisture exchange between the atmosphere and Earth; and
3. the urban heat island effect.

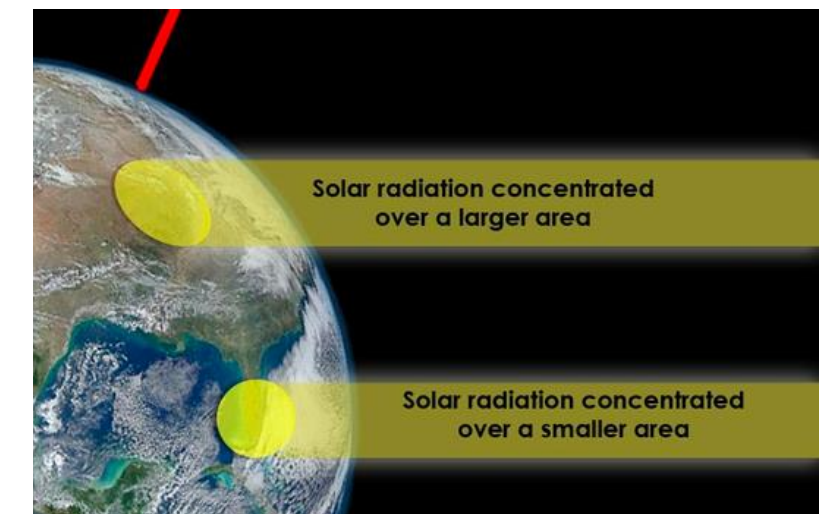
<https://observer.globe.gov/documents/19589576/85186c1d-2245-4471-88e0-7a215363637b>

Latitude determines the angles at which solar radiation hits the surface of Earth.

At higher and lower latitudes the Sun's rays are less direct. At or near the equator, the Sun's rays are more direct. Topography can affect climate by causing temperature variations due to the different elevations.

Water has a higher heat capacity (specific heat) than air, thus it heats and cools more slowly. Sudden increases or decreases of water temperature are unusual.

The climate of a region is described by the region's average precipitation and temperature.



<https://www.ces.fau.edu/nasa/module-3/why-does-temperature-vary/angle-of-the-sun.php>

<https://climatekids.nasa.gov/weather-climate/>



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Engage

Pre-assessment

Probe for students' prior knowledge using these pre-assessment tools.

1. Pretest items are located [at this link](#).
2. Essential questions
3. Class discussion questions

Essential Question(s)

What affect does land cover have on an area?
How do land surfaces change over time?

True or False?

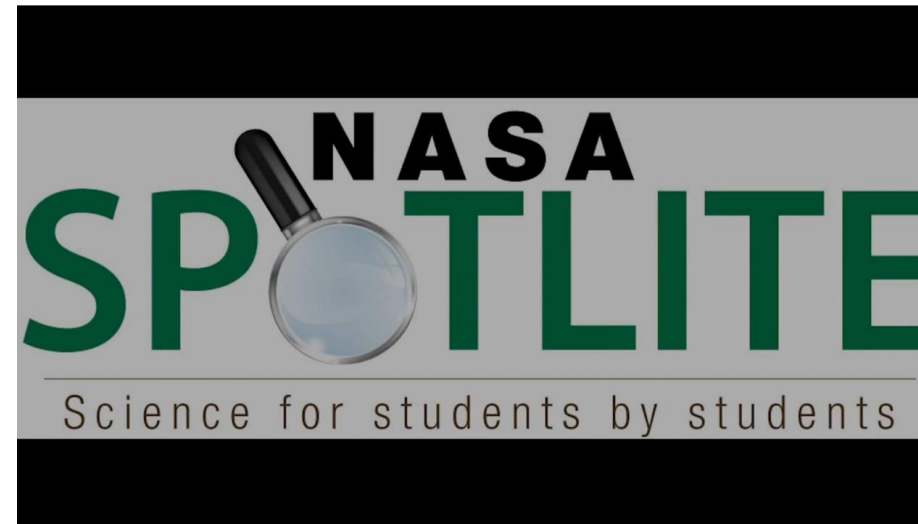
Land cover of an area does not matter.

Today's Lesson

In today's lesson you will learn that land cover is a part of the Earth system. As a result of watching Spotlight videos, learning the vocabulary collaboratively, and exploring how different surfaces absorb solar radiation and water, you will identify/describe different types of land cover in your community, and explain the role land cover plays in the Earth system.

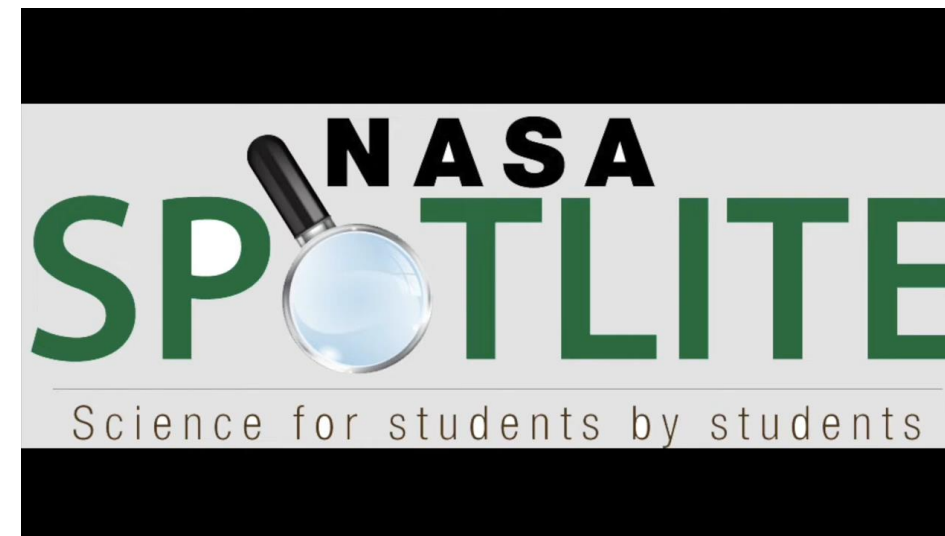
NASA Spotlight Videos

Watch these video clips about land cover. As you watch, identify a misconception about Earth's surface.



NASA Spotlight: Does Land Cover Matter

Link - <https://youtu.be/wMA8R-oD0uc>



NASA Spotlight: Why Land Cover Matters

Link - <https://youtu.be/qwZh0kuVsG8>

Class Discussion

- What do you already know about how the Sun's light warms Earth's surface?
- How is an area impacted by a change in the types of land surfaces?
- What role do humans play in changing the temperature of an area?

Recreate the demonstrations in the videos.

- What were your results? Were they the same as those in the video?



There are many places on Earth where you can find examples of different surfaces and the differences in temperature.

Visit the ["Climate Time Machine" interactive](#).

Study the series of visualizations.


- Do you notice any key climate indicators changing over time?
- Pay close attention to the Global Temperature Graph.
What is this color-coded map telling us about global surface temperatures since 1884?

Explore Activities


Guide learners to complete some activities to explore the characteristics of land cover and the impacts as a result of natural phenomena and human activity.

NASA Spotlight Interactive Lesson: Does Land Cover Matter? Explore

Activities
Complete some activities to explore characteristics of land cover and how natural phenomena and human activity affect it.



- **Be sure to wear eye and skin protection.**
- Wear safety goggles when working with liquids.
- Use sun screen to protect skin from UV rays.
- Use caution when collecting data and be mindful of your surroundings.
- Stay within approved areas and use the buddy system.



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NASA Spotlight Interactive Lesson: Does Land Cover Matter? Explore

Using an Infrared Thermometer

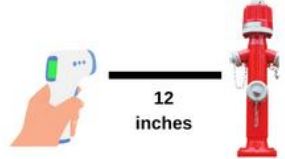
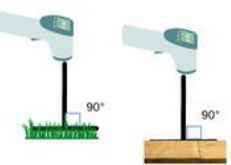
General Instructions

1. Allow 10 minutes for the infrared thermometer to adjust to the testing environment's ambient temperature.

2. Hold the thermometer perpendicular to the surface being measured.

3. Measure 12 inches away from the object to take the temperature of a 1-inch section. (Check the manufacturer's directions for distances.)

4. Press the button and hold until the temperature appears.

eClips

NASA Spotlight Interactive Lesson: Does Land Cover Matter? Explore

Activities
Complete some activities to explore characteristics of land cover and the impacts of natural phenomena and human activity.


Activity 1 - Taking Earth's Temperature
Investigate how sunlight warms different surfaces found in your ecosystem.

Locate different surfaces in your outside environment. Look for both natural and manufactured surfaces like bare soil, short grass, tall grass, concrete, asphalt, sand, forest litter, or other types of surfaces.

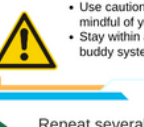
Record the temperature of the surface. Note the time of day and if the surface is in the shade or sun.

Repeat several times throughout the day or at the same time over several days.

Analyze your data. What does it mean? What conclusions can you make? Do you notice any patterns? How can you share the results?



- **Be sure to wear eye and skin protection.**
- Wear safety goggles when working with liquids.
- Use sun screen to protect skin from UV rays.
- Use caution when collecting data and be mindful of your surroundings.
- Stay within approved areas and use the buddy system.




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NASA Spotlight Interactive Lesson: Does Land Cover Matter? Explore

Activity 2 - Effects of Human Activity
Observe what happens to an area when it experiences growth nearly doubling from 790,000 people in 1991 to 1.4 million in 2010.

