

ANCHORAGE MUSEUM

SCIENCE PASSPORT: GROUND EXPLORATION

BACKGROUND INFORMATION

The Anchorage Museum has created a home edition of the Science Passport that uses the important science skills of observation, thoughtful questioning, and experimentation to learn more about the world around the home. This lesson plan gets students outside to examine different stop sign-sized areas of ground.

STUDENTS WILL:

- Learn about biotic and abiotic factors, land cover types, and saturated ground
- Compare and contrast different areas of the ground
- Use data sheets to make and record observations
- Think critically and support answers with evidence

MATERIALS

Activity 1, 2, & 3: Provided activity sheets and writing utensil

Activity 3: Water and container to carry water (pitcher, water bottle, or similar)

RECOMMENDED GRADE LEVEL

Fourth through eighth

Adapt for K-12 and adult learners

KEY TERMS

Biotic factors: living or once-living things; examples include plants, animals, fungi, and bacteria

Abiotic factors: non-living things that impact living things; examples include the sun, rocks, climate, and nutrients

Ecosystem: the interactions between living things (biotic factors) and their non-living environment (abiotic factors)

Land cover: surface covering an area of ground; examples include bare soil, plants, water, snow, and concrete

Absorb: take in or soak up

Saturated ground: ground that cannot absorb any more water because it is already filled with as much water as it can hold

Runoff: water that flows over land

Erosion: when land is worn away over time, often caused by water

ACTIVITIES

This lesson plan provides three activity options and explains each of them in detail on the next page. Complete one or more activities following this suggested order.

1. **Activity 1:** Observe - Carefully examine ground
2. **Activity 2:** Ask - Compare land cover
3. **Activity 3:** Experiment - Test how ground absorbs water



ACTIVITY 1 - OBSERVE

Carefully examine ground

[20 minutes]

In this activity, you will go outside and select an area of ground about the size of a stop sign. You will make careful observations to record what is found in your selected area and categorize these findings as biotic or abiotic. Complete **Appendix A** to guide your observations.

Extension: Repeat for different ground areas.

ACTIVITY 2 - ASK

Compare land cover

[20-25 minutes]

In this activity, you will ask what types of things cover different stop sign-sized areas of ground. You will find examples of land cover types and explain why you think different land cover types are found in certain places. Complete **Appendix B** to guide your exploration.

Extension: Repeat at different times of year.

ACTIVITY 3 - EXPERIMENT

Test how ground absorbs water

[30 minutes]

In this activity, you will experiment to learn how different areas of ground absorb, or take in, water.

1. Identify 4 stop sign-sized areas of ground with different land cover types. You can use some of the same areas you found in Activity 2 or find new areas.
2. Use **Appendix C** to guide you through the experiment and to record your observations.
3. At the first area, pour a container of water over the stop sign-sized area (for example, one full water bottle). If the ground absorbs all the water, refill the container with water and pour it again. Repeat until the ground no longer absorbs water. Record how many containers it takes until the ground no longer absorbs water in **Appendix C**.
4. Repeat steps 2-3 for the remaining 3 ground areas.
5. Analyze your results. Answer the remaining questions in **Appendix C**.

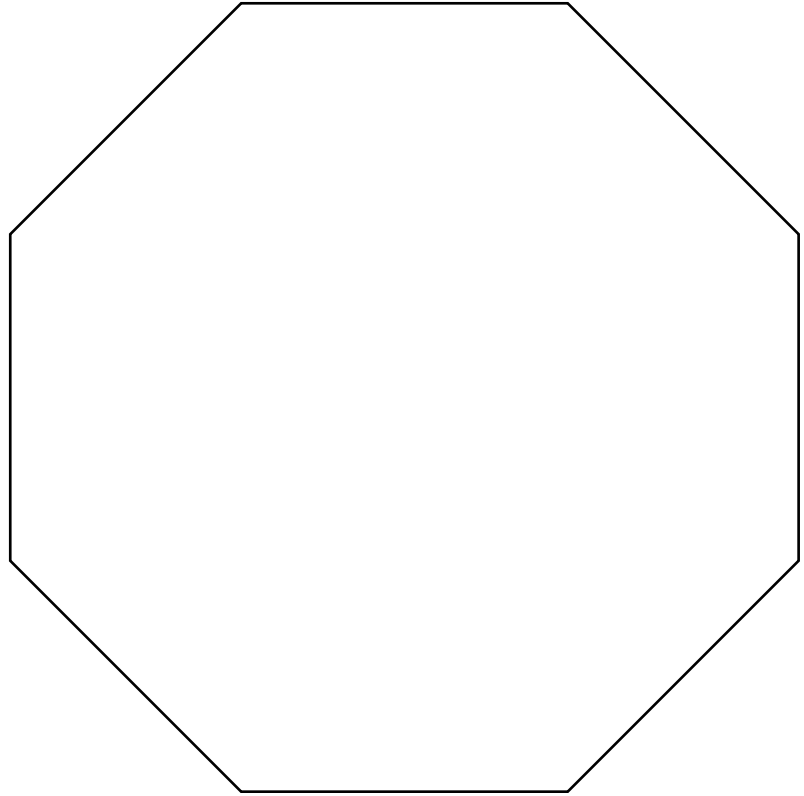
Extension: Repeat for the same ground areas in different weather conditions. Compare what happens when the ground is already wet versus when it is dry.



