

# Volcanoes: The Geology of Destruction and Creation

**Bloom's Level:** Understand

**Standard:**

NGSS.MS.ESS2.1 — Earth's Systems and Processes

NGSS MS-ESS2-3 — Plate Tectonics and Earth's Surface

TEKS §112.19(b)(9)(A) — Rock Cycle and Plate Tectonics

STUDENT EDITION



A stratovolcano eruption begins deep underground, where magma builds pressure before exploding through Earth's crust — connecting the geosphere to the atmosphere above.

## Volcanoes: The Geology of Destruction and Creation

### A Mountain That Explodes — Really?

Imagine standing on a quiet hillside, surrounded by forests and wildlife, when suddenly the ground begins to shake. Within moments, the mountaintop disappears in a massive explosion, sending ash, rock, and gas miles into the sky. This is exactly what happened on May 18, 1980, when Mount St. Helens in Washington State erupted with the force of 1,600 atomic bombs. Volcanoes are among the most powerful forces on Earth — capable of destroying entire cities and reshaping landscapes overnight. But here's the surprising part: volcanoes are also builders. Understanding how they work means understanding Earth itself.



A stratovolcano eruption begins deep underground, where magma builds pressure before exploding through Earth's crust — connecting the geosphere to the atmosphere above.

### What Is a Volcano, Really?

At its core, a volcano is an opening in Earth's crust where molten rock — called **magma** — escapes from deep underground. When magma reaches the surface, it's called **lava**. But volcanoes don't just appear randomly. They are closely connected to **plate tectonics**, the theory that Earth's outer shell is divided into massive slabs called tectonic plates that slowly move over time.

Most volcanoes form in one of two places:

- **Subduction zones**, where one tectonic plate slides beneath another, melting rock and forcing magma upward
- **Hotspots**, where a column of unusually hot mantle material burns through the crust — like the Hawaiian Islands

When plates pull apart, such as along the Mid-Atlantic Ridge, magma also rises to fill the gap, creating underwater volcanoes that slowly build new ocean floor. Earth's

systems — the geosphere, hydrosphere, and atmosphere — are all connected through these volcanic processes.

## Not All Volcanoes Are the Same

Two of the most important volcano types are **shield volcanoes** and **stratovolcanoes**, and they behave very differently. Recognizing these differences helps explain why some eruptions are relatively safe to observe while others become catastrophic disasters.

**Shield volcanoes**, like those in Hawaii, produce runny, low-silica lava that flows slowly and spreads wide. Their eruptions are dramatic but relatively predictable, which means people can often evacuate safely before lava reaches populated areas.

**Stratovolcanoes** — also called composite volcanoes — are far more dangerous. They build up thick, sticky lava rich in silica, which traps gases inside. Pressure builds until the volcano explodes violently. Mount St. Helens is a stratovolcano. So is **Mount Vesuvius**, the volcano that buried the Roman city of **Pompeii** in 79 CE under meters of ash and volcanic rock in a matter of hours. Thousands of people were killed, and the city was preserved almost perfectly — giving historians an incredible window into ancient Roman life.

The key difference comes down to **silica content and gas pressure**: more silica means thicker magma, more trapped gas, and a far more explosive eruption. In other words, the chemistry of magma determines whether a volcano oozes or explodes.

## Volcanoes and Earth's Climate

Volcanoes don't just affect the land around them — they influence the entire planet. When large eruptions blast sulfur dioxide gas into the upper atmosphere, it combines with water to form tiny droplets that reflect sunlight back into space. This can actually **cool the planet** for months or even years.

Scientists study ancient ice cores and rock layers to read the "volcanic record" — evidence of past eruptions preserved in Earth's materials. This record helps explain mysterious periods of global cooling throughout history and connects the geosphere

directly to the atmosphere and climate systems. In this way, a single volcanic eruption can ripple outward to affect weather patterns across the entire globe.

## **Destruction and Creation: Two Sides of the Same Force**

Here's what makes volcanoes so fascinating from a systems-thinking perspective: the same process that destroys also creates. Volcanic rock weathers over time into some of the most **fertile soil on Earth**. Farmers in Indonesia, Italy, and Central America have grown crops on volcanic slopes for centuries because the mineral-rich soil produces exceptional harvests. Volcanic activity also built the Hawaiian Islands from the ocean floor — land that simply did not exist before.