Go to the website [Climate.NASA.gov](https://climate.nasa.gov) and the Images of Change: [Urban growth, San Antonio, Texas.](https://climate.nasa.gov/images-of-change?id=312#312-urban-growth-san-antonio-texas)



Slide the curtain tool to reveal the land before and the land after the population changes.

Make observations.

- What does the bright green color indicate?
- What do the light tones represent?

eClips

Explore Activities Continued

NASA Spotlite Interactive Lesson: Does Land Cover Matter? Explore

Activity 3 - Effects of Natural Events
Use topographical maps to observe what happens to land when it experiences drought over a long period of time.

Go to the website [Climate.NASA.gov](https://climate.nasa.gov/images-of-change?did=317#317-lake-meredith-shrinkage-texas) and the [Images of Change: Lake Meredith shrinkage, Texas](https://climate.nasa.gov/images-of-change?did=317#317-lake-meredith-shrinkage-texas).

Slide the curtain tool to reveal the land before and the land after the long drought period.

Make observations.

1. What does the bright green color indicate?
2. What do the light tones represent?
3. What can you infer about the lake?
4. How will the change in land cover affect surface temperature?

<https://climate.nasa.gov/images-of-change?did=317#317-lake-meredith-shrinkage-texas>

NASA Spotlite Interactive Lesson: Does Land Cover Matter? Explore

Activity 4 - Sea Level Rise
Build simple models to demonstrate the differing impacts of melting land ice and sea ice on sea level rise.

Wear safety goggles when working with liquids.

Materials

- 2 plastic containers
- 2 wooden blocks or 2 blocks of clay of equal size that will fit in half of the plastic containers
- ice cubes
- water

Directions

1. Place a block of wood or clay in each plastic container.
2. Add 1 to 2 inches of water to each container. Use a marker to mark the water level of each container.
3. In one container put ice cubes on top of the block of wood or clay. Label it ice sheet.
4. In the other container put the same amount of ice cubes in the water. Label it iceberg.
5. After the ice has melted, compare the water levels and make note of any differences.

NASA Spotlite Interactive Lesson: Does Land Cover Matter? Explore

Think
about the question

Pair
to discuss with partners

Share
with the group

1
How did the activities demonstrate changes in land cover?.

2
Choose one or more of the activities and explain how the demonstration(s) debunk(s) the misconception.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Explain

Explore Activities

Let's compare answers.

Activity 1 - Taking Earth's Temperature

Investigate how sunlight warms the different surfaces found on Earth.

The Sun emits energy in the form of electromagnetic waves. We see part of the electromagnetic wave as light and we feel part of it as warmth. The Sun warms Earth's surfaces, but not all surfaces warm the same.

Land and Water

Solar radiation warms the land and water surfaces on Earth. Land surfaces absorb much more solar radiation than water. Many land surfaces are darker than water which results in more absorption of solar radiation and heat. Most solar radiation that reaches the surface of water is reflected back to the atmosphere. The land surface, which includes vegetation, retains more heat and warms more quickly than water.

Colors

Lighter colors reflect more of the sun's radiant energy. Darker colors absorb more sunlight than lighter colors, which is why darker colors get warmer more quickly in the sunlight than lighter colors.

The Urban Heat Island Effect

The air in urban areas can be 2 - 5°C (3.6 - 9°F) warmer than nearby rural areas. This is known as the heat island effect. It's most noticeable when there is little wind. An urban heat island can increase the magnitude and duration of a heat wave. It can also influence the weather, changing wind patterns, clouds, and precipitation.

What makes cities warmer? Many factors can influence the urban heat island effect. The changes to the land surfaces made in urban areas have a large impact on whether a heat island forms. Cities often have fewer trees than surrounding rural areas. The ground surfaces can heat up because they do not have the shade trees can provide. Dark colors on rooftops and pavement absorb more radiation, too. Tall buildings either reflect and absorb sunlight depending on the materials used in construction. Heat from the engines and exhaust of automobiles can contribute to the heat island effect. Evapotranspiration of plants occurs less in urban settings because there are less plants or vegetation. This process helps to cool the air.

How can people help? Some cities are using white or reflective materials for roofing and roads. More trees are being planted along city streets. Green roofs, which are living plants on rooftops, are being installed.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Explain

Explore Activities

Activity 2 - Effects of Human Activity

Observe what happens to an area when it experiences growth nearly doubling from **790,000 people in 1991 to 1.4 million in 2010.**

Military bases and airfields have contributed to the growth of San Antonio, Texas. The green spaces have significantly decreased.

Activity 3 - Effects of Natural Events

Observe what happens to land when it experiences drought over a long period of time.

"Lake Meredith is a reservoir formed by the Sanford Dam on the Canadian River in the Texas panhandle. Continuous drought has diminished water levels significantly in the past years, leading to a record low in 2011. In each image, the lake is the black feature near the center. Light tones at the lower end of the lake indicate dry land and former shores. Bright green areas indicate healthy vegetation along the river beds and irrigated fields in the upper center of each image. The nearby industrial area (a petroleum plant and a carbon-processing plant) appears as a dark spot. The light blue tone further east is Borger, Texas."

Excerpt from Global Climate Change: Images of Change, NASA

Activity 4 - Sea Level Rise

Build simple models to demonstrate the differing impacts of melting land ice and sea ice on sea level rise.

The melting glaciers on land are adding more water to Earth's oceans which contribute to sea level rise. Glaciers are large sheets of ice and snow that are found on land all year long.

As temperatures rise, glaciers melt faster than they accumulate new snow. As these ice sheets and glaciers melt, the water eventually runs into the ocean, causing sea level to rise.

Icebergs and frozen seawater also melt in warm temperatures but are not significant contributors to sea level rise. This is because they are already in the water. The volume of water they displace as ice is about the same as the volume of water they add to the ocean when they melt. As a result, sea level does not rise when sea ice melts.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Explain

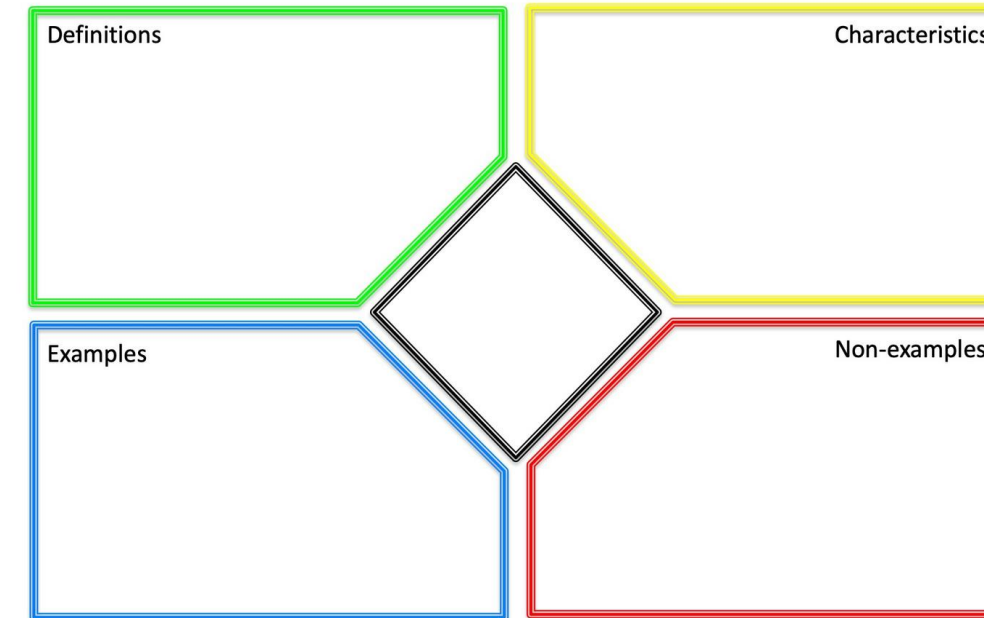
Vocabulary Development

It's almost impossible to learn science concepts without also learning vocabulary words. Vocabulary words help people discuss science concepts, so they're important. However, knowing vocabulary words is not the same as understanding science concepts. This section is designed to help your students do more than memorize definitions through connecting the vocabulary to the science concepts they have explored.

1. Place the term "ecosystem" in the center of the graphic organizer. ([Link to a fillable Frayer Model](#))
Facilitate a discussion with students exploring why this word is key vocabulary to this study.
2. Ask students to brainstorm **characteristics** of "ecosystem" and add responses to the area with the corresponding heading on the graphic organizer.
3. Ask students to continue their exploration as they research the topic using a variety of resources including their textbook and notes.
4. Next, ask students to add **examples** and **non-examples** in the Frayer Model. Emphasize the higher-level thinking skill of comparing and contrasting. How are the examples alike/different than the non-examples?
5. Using the information provided, ask students to develop their own **definition** of the term "ecosystem" that is clear and concise.
6. After completing the example together, assign a new vocabulary word to each group of students to work on collaboratively. The group will complete the Frayer Model graphic organizer using their assigned word.
7. Groups will share their Frayer Models and lead discussions to check for understanding of each vocabulary word. Refer to definitions in the Explain section. ([Link to Definitions](#))
8. Compile and post final definitions so all students have access for later reference.

Frayer Model for Vocabulary Development

Use the graphic organizer to write definitions, characteristics, examples and non-examples for a vocabulary word. You can include drawings, graphics, and diagrams.





NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Extend

Extend learning with these activities that provide opportunities for learners to apply new knowledge and skills acquired.

NASA Connection

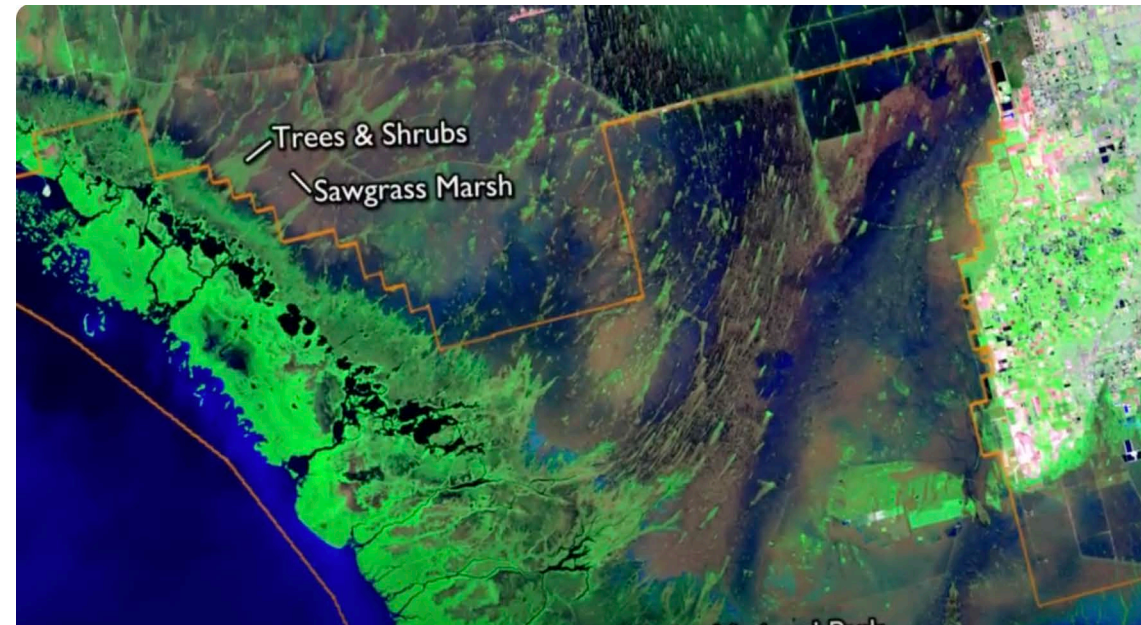


What is an Urban Heat Island?

What is the link between land cover and urban heat islands?

Peeling Back Landsat's Layers of Data

Watch this video to learn how NASA uses satellite data to help us learn more about Earth's surfaces.



Link - https://youtu.be/YP0et8l_bvY

Urban Heat Island and Temperature

Study the graph below. What can you infer about the land cover in each area?

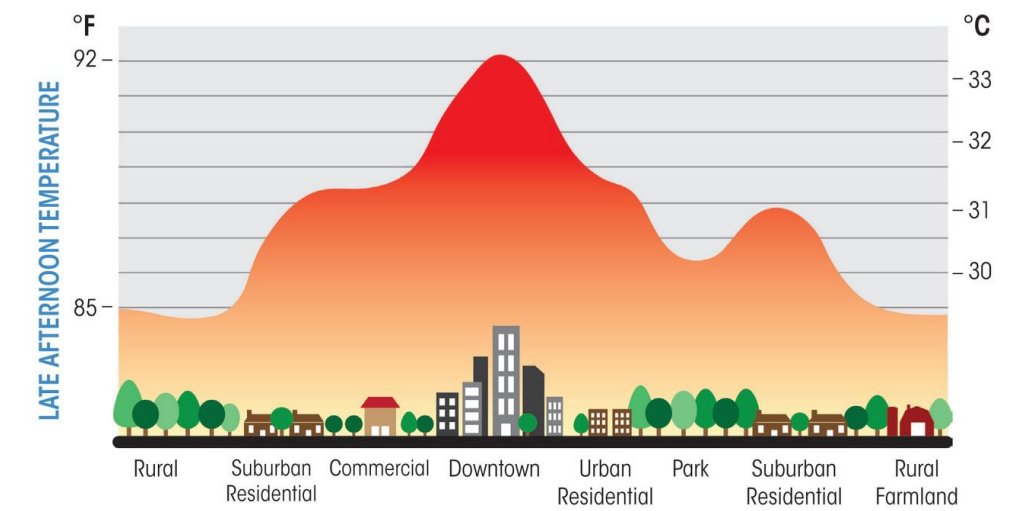


Image Credit: Meteo Zurich. (2015). <https://www.meteozurich.ch/?tag=urban-heat-island>



You are on a team challenged with developing a planned community.

What strategies would you need to follow to avoid creating a heat island?



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Evaluate

Post-Assessment

Check students' understanding with these activities.

1. Identify misconception
2. Discussion questions
3. Vocabulary Review
4. Post test items are [located here](#).

Identify Misconception

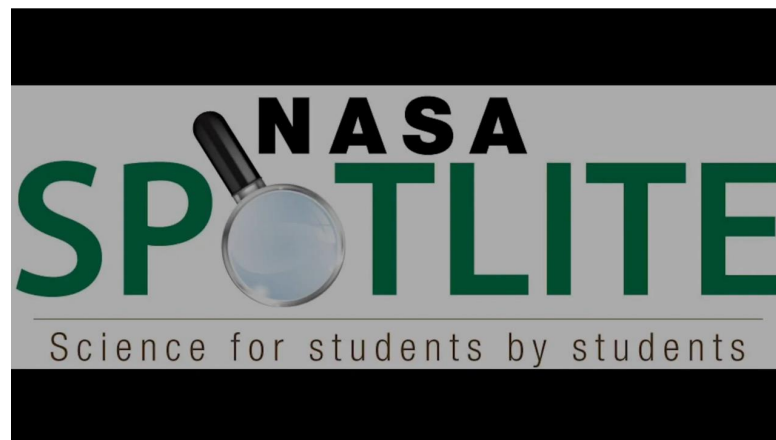
What is a common misconception people have about land cover?

Discussion Question(s)

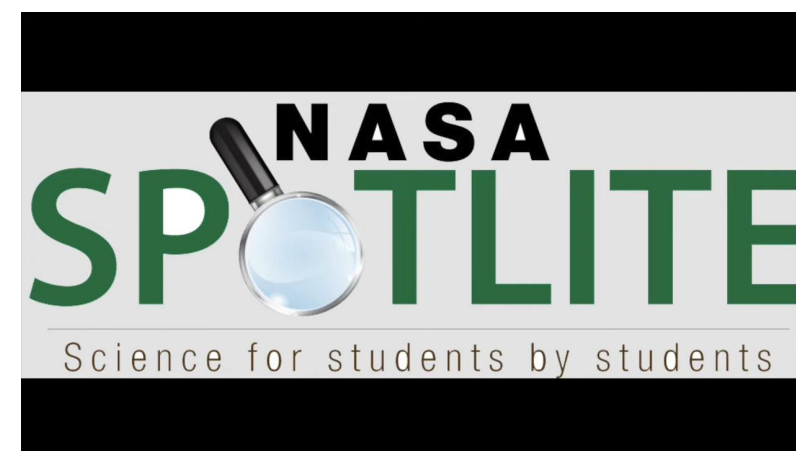
What effect does land cover have on an area?
How do land surfaces change over time?

NASA Spotlight Videos

Re-watch the video clips about land cover. How did your explorations of the topic confront the misconceptions presented in the videos?



NASA Spotlight: Does Land Cover Matter
Link - <https://youtu.be/wMA8R-oD0uc>



NASA Spotlight: Why Land Cover Matters
Link - <https://youtu.be/qwZh0kuVsG8>

Vocabulary Review

Select a claim about land cover. Using your new vocabulary words and knowledge about land cover create a poster that supports your claim.

NASA Spotlight Video Design Challenge: Land Detectives

The challenge: As NASA Land Detectives, you are challenged to gather and share evidence to confront misconceptions about Earth's land cover. Land cover is what is on Earth's surface, such as trees, grass, pavement, and buildings.

STEP 1: Select the misconception you will investigate.

STEP 2: Choose one CLAIM to refute or disprove one misconception.

Misconception 1: Land cover doesn't change.
Claim 1: Human activity can change land cover.
Claim 2: Natural phenomena can change land cover.
Claim 3: Land cover can change slowly or quickly.

Misconception 2: The land cover of an area doesn't matter.
Claim 1: Habitats are impacted by land cover.
Claim 2: Communities are impacted by land cover.
Claim 3: Land cover influences the water cycle.
Claim 4: Land cover influences temperature.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Evaluate

Pretest & Posttest Answer Key

Table AT-ST-5: Surface Temperature Readings (°C) at Areas with Different Types of Land Cover

Land Cover	Observation Spots			
	1	2	3	4
Grass	27.5	30.0	28.5	29.0
Asphalt	35.5	33.5	33.5	34.0
Cement	32.0	33.0	32.0	33.5
Bare Soil	30.0	31.0	33.0	31.5

1. What can you conclude from the surface temperature readings data table?

- A) The temperature of the bare soil did not change between observation spots.
- B) The grass had the highest temperature while the cement had the lowest.
- C) Both asphalt and cement temperatures increased among the spots.
- D) **The asphalt had the highest temperature while the grass had the lowest. *****

2. Which is more likely to have higher temperatures due to the urban heat island effect?

- A) **city with paved streets, lots of buildings, and little green spaces *****
- B) rural area with lots of green spaces
- C) farms and parks
- D) suburban residential

3. What is sea ice?

- A) Ice that forms on rivers
- B) **Ice that forms on the surface of the ocean *****
- C) Ice that forms in glaciers

4. Climate refers to the average state of the atmosphere

- A) **over a long period of time. *****
- B) at a specific time and place.
- C) at a specific temperature.
- D) over a short period of time.

