

Teaching Activity Guide

Gopher to the Rescue!

A Volcano Recovery Story

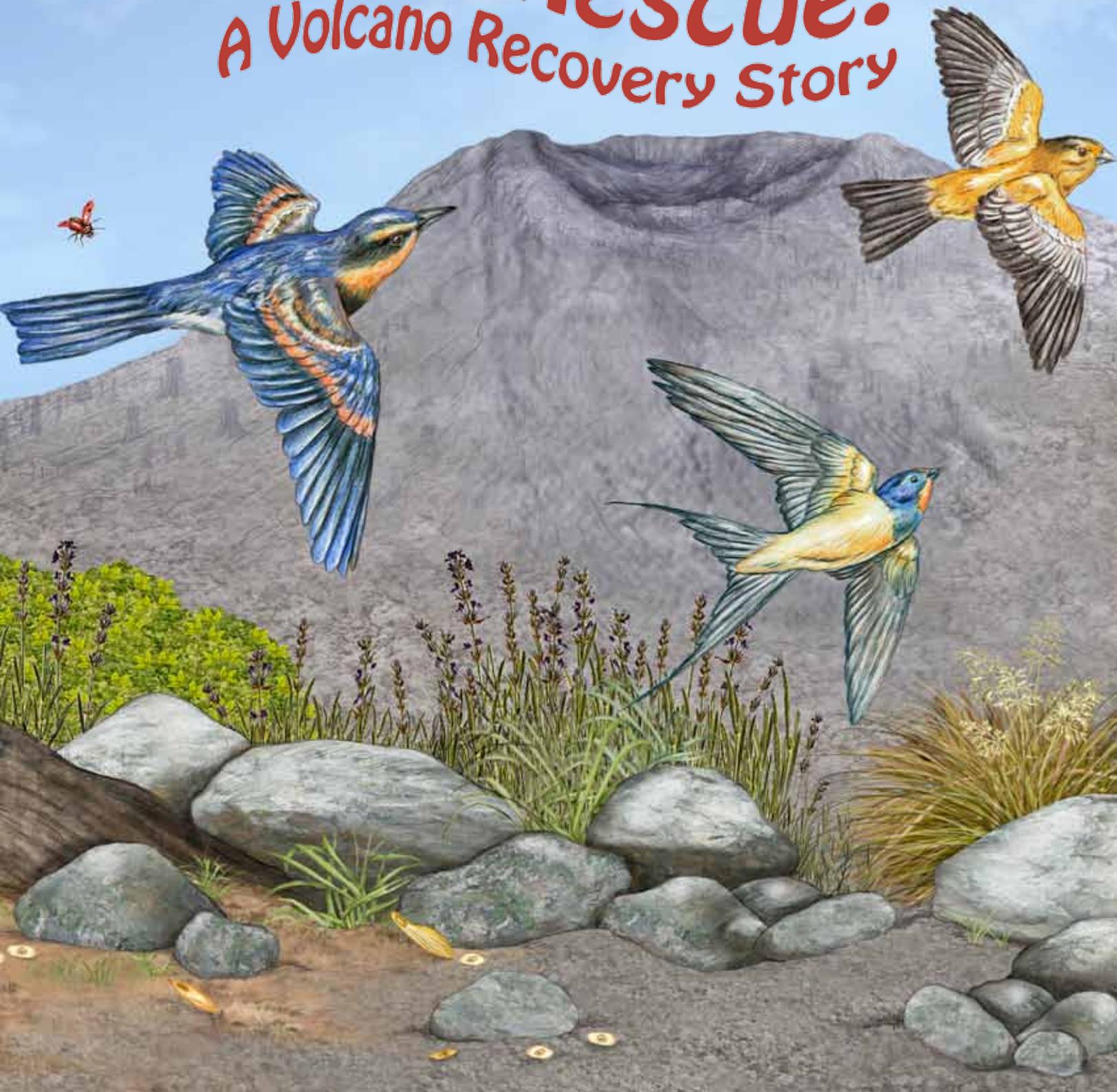
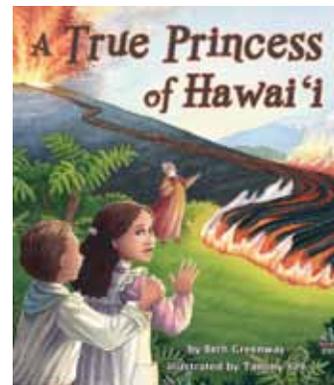
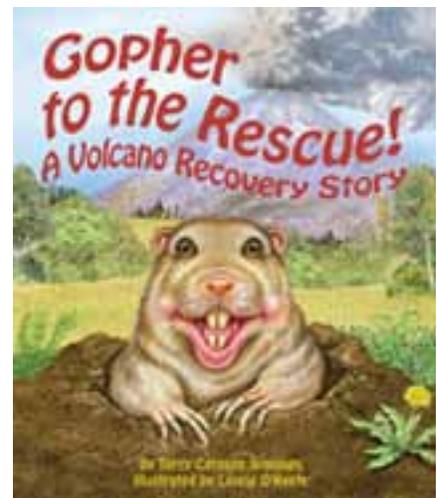