### **Summary**

Volcanoes are powerful geological events driven by plate tectonics and the movement of magma through Earth's crust. Shield volcanoes erupt gently and build wide landforms, while stratovolcanoes can explode catastrophically, as seen at Mount St. Helens and Pompeii. The key to understanding this difference lies in silica content — a concept that connects chemistry directly to real-world consequences. Beyond local destruction, volcanoes interact with Earth's atmosphere to influence global climate. Most importantly, volcanoes remind us that Earth is a dynamic, interconnected system — where destruction and creation are often the very same event.

## Lesson Objective

In this lesson, you will explore how volcanoes form and why they behave differently depending on their type. You will explain how volcanic activity connects Earth's major systems — the geosphere, atmosphere, and hydrosphere — and how these connections shape landscapes and climate. By the end, you will be able to describe the role volcanoes play in both destroying and building features on Earth's surface.

**Standard:** NGSS.MS.ESS2.1 — Earth's Systems and Processes; NGSS MS-ESS2-3 — Plate Tectonics and Earth's Surface; TEKS §112.19(b)(9)(A) — Rock Cycle and Plate Tectonics

**Bloom's Level:** Understand

**Bloom's Goal:** Students will demonstrate understanding by explaining how volcanic processes connect Earth's systems and why different types of volcanoes behave in distinct ways.

**Explanation:** At the Understand level, students move beyond memorizing facts to making sense of concepts and explaining relationships in their own words. This lesson asks students to interpret how silica content affects eruption style and how volcanic activity links the geosphere, atmosphere, and other Earth systems — showing true comprehension rather than simple recall.



Shield volcanoes, like those that formed the Hawaiian Islands, build land slowly over thousands of years — turning volcanic rock into fertile, life-supporting ground.

## Application Questions

Read each question carefully, use what you learned from the article, and write a complete response in your own words.

1. Explain why stratovolcanoes are more dangerous than shield volcanoes. What role does silica play in making an eruption explosive?

Think about: Think about what happens to gases when magma is thick and sticky versus when it is runny and thin.

2. How can a volcanic eruption affect Earth's climate, even in places far away from the volcano itself? Which of Earth's systems are involved?

Think about: Consider what happens when sulfur dioxide gas enters the upper atmosphere and how that connects the geosphere to the atmosphere.

3. The article says volcanoes are both destroyers and creators. Using at least two examples from the article, explain how the same volcanic process can cause destruction and also support life.

Think about: Look for examples of what volcanoes destroy and what they leave behind that living things can use.

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## Data Table & Analysis

Study the data table below, which compares key characteristics of famous volcanoes discussed in the lesson. Use the information in the table to answer the three analysis questions that follow. Write your answers in complete sentences.

**Experiment:** This data table compares five well-known volcanoes based on their type, silica content, eruption style, and real-world impact. The information is drawn from geological records and the lesson article on volcanic processes and plate tectonics.

Volcano Name (N/A)	Volcano Type (N/A)	Silica Content in Magma (Low / High)	Eruption Style (N/A)	Notable Impact (N/A)
Mount St. Helens	Stratovolcano	High	Explosive	Erupted in 1980 with force of 1,600 atomic bombs; destroyed surrounding landscape
Mount Vesuvius	Stratovolcano	High	Explosive	Buried Roman city of Pompeii in 79 CE under meters of ash; thousands killed
Kilauea (Hawaii)	Shield Volcano	Low	Gentle / Effusive	Slow lava flows allow safe evacuation; built new land on Hawaiian Islands
Mid-Atlantic Ridge	Underwater Volcanic Rift	Low	Gentle / Effusive	Magma rises to fill gaps between plates; creates new ocean floor
	Shield Volcano	Low	Gentle / Effusive	

Volcano Name (N/A)	Volcano Type (N/A)	Silica Content in Magma (Low / High)	Eruption Style (N/A)	Notable Impact (N/A)
Hawaiian Islands (general)				Entire island chain built from ocean floor by hotspot volcanic activity

1. Based on the data table, what pattern do you notice between silica content and eruption style? Use at least two examples from the table to support your answer.