5. What can contribute to the creation of a heat island?

- A) too many trees
- B) **many surfaces that absorb solar radiation *****
- C) many surfaces that reflect solar radiation
- D) lots of green spaces

6. What can be a consequence of melting ice in the polar regions?

- A) Increased habitat for polar bears
- B) More stable weather patterns
- C) **Rising sea levels and coastal flooding. *****

7. Which statement heat absorption is correct?

- A) **Black absorbs heat the best. *****
- B) White absorbs heat the best.
- C) Black reflects heat the best.
- D) White and black reflect heat equally.

8. What type of map shows the land cover or surface feature of an area?

- A) **topographic map. *****
- B) relief map
- C) population map
- D) political map

9. What is an urban heat island?

- A) A special type of park in the city
- B) An area in the city with a lot of snow and ice
- C) **A place in the city where it's hotter than the surrounding areas *****

10. A change to one of Earth's systems will affect:

- A) **All other spheres *****
- B) No other spheres
- C) Only one other sphere
- D) It is impossible to tell



NASA Spotlite Interactive Lesson: Does Land Cover Matter?

Engage



True or False?

Land cover of an area does not matter.





NASA Spotlite Interactive Lesson: Does Land Cover Matter?

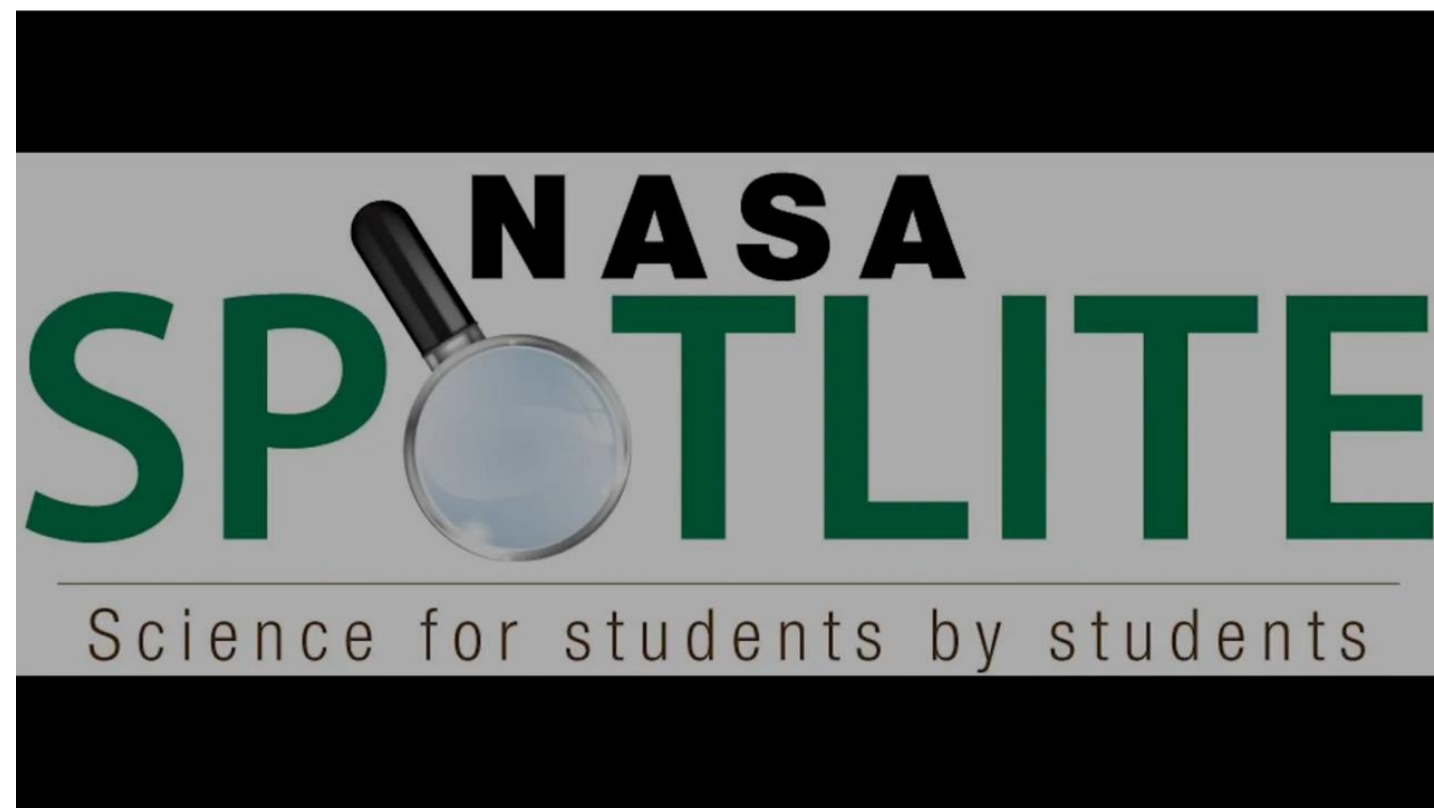
Engage

Today's Lesson

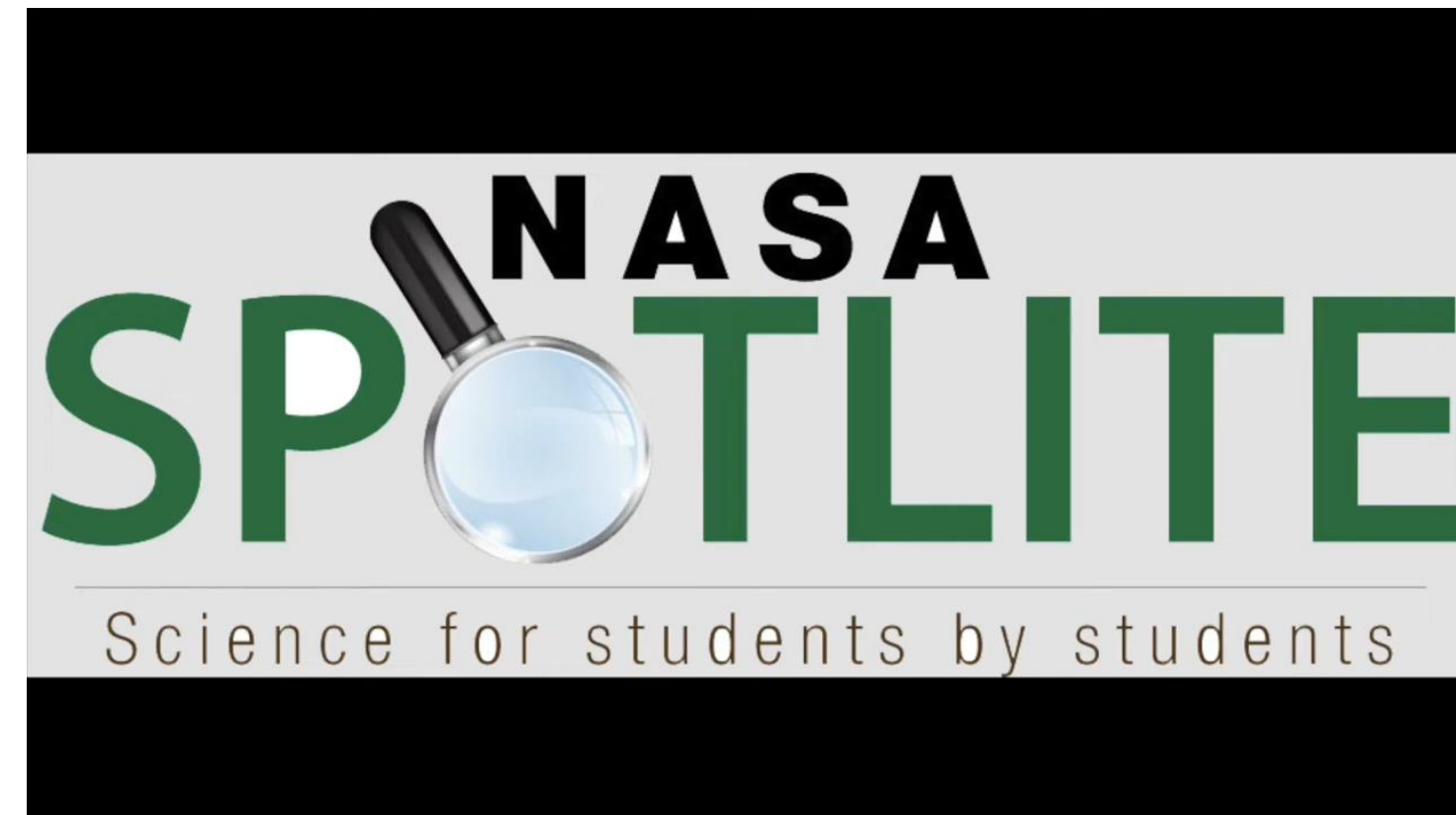
In today's lesson you will learn that land cover is a part of the Earth system. As a result of watching Spotlite videos, learning the vocabulary collaboratively, and exploring how different surfaces absorb solar radiation and water, you will identify and describe different types of land cover in your community and explain the role land cover plays in the Earth system.