OBSERVE - WHAT IS IN MY GROUND AREA?

1. Find an area of ground outside that is about the size of a stop sign. This is the area of ground you will use to answer all the questions for Appendix A.

- a. Sketch your ground area:



- b. Why did you select this ground area?

2. Scientists make observations using different senses. Sit or crouch next to your ground area and list your observations for four of your five senses.

- a. In my ground area, I see:

- b. In my ground area, I smell:

- c. In my ground area, I hear:

- d. In my ground area, I feel:

OBSERVE - WHAT IS IN MY GROUND AREA?

3. Continue sitting or crouching next to your ground area. Using words or pictures, list everything you see in your ground area.

Example: leaves, dirt, spider

4. Using your list from Question 3, decide whether each item is alive now, was alive at one time, or was never alive. Write or draw each item from your list in the correct column below.

Alive now	Alive at one time	Never alive
Spider (currently moving)	Leaves (were once attached to living trees)	Dirt
Biotic Factors		Abiotic Factors

You just categorized everything in your ground area into two categories: biotic factors and abiotic factors. **Biotic factors** are living or once-living things (examples include plants, animals, fungi, and bacteria). **Abiotic factors** are non-living things that impact living things (examples include the sun, rocks, climate, and nutrients). An ecosystem is created when living things (biotic factors) interact with their non-living environment (abiotic factors). If you found both living and non-living things in your ground area, then you just studied a (very small) ecosystem!



ASK - WHAT COVERS THE GROUND?

Land Cover is the surface covering an area of ground (examples include bare soil, plants, water, snow, and concrete).

- Before going outside, write or draw what land cover types you think you will find.
- Go outside and locate as many different examples of land cover that fill an area at least the size of a stop sign. Record your findings in this chart.

Land cover Type	Did you find this land cover? (circle one)	If you found this land cover, what else do you observe about it? Consider: What colors do you see? How does the ground smell? How do your footsteps sound when you walk across the ground? How does the ground feel when you place the palm of your hand flat on the ground?
Bare soil	Yes / No	
Gravel or sand	Yes / No	
Water	Yes / No	
Plants - shorter than a pencil	Yes / No	
Plants - taller than a pencil	Yes / No	
Snow	Yes / No	
Ice	Yes / No	
Human-made (describe): _____	Yes / No	
Human-made (describe): _____	Yes / No	
Other (describe): _____	Yes / No	
Other (describe): _____	Yes / No	



EXPERIMENT - HOW DO DIFFERENT GROUND AREAS ABSORB WATER?

1. Select a container that you can use to hold water. Describe this container. How much water does it hold?
2. Go outside and identify 4 stop sign-sized areas of ground with different land cover types. Before pouring any water, make observations about each area.

Area	Land cover type	How wet is the area? (circle one)	What else do you observe about the area?
1		Really wet A little wet Not wet Area is frozen	
2		Really wet A little wet Not wet Area is frozen	
3		Really wet A little wet Not wet Area is frozen	
4		Really wet A little wet Not wet Area is frozen	

3. Do the experiment at each area: Pour a container of water over the stop sign-sized area. If the ground absorbs all the water, refill the container with water and pour it again. Repeat until the ground no longer absorbs water. Record your results on the next page.



EXPERIMENT - HOW DO DIFFERENT GROUND AREAS ABSORB WATER?

Area	Land cover type	How many containers of water did the area absorb?	What else did you observe during the experiment?
1			
2			
3			
4			

- Which area absorbed the most water? Why do you think it absorbed the most?
- Which are absorbed the least water? Why do you think it absorbed the least?
- How do you think how wet the ground was before you poured water impacted your results? If the ground was frozen, how did that impact your results?

*You may have discovered that really wet ground absorbed less water than dry ground. This is because **saturated ground** is already filled with as much water as it can hold. If more water falls on saturated ground, it becomes runoff. **Runoff** is water that flows over land, rather than soaking into the ground. Any pools of water you created in your experiment are examples of runoff.*

- Did you observe anything move from the force of pouring water onto the ground? If so, describe.

*If you observed something like dirt or leaves move when you poured water on the ground, you saw an example of erosion. **Erosion** is when land is worn away over time and is often caused by water. Imagine how a huge rainstorm might change your area of ground. The force of all those water droplets hitting the ground could cause more dirt and leaves to wash away.*