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2. Why are stratovolcanoes generally more dangerous to nearby human populations than shield volcanoes? Use evidence from the table and the lesson to explain your reasoning.

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3. How does the data in the table show that volcanoes can be both destructive and creative forces? Identify one example of destruction and one example of creation from the table.

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## Hypothesis Builder

Read the context below carefully. Then complete each component to build a scientific hypothesis about volcanic eruptions. Use evidence from what you have learned about volcanoes and plate tectonics to guide your answers.

Scientists studying volcanoes have noticed that not all eruptions are equally explosive. Some volcanoes, like those in Hawaii, produce slow-moving lava flows, while others, like Mount St. Helens, explode with tremendous force. Researchers want to investigate whether the silica content of magma affects how explosive a volcanic eruption will be. They plan to compare eruptions from volcanoes with low-silica magma versus volcanoes with high-silica magma to measure differences in eruption intensity.

### Independent Variable

What is the one factor the scientists are deliberately changing or comparing between the volcanoes in this investigation?

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### Dependent Variable

What is the outcome or result that scientists will measure or observe to see if the independent variable made a difference?

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**If**

Write the 'If' part of your hypothesis by stating what condition or change is being tested. Start your answer with the word 'If.'

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**Then**

Write the 'Then' part of your hypothesis by predicting what result you expect to observe. Start your answer with the word 'Then.'

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**Because**

Write the 'Because' part of your hypothesis by explaining the scientific reasoning behind your prediction. Start your answer with the word 'Because.'

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## Claim-Evidence-Reasoning (CER)

Read the phenomenon below carefully. Then complete each component of the Claim-Evidence-Reasoning (CER) framework by responding to the guiding prompt. Your responses should demonstrate your understanding of how Earth's systems interact through volcanic processes.

**Phenomenon:** In 1991, Mount Pinatubo in the Philippines erupted violently, blasting enormous amounts of sulfur dioxide gas high into the atmosphere. In the months and years that followed, scientists recorded a measurable drop in average global temperatures of about  $0.5^{\circ}\text{C}$ . Meanwhile, the volcanic ash and rock deposited around the region eventually broke down into some of the most fertile agricultural soil in the area.

### Claim

What is your overall explanation for how a single volcanic eruption can affect both global climate and local land conditions? Write a clear statement that answers this question without using evidence yet.

**Evidence**

What specific facts from the article or the phenomenon description support your claim? Identify at least two pieces of evidence that connect volcanic eruptions to changes in Earth's systems.

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**Reasoning**

Explain how your evidence connects to your claim. Use what you know about Earth's systems — the geosphere, atmosphere, and how volcanic materials behave — to explain why the evidence supports your claim.

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## Independent / Dependent Variable Analysis

Read the experimental scenario below carefully. Then, for each component, write your answer in complete sentences using evidence from the scenario. Be specific and use scientific vocabulary where appropriate.

**Scenario:** A group of 7th-grade scientists wants to investigate how the silica content of magma affects the explosiveness of a volcanic eruption. They design a model using baking soda and vinegar mixtures of different thicknesses — thin mixtures represent low-silica magma like that found in shield volcanoes, while thick, gel-like mixtures represent high-silica magma like that found in stratovolcanoes. Each mixture is placed inside an identical cone-shaped model volcano, and the scientists measure how high the eruption shoots out of the opening in centimeters. The team keeps the amount of baking soda, the size of the volcano model, and the temperature of the room the same for every trial.

### Independent Variable

What is the one factor the scientists are deliberately changing between trials? How does this variable connect to the difference between shield volcanoes and stratovolcanoes described in the article?

**Dependent Variable**

What outcome are the scientists measuring to determine the effect of their change?  
How does this measurement relate to the concept of volcanic explosiveness discussed in the article?

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**Control Variables**

What factors are kept the same in every trial, and why is it important to keep these factors constant when testing the effect of magma silica content?

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**Operationalized Definition**

How are the scientists defining and measuring 'silica content' and 'explosiveness' in a way that can be observed and recorded in this model experiment?

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## Hypotheticals

Read each scenario carefully, then answer both questions using what you have learned about volcanoes, plate tectonics, and Earth's systems.