NASA Spotlite Videos

Watch these video clips about land cover. As you watch, identify a misconception about Earth's surface.



NASA Spotlite: Does Land Cover Matter
Link - <https://youtu.be/wMA8R-oD0uc>



NASA Spotlite: Why Land Cover Matters
Link - <https://youtu.be/qwZh0kuVsG8>



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Engage



Class Discussion

- What do you already know about how the Sun's light warms Earth's surface?
- How is an area impacted by a change in the types of land surfaces?
- What role do humans play in changing the temperature of an area?



Recreate the demonstrations in the videos.

- What were your results?
- Were they the same as those in the video?

There are many places on Earth where you can find examples of different surfaces and differences in temperature.

Visit the [“Climate Time Machine” interactive.](#)



Study the series of visualizations.

- Do you notice any key climate indicators changing over time?
- Pay close attention to the Global Temperature Graph. What is this color-coded map telling us about global surface temperatures since 1884?



NASA Spotlite Interactive Lesson: Does Land Cover Matter?

Explore

Activities

Complete some activities to explore characteristics of land cover and how natural phenomena and human activity affect it.



- **Be sure to wear eye and skin protection.**
- Wear safety goggles when working with liquids.
- Use sunscreen to protect skin from UV rays.
- Use caution when collecting data and be mindful of your surroundings.
- Stay within approved areas and use the buddy system.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Explore

Activities

Complete some activities to explore characteristics of land cover and how natural phenomena and human activity impact it.



Activity 1 - Taking Earth's Temperature

Investigate how sunlight warms different surfaces found in your ecosystem.



Locate different surfaces in your outside environment. Look for both natural and manufactured surfaces. Examples include bare soil, short grass, tall grass, concrete, asphalt, sand, forest litter, or other types of surfaces.



Record the temperature of the surface using an infrared thermometer. Note the time of day and if the surface is in the shade or sun.



Repeat several times throughout the day or at the same time over several days.



Analyze your data.
What does it mean?
What conclusions can you draw?
Do you notice any patterns?
How can you share the results?

- **Be sure to wear eye and skin protection.**
- Wear safety goggles when working with liquids.
- Use sun screen to protect skin from UV rays.
- Use caution when collecting data and be mindful of your surroundings.
- Stay within approved areas and use the buddy system.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Explore

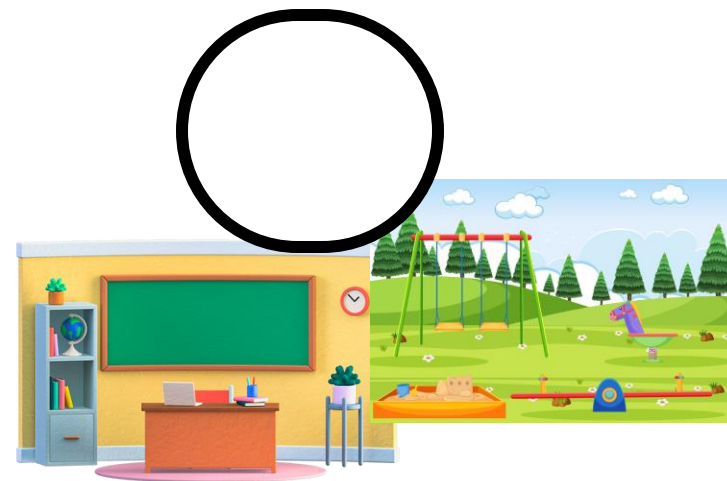
Using an Infrared Thermometer



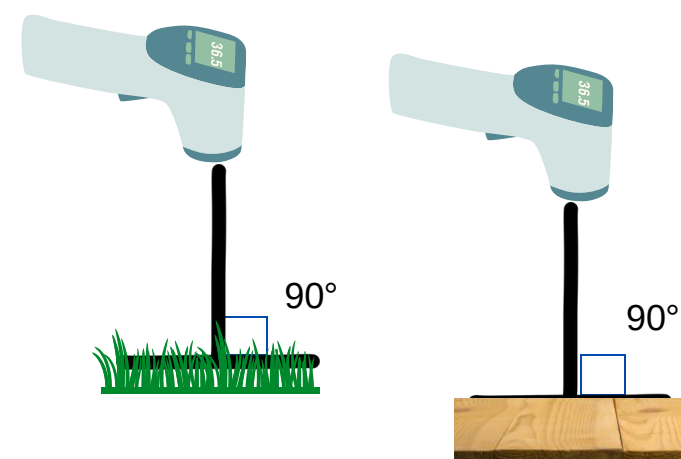
**Check the manufacturer's instructions for use and care of the infrared thermometer.

General Instructions

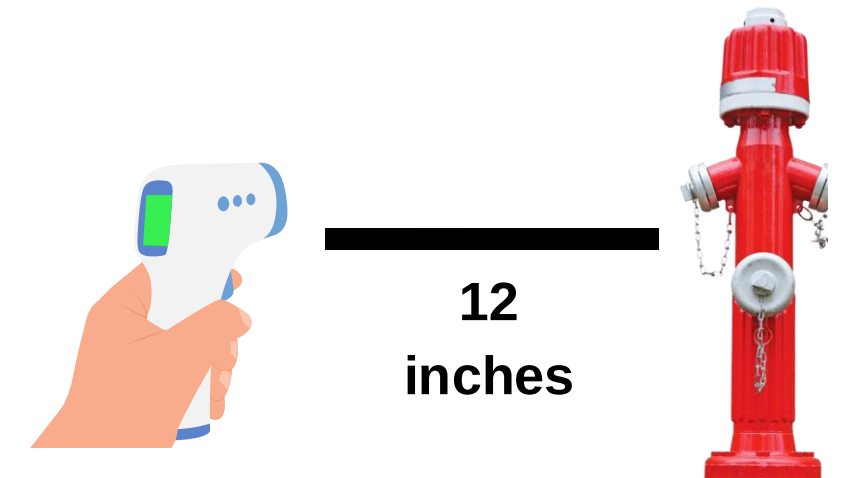
1. Allow 10 minutes for the infrared thermometer to adjust to the testing environment's ambient temperature.



2. Hold the thermometer perpendicular to the surface being measured.



3. Measure 12 inches away from the object to take the temperature of a 1-inch section. (Check the manufacturer's directions for distances.)



4. Press the button and hold until the temperature appears.





NASA Spotlite Interactive Lesson: Does Land Cover Matter?

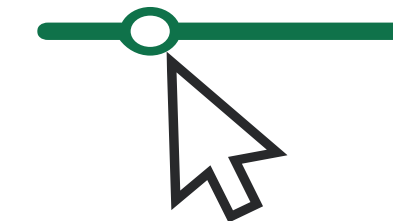
Explore

Activity 2 - Effects of Human Activity

Observe what happens to an area when it experiences growth nearly doubling from 790,000 people in 1991 to 1.4 million in 2010.



Go to the website [Climate.NASA.gov](https://climate.nasa.gov) and the Images of Change: [Urban growth, San Antonio, Texas.](#)



Slide the curtain tool to reveal the land before and the land after the population changes.



Make observations.

- What does the bright green color indicate?
- What do the lighter tones represent?

<https://climate.nasa.gov/images-of-change?id=312#312-urban-growth-san-antonio.-texas>



NASA Spotlite Interactive Lesson: Does Land Cover Matter?