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Check out this other volcano-related title that may also be of interest.



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How to Use This Activity Guide (General)

There are a wide variety of activities that teach or supplement all curricular areas. The activities are easily adapted up or down depending on the age and abilities of the children involved. And, it is easy to pick and choose what is appropriate for your setting and the time involved. Most activities can be done with an individual child or a group of children.

For teachers in the classroom: We understand that time is at a premium and that, especially in the early grades, much time is spent teaching language arts. All Arbordale titles are specifically selected and developed to get children excited about learning other subjects (science, geography, social studies, math, etc.) while reading (or being read to). These activities are designed to be as comprehensive and cross-curricular as possible. If you are teaching sentence structure in writing, why not use sentences that teach science or social studies? We also know and understand that you must account for all activities done in the classroom. While each title is aligned to all of the state standards (both the text and the For Creative Minds), it would be near impossible to align all of these activities to each state's standards at each grade level. However, we do include some of the general wording of the CORE language arts and math standards, as well as some of the very general science or social studies standards. You'll find them listed as "objectives" in italics. You should be able to match these objectives with your state standards fairly easily.

For homeschooling parents and teachers in private schools: Use as above. Aren't you glad you don't have to worry about state standards?

For parents/caregivers: Two of the most important gifts you can give your child is the love of reading and the desire to learn. Those passions are instilled in your child long before he or she steps into a classroom. Many adults enjoy reading historical fiction novels . . . fun to read but also to learn (or remember learning) about historical events. Not only does Arbordale publish stories that are fun to read and that can be used as bedtime books or quiet "lap" reading books, but each story has non-fiction facts woven through the story or has some underlying educational component to sneak in "learning." Use the "For Creative Minds" section in the book itself and these activities to expand on your child's interest or curiosity in the subject. They are designed to introduce a subject so you don't need to be an expert (but you will probably look like one to your child)! Pick and choose the activities to help make learning fun!

For librarians and bookstore employees, after-school program leaders and zoo, aquariums, nature center, park & museum educators: Whether reading a book for story time or using the book to supplement an educational program, feel free to use the activities in your programs. We have done the "hard part" for you.

What Do Children Already Know?

Young children are naturally inquisitive and are sponges for information. The whole purpose of this activity is to help children verify the information they know (or think they know) and to get them thinking “beyond the box” about a particular subject.

Before reading the book, ask the children what they know about the subject. A list of suggested questions is below. The children should write down their “answers” (or adults for them if the children are not yet writing) on the chart found in Appendix A, index cards, or post-it notes.

Their answers should be placed on a “before reading” panel. If doing this as a group, you could use a bulletin board or even a blackboard. If doing this with individual children, you can use a plain manila folder with the front cover the “before reading” panel. Either way, you will need two more panels or sections—one called “correct answer” and the other “look for correct answer.”

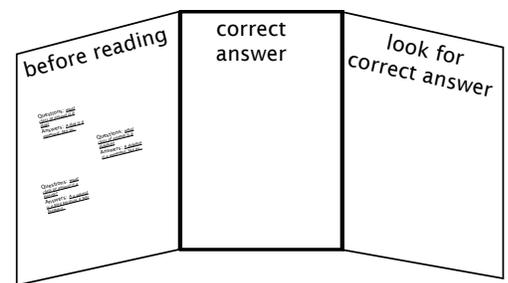
Do the children have any more questions about the subject? If so, write them down to see if they are answered in the book.

After reading the book, go back to the questions and answers and determine whether the children’s answers were correct or not.