**Scenario 1:** Scientists discover a new volcano forming on the ocean floor along the Mid-Atlantic Ridge, where two tectonic plates are slowly pulling apart. Over thousands of years, lava pours out and builds up layer by layer. The lava produced is runny and low in silica, spreading wide across the ocean floor. Eventually, the volcanic structure grows tall enough to break the ocean's surface and form a new island.

a) Based on the type of lava described, what kind of volcano is most likely forming, and what would its eruptions probably look like once the island appears above the ocean surface?

b) How does this volcanic process connect the geosphere to the hydrosphere and atmosphere as the new island forms and grows over time?

**Scenario 2:** A large stratovolcano in a densely populated region has been dormant for 200 years. Geologists detect increasing earthquake activity beneath it and rising levels of sulfur dioxide gas escaping from vents near the summit. Government officials must decide whether to order a large-scale evacuation of nearby towns. Some residents argue the volcano has been quiet for two centuries and there is no real danger.

a) Using what you know about how stratovolcanoes work, explain why the warning signs geologists detected — earthquakes and rising sulfur dioxide — suggest a dangerous eruption could be coming.

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b) If the stratovolcano does erupt explosively and sends sulfur dioxide high into the upper atmosphere, what effect could this have beyond the local region, and which of Earth's systems would be involved?

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## Multiple Choice

Choose the best answer for each question. Select the letter (A, B, C, or D) that correctly answers the question based on your knowledge of volcanoes, plate tectonics, and Earth's systems.

1. What is magma called once it reaches Earth's surface?
  - A. Lava
  - B. Silica
  - C. Ash
  - D. Mantle
2. Most volcanoes form at subduction zones or hotspots. What happens at a subduction zone to cause volcanic activity?
  - A. Two plates pull apart, allowing cold ocean water to rush underground
  - B. One tectonic plate slides beneath another, melting rock and forcing magma upward
  - C. A column of hot mantle material burns through the center of a plate
  - D. Plates collide and push rock sideways without any melting
3. Which characteristic best explains why stratovolcanoes are more dangerous than shield volcanoes?
  - A. Stratovolcanoes are located closer to populated cities
  - B. Stratovolcanoes produce lava that flows faster and covers more area
  - C. Stratovolcanoes have thick, silica-rich magma that traps gases and causes explosive eruptions
  - D. Stratovolcanoes are always taller than shield volcanoes

4. The Hawaiian Islands are examples of volcanoes formed at a hotspot. What is a hotspot?

- A. A location where two tectonic plates collide and form mountains
- B. A region where the ocean floor spreads apart along a ridge
- C. A column of unusually hot mantle material that burns through the crust
- D. An area where a subducting plate melts and creates a trench

5. How did the eruption of Mount Vesuvius in 79 CE affect the city of Pompeii?

- A. It buried the city under meters of ash and volcanic rock within hours, killing thousands
- B. It slowly covered the city with lava flows over several weeks
- C. It caused a massive earthquake that destroyed most of the buildings
- D. It sent a tsunami that flooded the city from the nearby sea

6. When a large volcanic eruption releases sulfur dioxide into the upper atmosphere, what effect can this have on Earth's climate?

- A. It warms the planet by trapping heat near the surface
- B. It has no measurable effect on global temperatures
- C. It increases rainfall by adding moisture to the atmosphere
- D. It cools the planet by forming droplets that reflect sunlight back into space

7. Which of the following best describes how volcanoes connect Earth's geosphere and atmosphere?

- A. Volcanic eruptions release gases that can influence global weather and climate patterns
- B. Volcanic rock absorbs carbon dioxide from the air and stores it underground
- C. Volcanoes create ocean currents that distribute heat around the planet
- D. Volcanic ash falls into rivers and changes the chemistry of freshwater

8. Why do farmers in places like Indonesia and Italy often choose to grow crops on volcanic slopes?

- A. Volcanic slopes receive more rainfall than surrounding areas
- B. Volcanic rock weathers into mineral-rich soil that is very fertile
- C. The heat from underground magma keeps the soil warm year-round
- D. Volcanic ash prevents insects and pests from damaging crops

9. Scientists study ice cores and rock layers to learn about past volcanic eruptions. What does this evidence help scientists understand?