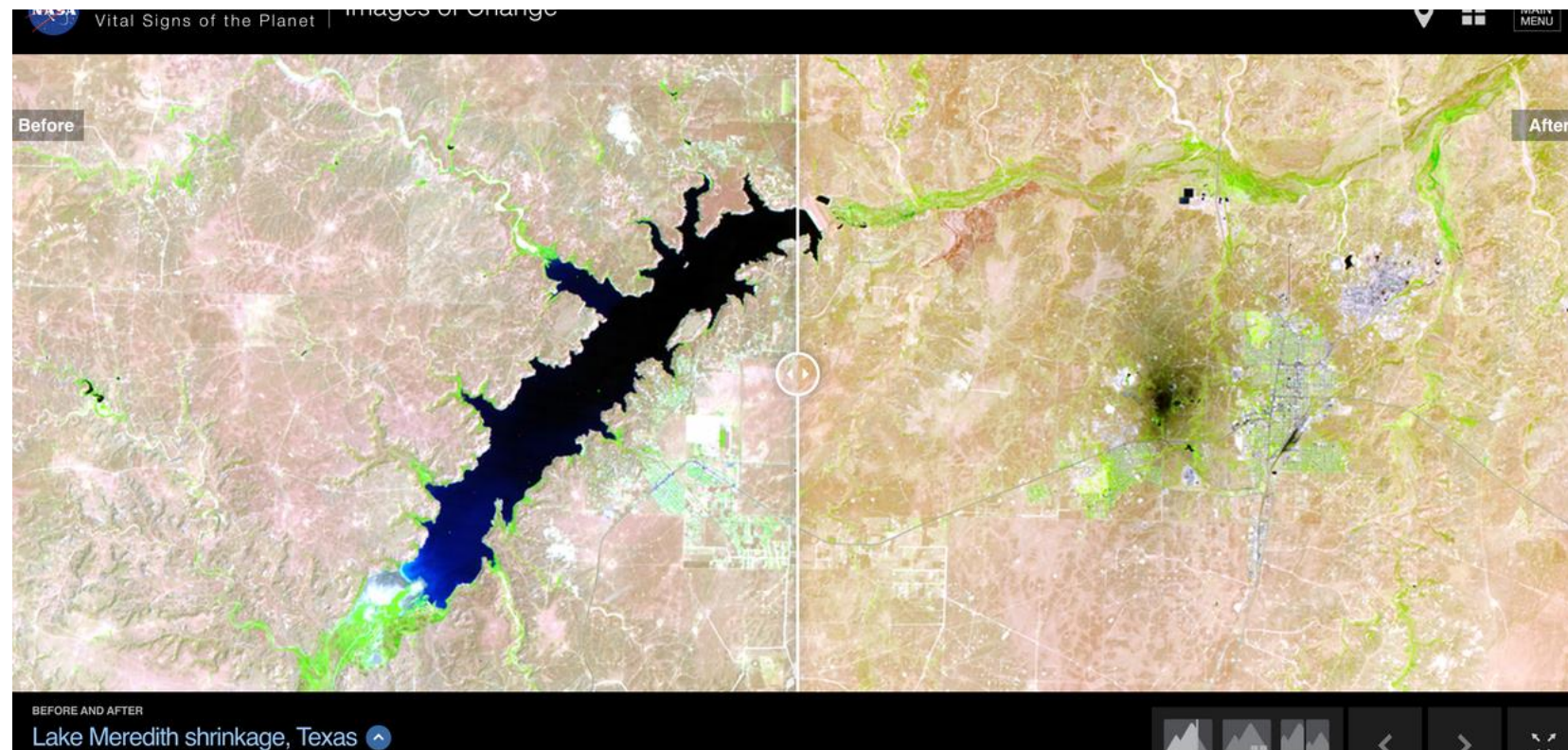
Explore

Activity 3 - Effects of Natural Events

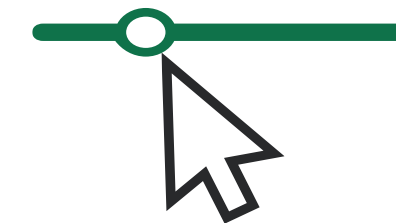
Use topographical maps to observe what happens to land when it experiences drought over a long period of time.



Go to the website [Climate.NASA.gov](https://climate.nasa.gov/images-of-change) and the [Images of Change: Lake Meredith shrinkage, Texas.](#)



<https://climate.nasa.gov/images-of-change?id=317#317-lake-meredith-shrinkage-texas>



Slide the curtain tool to reveal the land before and the land after the long drought period.



Make observations.

1. What does the bright green color indicate?
2. What do the lighter tones represent?
3. What can you infer about the lake?
4. How will the change in land cover affect surface temperature?

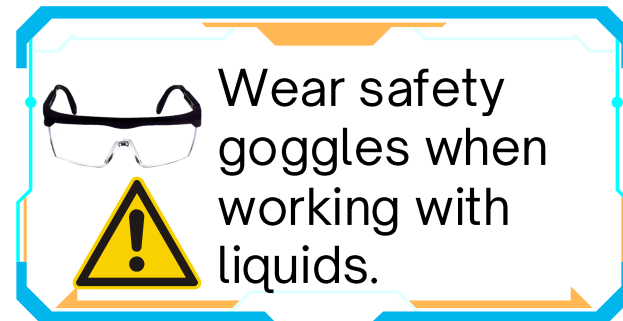


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Explore

Activity 4 - Sea Level Rise

Build simple models to demonstrate the impacts of melting land ice and sea ice on sea level rise.

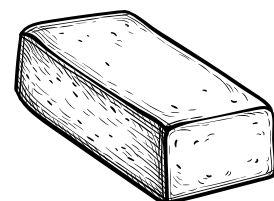


Materials

- 2 plastic containers
- 2 wooden blocks or 2 blocks of clay of equal size that will fit in half of the plastic containers
- ice cubes
- water

Directions

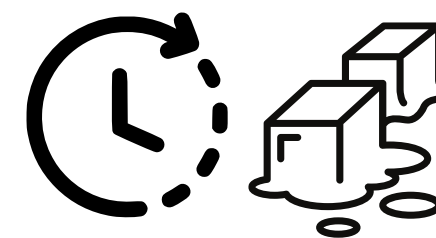
1. Place a block of wood or clay on one end of each plastic container.



2. Add 1 to 2 inches of water to each container. Use an erasable marker to mark the water level of each container.



3. In one container put ice cubes on top of the block of wood or clay. Label it ice sheet.
4. In the other container put the same amount of ice cubes in the water. Label it iceberg.



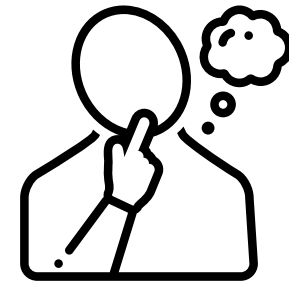
5. After the ice has melted, compare the water levels and make note of any differences.





NASA Spotlite Interactive Lesson: Does Land Cover Matter?

Explore



Think

about the question



Pair

to discuss with partners



Share

with the group

1

How did the activities demonstrate changes in land cover?

2

Choose one or more of the activities and explain how the demonstration(s) debunk(s) the misconception.

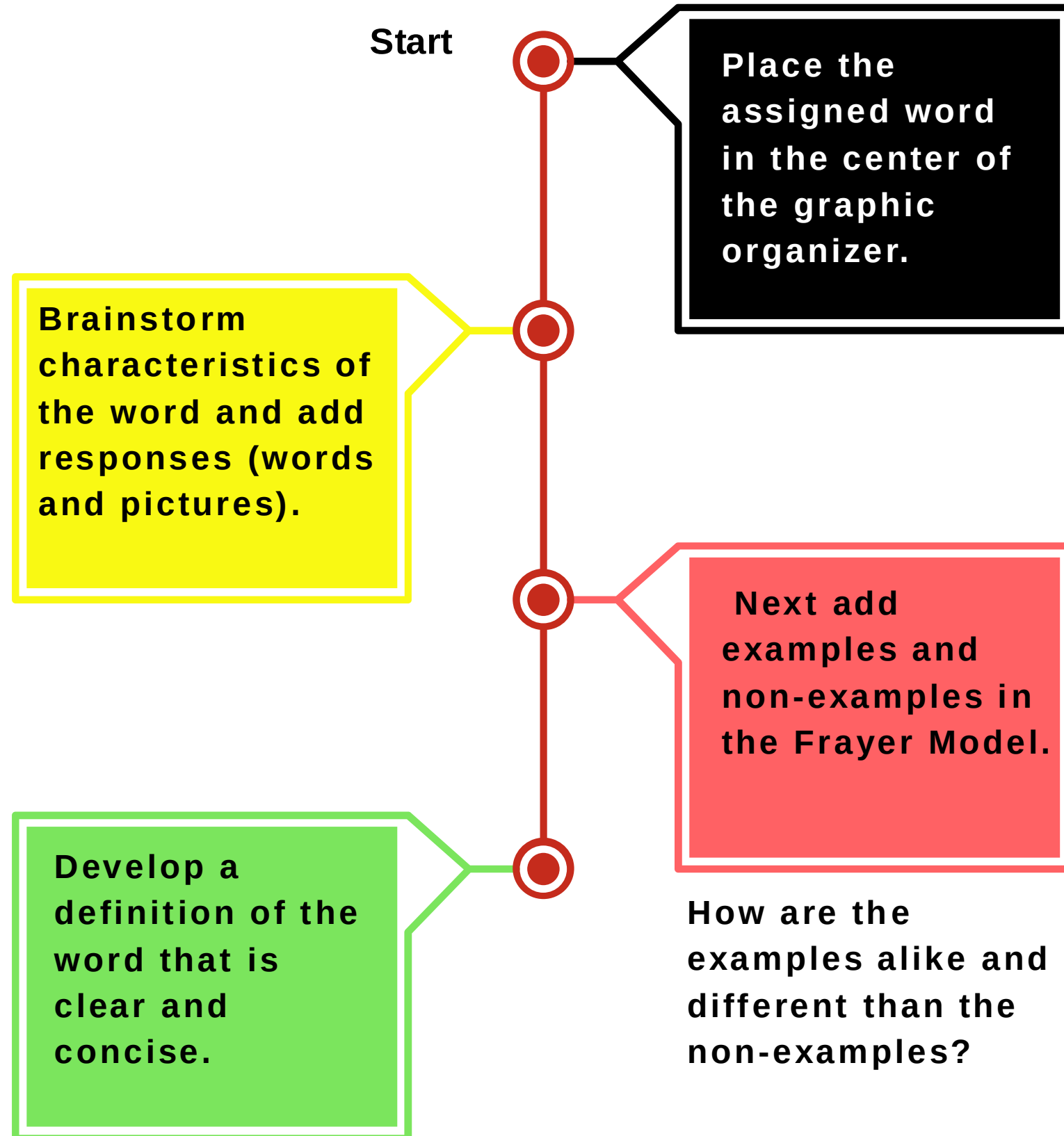


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Explain

Vocabulary Development

It's almost impossible to learn science concepts without also learning vocabulary words. Vocabulary words help people discuss science concepts.