If the answer was correct, move that card to the “correct answer” panel. If the answer was incorrect, go back to the book to find the correct information.

If the child/children have more questions that were not answered, they should look them up.

When an answer has been found and corrected, the card can be moved to the “correct answer” panel.



Pre-Reading Questions

What is a volcano?

What are some early warning signs for humans and animals that a volcano might be getting ready to erupt?

What happens to the area around the volcano when it erupts?

What are some living things that might be able to survive a volcanic eruption?

Why can those living things survive and not others?

How does life return to a volcanic blast area?

How long do you think it takes for life to return to normal?

Comprehension Questions & Writing Prompts

Objective Core Language Arts, Speaking and Listening: Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Retell stories, including key details, and demonstrate understanding of their central message or lesson.

Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

What were some of the things the animals sensed that told them something was different on the mountain?

Why didn't all the animals survive?

What animals survived and how or why did they survive?

What plants survived and how?

How did seeds return to the mountain area?

What were some of the first animals to return to the area?

What were some of the early animals that visited the area but lived in the shady forests away from the blast zones?

How did gopher help the area recover?

How did visiting animals help the area recover?

How did the wind help the area recover?

Do you think the gopher, visiting animals, or wind could have saved the habitat alone? Why or why not?

Write a poem about the volcanic eruption and life coming back.

Think it Through

Objective: Critical thinking, how environments change

The volcanic eruption was a natural disaster. What are some other natural disasters?

What are some ways that animals might sense other natural disasters?

How do you think living things (plants and animals) might recover from other natural disasters?

What are some ways that humans change habitats that affect the plants and animals that live there?

Changing Environments

How can each of these natural disasters change the environment?

- Tornadoes
- Hurricanes
- Earthquakes
- Ice storms
- Tsunamis
- Floods
- Volcanoes
- Heat waves
- Avalanches
- Landslides
- Forest fires
- Blizzards
- Electrical storms

Language Arts & Science: Five Senses

Objective Core Language Literature 4: Identify words and phrases in stories or poems that suggest feelings or appeal to the senses.

Re-read the story and write down any words that relate to the five senses:

Touch	Taste	Sight	Smell	Hearing

Cross-Curricular Vocabulary Activities

Objective Core Language Arts:

Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level reading and content.

Identify new meanings for familiar words and apply them accurately.

Use words & phrases acquired through conversations, reading/being read to, and responding to texts.

Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade level topic or subject area.

Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences.

Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

Use frequently occurring adjectives.

Vocabulary game: This activity is a very general idea and is designed to get children thinking of vocabulary words that will then be used as the beginning vocabulary list for a science lesson.

Select an illustration from the book and give the children a specific length of time (five minutes?) to write down all the words they can think of about the particular subject. It is helpful to project an illustration on a whiteboard. Use eBook or book preview found at www.ArbordalePublishing.com.

The children's word list should include anything and everything that comes to mind, including nouns, verbs, and adjectives. At the end of the time, have each child take turns reading a word from his/her list. If anyone else has the word, the reader does nothing. However, if the reader is the only one with the word, he/she should circle it. While reading the list, one person should write the word on a flashcard or large index card and post it on a bulletin board or wall.

At the end, the child with the most words circled "wins." And you have a start to your science vocabulary list. Note: if a child uses an incorrect word, this is a good time to explain the proper word or the proper usage.

Glossary/Vocabulary words: Word cards may be used (see Appendix) or have children write on index cards, a poster board, or on a chalkboard for a "word wall." If writing on poster board or chalkboard, you might want to sort words into nouns, verbs, etc. right away to save a step later if using for Silly Sentences. Leaving the words posted (even on a refrigerator at home) allows the children to see and think about them frequently. The glossary has some high-level words. Feel free to use only those words as fit your situation.

Using the Words: The following activities may be done all at once or over a period of several days.

- Sort vocabulary words into nouns, verbs, adjectives, etc. and write what they are on the backs of the cards. When the cards are turned over, all you will see is "noun," etc. (these can then be used for the "silly sentences" on the next page).
- After the cards have been sorted, go over the categories to ensure that all cards have been placed correctly. (Mistakes are a great opportunity to teach!)
- Choose two words from each category and write a sentence for each word.
- Write a story that uses at least ten vocabulary words from the word sort.
- Have children create sentences using their vocabulary words. Each sentence could be written on a separate slip of paper. Have children (individually or in small groups) sort and put sentences into informative paragraphs or a story. Edit and re-write paragraphs into one informative paper or a story.