- A. The exact dates when tectonic plates first began to move
- B. How volcanic eruptions in the past contributed to periods of global cooling
- C. Which ancient civilizations were most affected by earthquakes
- D. How quickly lava flows cool and harden into igneous rock

10. Which statement best summarizes the relationship between destruction and creation in volcanic activity?

- A. Volcanoes only destroy existing landforms and never contribute to building new ones
- B. Volcanic eruptions create new land and fertile soil, showing that the same process can both destroy and build
- C. Volcanic activity is purely destructive and has no long-term benefits for ecosystems
- D. New land from volcanoes forms only in the ocean and never affects land-based ecosystems

## True / False

Read each statement carefully. Write T if the statement is true or F if the statement is false.

1. Magma is the term used for molten rock after it reaches Earth's surface.  
 True  False
2. Most volcanoes form at tectonic plate boundaries or hotspots.  
 True  False
3. Shield volcanoes produce thick, sticky lava that traps gases and causes violent explosions.  
 True  False
4. Stratovolcanoes are more dangerous than shield volcanoes because their high-silica magma traps gases and builds pressure.  
 True  False
5. Mount St. Helens is an example of a stratovolcano.  
 True  False
6. The Roman city of Pompeii was destroyed by a shield volcano eruption.  
 True  False
7. When large volcanic eruptions release sulfur dioxide into the upper atmosphere, they can cause global temperatures to decrease.  
 True  False

8. Volcanic rock weathers into poor-quality soil that is not useful for farming.

- True    False
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9. The Hawaiian Islands were formed by volcanic activity at a hotspot.

- True    False
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10. Volcanoes connect Earth's geosphere, atmosphere, and hydrosphere, showing that Earth's systems interact with one another.

- True    False

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## Vocabulary

Study each vocabulary term and its definition below. These words will help you understand how volcanoes work and how they connect to Earth's systems. As you read, look for these terms in the lesson article.

### **magma**

Magma is molten rock found deep beneath Earth's surface that can rise through cracks in the crust.

Explain in your own words:

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### **lava**

Lava is the name given to magma once it reaches and flows on Earth's surface during a volcanic eruption.

Explain in your own words:

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### **plate tectonics**

Plate tectonics is the scientific theory that Earth's outer shell is made up of large, slowly moving slabs called tectonic plates.

Explain in your own words:

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**subduction zone**

A subduction zone is an area where one tectonic plate slides beneath another, causing rock to melt and magma to push upward.

Explain in your own words:

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**hotspot**

A hotspot is a location where an unusually hot column of mantle material burns through Earth's crust, forming volcanoes like those in Hawaii.

Explain in your own words:

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**shield volcano**

A shield volcano is a broad, gently sloping volcano that produces runny, low-silica lava that flows slowly and spreads wide.

Explain in your own words:

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**stratovolcano**

A stratovolcano, also called a composite volcano, is a steep, cone-shaped volcano that builds up thick, gas-trapping lava and can erupt with extreme violence.

Explain in your own words:

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**silica**

Silica is a chemical compound found in magma that determines how thick or runny the lava will be and how explosively a volcano may erupt.

Explain in your own words:

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**geosphere**

The geosphere is the solid rocky part of Earth, including its crust, mantle, and core, which interacts with other Earth systems.

Explain in your own words:

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**sulfur dioxide**

Sulfur dioxide is a gas released by volcanic eruptions that can rise into the upper atmosphere and cause the planet to temporarily cool by reflecting sunlight.

Explain in your own words:

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## Exit Ticket

Answer both questions below in 1-2 sentences each. Use what you learned in today's lesson to support your answers.

1. Explain why stratovolcanoes are more explosive than shield volcanoes. What role does silica play in this difference?

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2. Describe one way a volcanic eruption can affect Earth's atmosphere and climate beyond the local area where the eruption occurs.

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# INSIDE A STRATOVOLCANO

Stratovolcanoes are tall, steep-sided volcanoes built from alternating layers of lava, ash, and rock. They form above subduction zones where one tectonic plate dives beneath another, melting rock deep underground and fueling explosive eruptions.