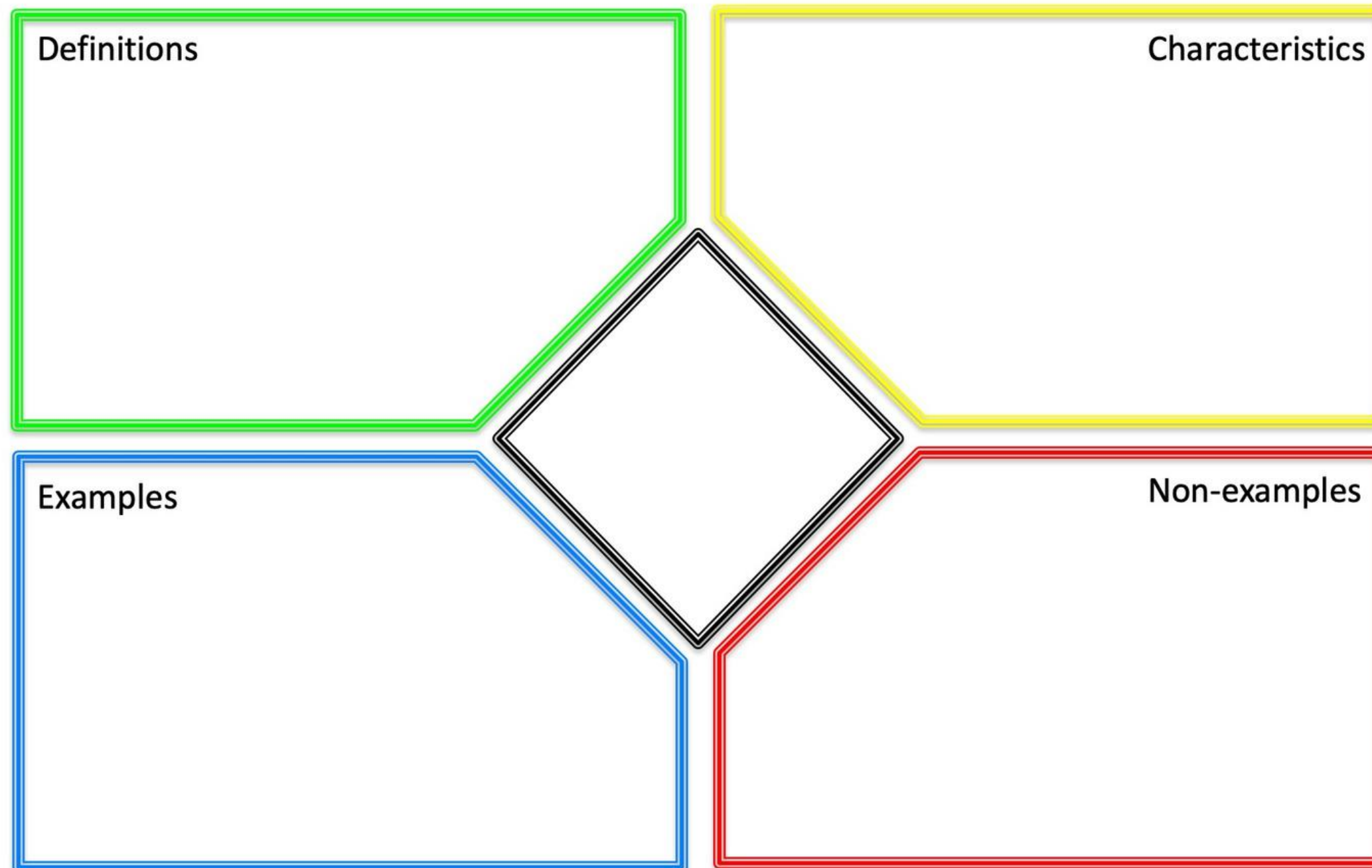
NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Explain

Complete a Frayer Model with your group using your assigned word and fill in the graphic organizer. We will share some as a class.

Frayer Model for Vocabulary Development

Use the graphic organizer to write definitions, characteristics, examples and non-examples for a vocabulary word. You can include drawings, graphics, and diagrams.



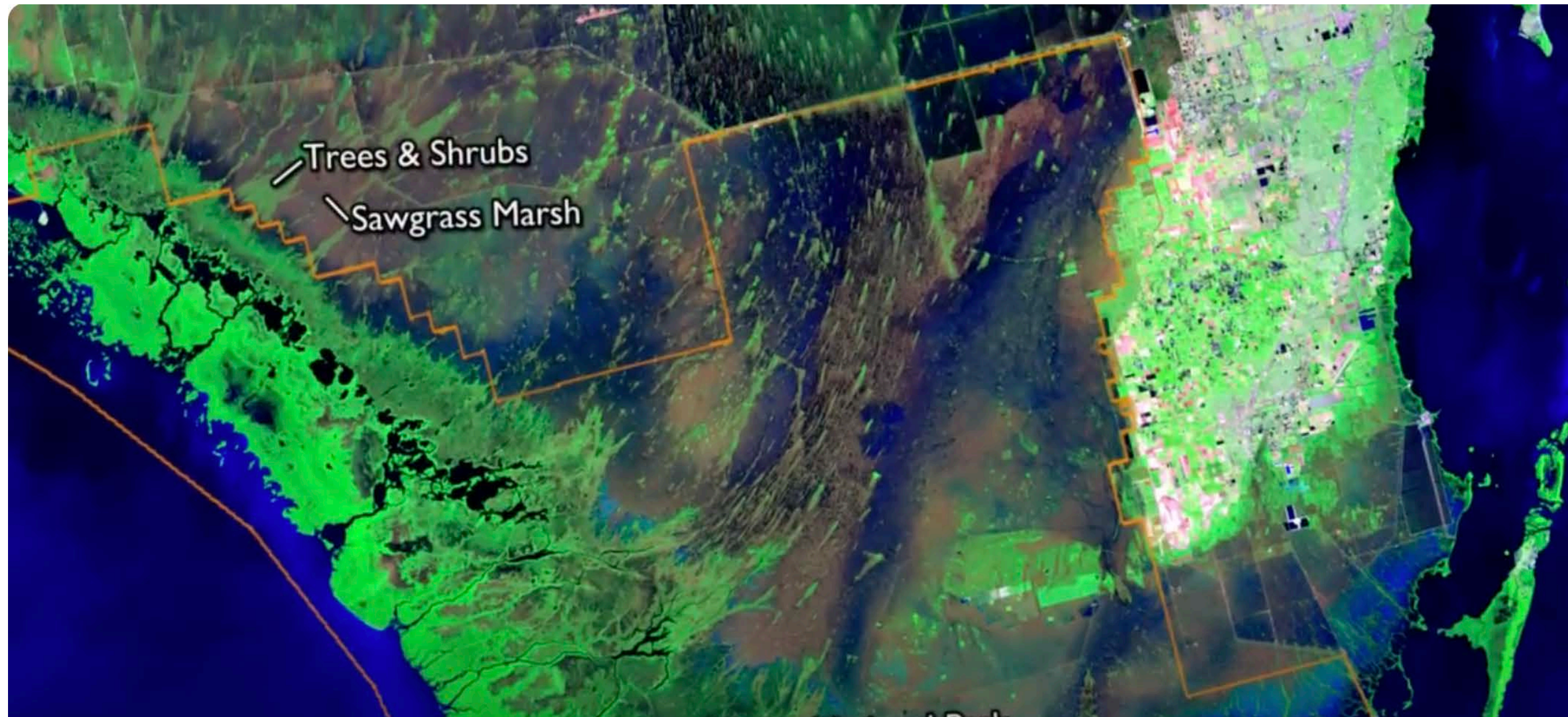


NASA Spotlite Interactive Lesson: Does Land Cover Matter?

Explain

Peeling Back Landsat's Layers of Data

Watch this video to learn how NASA uses satellite data to help us learn more about Earth's surfaces.



Link - https://youtu.be/YP0et8I_bvY



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Explain

Vocabulary Words

absorption- the process by which one substance soaks into or is taken in by another substance

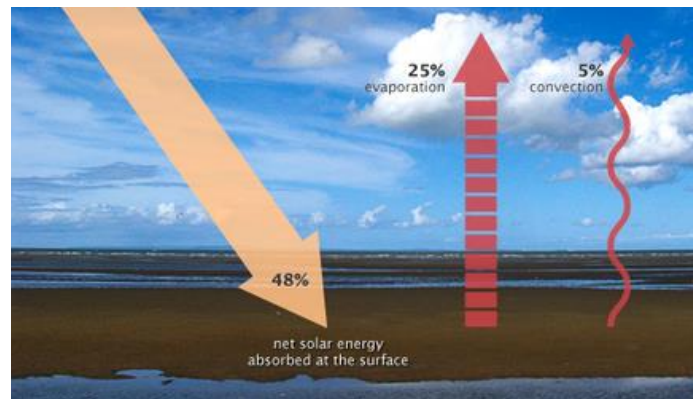
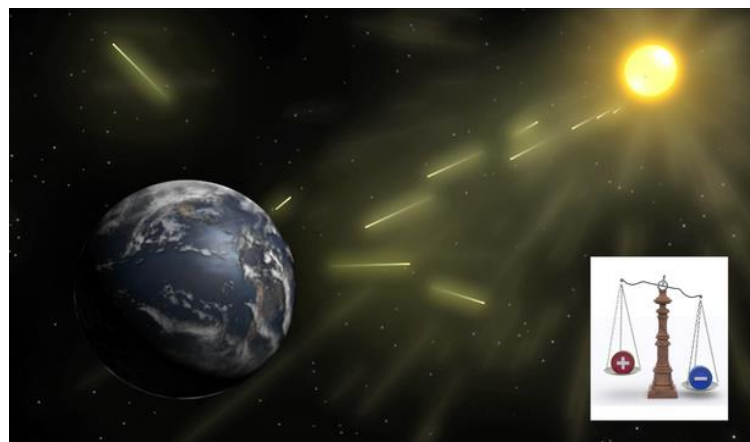