**TYPES OF ERUPTIONS**

**EXPLOSIVE**  
High in silica, thick magma traps gas, leading to violent eruptions with ash, pumice, and pyroclastic flows.

**EFFUSIVE**  
Lower in silica, runny magma allows gentler eruptions with lava flows.

**6 MAGMA CHAMBER**  
A large underground reservoir of molten rock.

**7 DEEP MAGMA SOURCE**  
Magma forms deeper in the mantle and rises upward.

- 1 ERUPTION COLUMN**  
Hot ash, gas, and rock fragments shoot high into the atmosphere.
- 2 CRATER**  
The summit opening where eruptions occur.
- 3 LAYERS OF LAVA AND ASH**  
Alternating deposits build the steep sides of the volcano.
- 4 SIDE VENT**  
Magma can escape through fractures on the sides.
- 5 LAVA FLOW**  
Magma erupts and flows down the slopes.
- 8 SUBDUCTION ZONE**  
The denser oceanic plate sinks beneath the continental plate, melting rock above it.



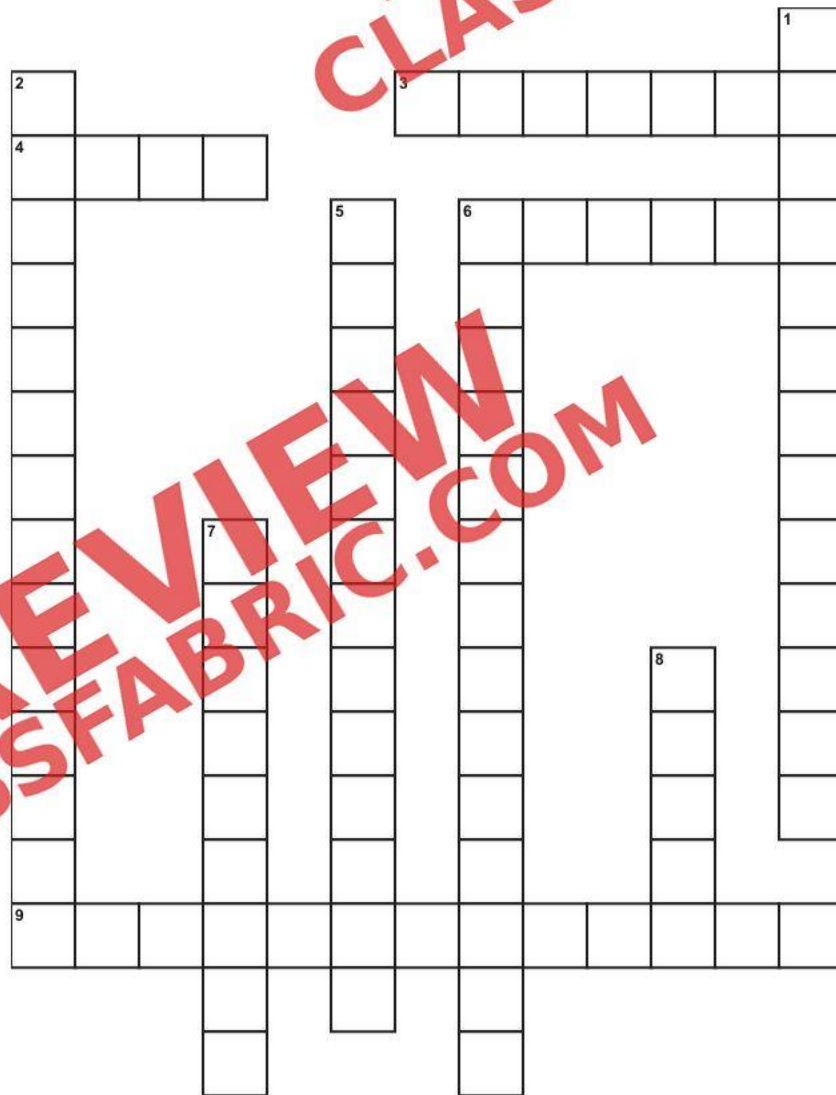
A stratovolcano eruption begins deep underground, where magma builds pressure before exploding through Earth's crust — connecting the geosphere to the atmosphere above.



Shield volcanoes, like those that formed the Hawaiian Islands, build land slowly over thousands of years — turning volcanic rock into fertile, life-supporting ground.

# Volcanoes: The Geology of Destruction and Creation

## CROSSWORD PUZZLE



# Volcanoes: The Geology of Destruction and Creation

## CROSSWORD PUZZLE

### ACROSS

3. A \_\_\_\_\_ is a location where an unusually hot column of mantle material burns through Earth's crust, forming volcanoes like those in Hawaii.
4. \_\_\_\_\_ is the name given to magma once it reaches and flows on Earth's surface during a volcanic eruption.
6. \_\_\_\_\_ is a chemical compound found in magma that determines how thick or runny the lava will be and how explosively a volcano may erupt.
9. A \_\_\_\_\_ is a broad, gently sloping volcano that produces runny, low-silica lava that flows slowly and spreads wide.

### DOWN

1. A \_\_\_\_\_, also called a composite volcano, is a steep, cone-shaped volcano that builds up thick, gas-trapping lava and can erupt with extreme violence.
2. \_\_\_\_\_ is the scientific theory that Earth's outer shell is made up of large, slowly moving slabs called tectonic plates.
5. \_\_\_\_\_ is a gas released by volcanic eruptions that can rise into the upper atmosphere and cause the planet to temporarily cool by reflecting sunlight.
6. A \_\_\_\_\_ is an area where one tectonic plate slides beneath another, causing rock to melt and magma to push upward.
7. The \_\_\_\_\_ is the solid rocky part of Earth, including its crust, mantle, and core, which interacts with other Earth systems.
8. \_\_\_\_\_ is molten rock found deep beneath Earth's surface that can rise through cracks in the crust.

# Volcanoes: The Geology of Destruction and Creation

## WORD SEARCH

D H E Q X X L E V Y T J P L A T E T E C T O N I C S X S  
R A C N R C P M S H I E L D V O L C A N O Z G O A W L S  
I U S D K Z T Z E J I O H L M W G B Z H O E U C D V E M  
D E Y R Z Q O B R L Y Q P S O E H P E A A X S T S V Y A  
A B W B O D G P B Y C X V F Q H F Z G A N W I U L N K M  
I V F I U Y I E X W M A G M A D C K W K R L L D O T I C  
V U S V W N B V C F J J S P J O K N A X G G I V W B L F  
O T P V U S J S K Y K T I B N D V A L C P J C W V U M C  
J T O X O H J Y I D P K P A P I U B S E R O A O Z W O A  
N P A B T N C G H I Y R C F A H P T X P R G D G V C P T  
Z B H H P L W X W M F L S W V K N A H F D B Z M F Q A G  
S B G N H N Z B T P O R J B G G E X I U H J P R M T W K  
A Z N L W P F Q V V H A L V I K E N Y J F X Q Q J U E E  
V T H I K H R W O X W B F U U Y O O U E Z X P N J G C G  
E J N A C H V T Y G M H U Y U I M I S V H E C I Y Z F Z  
W Y F G L W A J F J P N R Z X S Z C K P I V A E Y W U O  
M Q E S I R I B F R J O D C Y M U K G L H G D K V O W H  
K F S Y T C O X T E V Z I N T O M A P Q V E J N B U Q Y  
C V N S T P H O Z A Y B O E E H F J Q H L D R V B A E Z  
F Q Z N T Y G T D H Y K X P A C H K M M T T Z E E C Q F  
P X K U H O T S P O T H I P F H I Z W F I E V C R U C V  
K T F A Q X I T R X Y X D B C U A Q D T P Q G F H G K U  
M U U J G C O Y W Y Q W E C G Z X T S E Z Y L A G B C B  
I M W D J J Z G B I L S S U B D U C T I O N Z O N E C E  
H R T D E R Y Y N U A A S Y G P C Z H P O D Z R C T Z J  
Z M I H P X J G K I U A V Q O W S S B Y Z S P B K I B E  
A J R Z P U G C L Q U E L A P P B U O N W M X G M J I O  
Q M A V B K P U N J U X U W V P N O Z A Q U V I A X L L

### FIND THESE WORDS

stratovolcano  
plate tectonics  
sulfur dioxide

hotspot  
silica  
geosphere

subduction zone  
lava

shield volcano  
magma