Image Credits: NASA

Earth's energy balance - the tracking of how much energy is flowing into and away from Earth, where the energy is going, and if the energy coming in balances the energy going out. The energy balance determines the climate of the Earth.



erosion -the gradual destruction and removal of rock or soil in a particular area by rivers, the sea, weather, or wind



sea ice - frozen ocean water that forms, grows, and melts entirely in the ocean



topography - the detailed mapping of the features of an area



ecosystem -all the living and nonliving parts of an organism's home



satellite data- information about Earth, the Moon, or planets that is collected by orbiting artificial instruments



Image Credits: NASA / Jesse Kirsch

urban heat island - occurs when a city (urban area) experiences much warmer temperatures than nearby rural areas

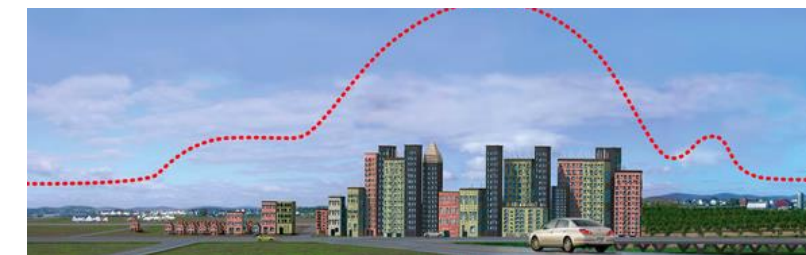


Image Credits: NASA



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Extend

NASA Connection



What is an Urban Heat Island?

What is the link between land cover and urban heat islands?





NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Extend

Urban Heat Island and Temperature

Study the graph below. What can you infer about the land cover in each area?

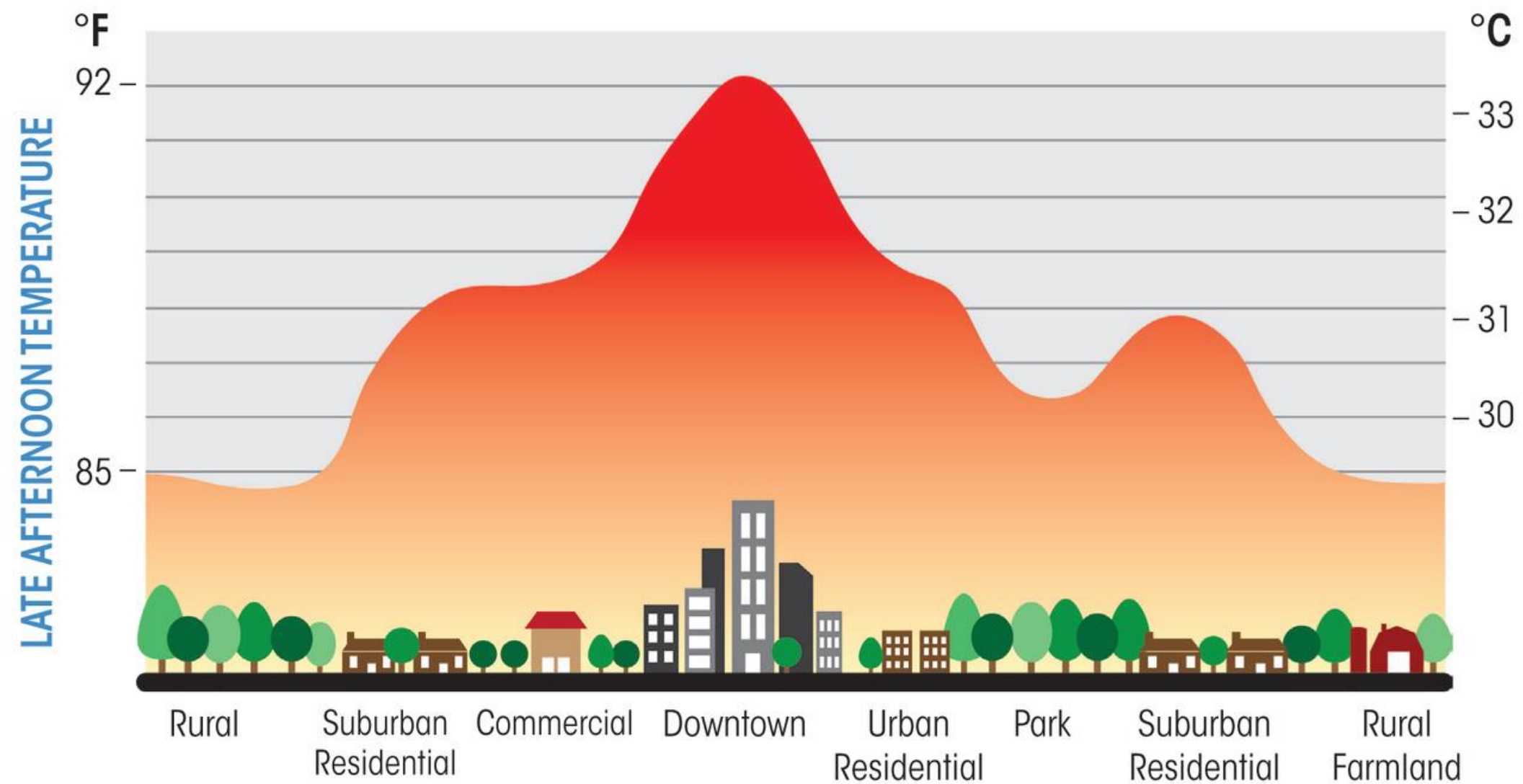


Image Credit: Meteo Zurich. (2015). <https://www.meteozurich.ch/?tag=urban-heat-island>



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Extend

Apply What You Have Learned



You are on a team challenged with developing a planned community.

What strategies would you need to follow to avoid creating a heat island?



NASA Spotlite Interactive Lesson: Does Land Cover Matter?

Extend

Vocabulary Review

Select a claim about land cover. Using your new vocabulary words and knowledge about land cover create a poster that supports your claim.

NASA Spotlite Video Design Challenge: Land Detectives

The challenge: As NASA Land Detectives, you are challenged to gather and share evidence to confront misconceptions about Earth's land cover. Land cover is what is on Earth's surface, such as trees, grass, pavement, and buildings.

STEP 1: Select the misconception you will investigate.

STEP 2: Choose one CLAIM to refute or disprove one misconception.

Misconception 1: Land cover doesn't change.

Claim 1: Human activity can change land cover.

Claim 2: Natural phenomena can change land cover.

Claim 3: Land cover can change slowly or quickly.

Misconception 2: The land cover of an area doesn't matter.

Claim 1: Habitats are impacted by land cover.

Claim 2: Communities are impacted by land cover.

Claim 3: Land cover influences the water cycle.

Claim 4: Land cover influences temperature.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Evaluate

Pretest & Posttest

Table AT-ST-5: Surface Temperature Readings (°C) at Areas with Different Types of Land Cover

Land Cover	Observation Spots			
	1	2	3	4
Grass	27.5	30.0	28.5	29.0
Asphalt	35.5	33.5	33.5	34.0
Cement	32.0	33.0	32.0	33.5
Bare Soil	30.0	31.0	33.0	31.5

1. What can you conclude from the surface temperature readings data table?

- A) The temperature of the bare soil did not change between the observation spots.
- B) The grass had the highest temperature while the cement had the lowest.
- C) Both asphalt and cement temperatures increased among the spots.
- D) The asphalt had the highest temperature while the grass had the lowest.

2. Which is more likely to have higher temperatures due to the urban heat island effect?

- A) city with paved streets, lots of buildings, and little green spaces
- B) rural area with lots of green spaces
- C) farms and parks
- D) suburban residential

3. What is sea ice?

- A) Ice that forms on rivers
- B) Ice that forms on the surface of the ocean
- C) Ice that forms in glaciers

4. Climate refers to the average state of the atmosphere

- A) over a long period of time.
- B) at a specific time and place.
- C) at a specific temperature.
- D) over a short period of time.



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

Evaluate

Pretest & Posttest

5. What can contribute to the creation of a heat island?

- A) too many trees
- B) many surfaces that absorb solar radiation
- C) many surfaces that reflect solar radiation
- D) lots of green spaces

6. What can be a consequence of melting ice in the polar regions?

- A) Increased habitat for polar bears
- B) More stable weather patterns
- C) Rising sea levels and coastal flooding

7. Which statement about heat absorption is correct?

- A) Black absorbs heat the best.
- B) White absorbs heat the best.
- C) Black reflects heat the best.
- D) White and black reflect heat equally.

8. What type of map shows the land cover or surface feature of an area?

- A) topographic map
- B) relief map
- C) population map
- D) political map

9. What is an urban heat island?

- A) A special type of park in the city
- B) An area in the city with a lot of snow and ice
- C) A place in the city where it's hotter than the surrounding areas

10. A change to one of Earth's systems will affect:

- A) All other spheres
- B) No other spheres
- C) Only one other sphere
- D) It is impossible to tell



NASA Spotlight Interactive Lesson: Does Land Cover Matter?

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NASA Spotlite Interactive Lesson: Does Land Cover Matter?

Engage

Explore

Explain

Extend

Evaluate