Silly Sentence Structure Activity: This "game" develops both an understanding of sentence structure and the science subject. Use words from the "word wall" to fill in the blanks. After completing silly sentences for fun, have children try to fill in the proper words by looking for the correct information in the book.

Word Bank

Adjective	Noun			Verb
active	ash	landform	predator	build
cool	boundary	lava	pressure	destroy
dense	caldera	lava flow	prey	dig
dormant	carbon dioxide	lava lake	puzzle	dissolve
dry	continental plate	lava tube	Ring of Fire	erupt
four	core	magma	sapling	glide
gray	crater	magma chamber	seismograph	melt
hot	crust	mantle	sense	sense
molten	disaster	melting point	shelter	sink/sinks
outer	dome	mudflow	silica	soften
puzzle-like	eruption	natural disaster	temperature	
solid	food	nutrient	vent	
tectonic	gas	ocean plate	volcano	
thin	habitat	plate boundaries	water vapor	
	hotspot	plate tectonics		
	igneous rocks	plates		

Cross Curricular: Silly Sentences

1. A volcano is a _____ in the Earth's surface where magma, _____ es, and ash erupt. It also refers to the _____ constructed by erupted material.
noun noun noun
2. Erupting _____ builds new land but volcanic explosions can _____ the area around them.
noun verb
3. Volcanoes are _____ (erupting or expected to erupt in near future), _____ (like sleeping), or _____ (not expected to erupt again).
adjective adjective adjective
4. The Earth is made up of _____ layers. The outer layer is the Earth's _____. It is very _____ compared to everything else.
adjective noun adjective
5. The next layer is the Earth's _____, a _____, _____ layer of _____-solid rock. The Earth's two inner layers (called the core) are mostly iron and nickel.
noun adjective adjective adjective
6. The Earth's crust and the top part of the _____ are broken into _____ pieces called _____ plates. These plates glide past, pull away from, or move toward each other.
noun adjective
7. When the _____, dense ocean plate _____s into the mantle of the continental plate, _____s are hot enough to drive water out of the plate.
adjective verb noun
8. The water causes part of the mantle to _____—making magma. Since _____ is less dense than the rock around it, it moves up—just as a balloon floats up.
verb noun
9. As it moves up, it melts the _____ rock in the Earth's crust along the way.
adjective
10. The magma pools together in a large space called a _____.
noun noun
11. Gases in the magma can cause it to _____.
verb

Language Arts: Sequence Sentence Strips

Cut into sentence strips, laminate if desired, and place in a "center." Have children put the events in order. Children may work alone or in small groups. Cards are in order but should be mixed up when cut apart.

Objective Core Language Arts:

Use temporal words and phrases to signal event order.

Describe the overall structure of a story, including describing how the beginning introduces the story and the ending concludes the action.

**Some animals sense rumbling from the mountain.
Gopher digs and digs.**

The mountain rumbles for days. Gopher digs and digs.

**The mountain blows its top! The explosion knocks
down trees. The land is completely covered with ash.
Gopher is safe in his burrow with enough food.**

**Gopher, mouse, beetle and ant survive the blast in
their underground burrows or inside rotten logs.
Gopher digs and digs.**

**Insects fly in. Plant seeds blow in on the wind.
Gopher digs and digs.**

Seeds grow in soil not covered by ash or where gopher dug and mixed soil with ash. Gopher digs and digs.

Plants start to grow. Birds visit but don't have a place to build nests. Gopher digs and digs.

More plants start to grow. Gopher digs and digs. He keeps mixing the soil.

Animals visit and find small plants to eat but there's still not enough to eat. Gopher digs and digs.

Salamanders and toads come out of hibernation. They use gopher's tunnels to stay cool. Gopher digs and digs.

Years pass. Plants grow and more animals return to the mountain. Gopher digs and digs.

Word Search

Find the hidden words. Even non-reading children can match letters to letters to find the words! Easy—words go up to down or left to right (no diagonals). For older children, identify the coordinates of the first letter in each word (number, letter).

	A	B	C	D	E	F	G	H	I	J
1	V	O	L	C	P	I	G	I	S	E
2	E	A	R	Y	W	E	P	M	I	X
3	N	O	D	A	N	T	L	E	R	P
4	D	G	S	E	Z	O	A	G	O	L
5	B	V	O	L	C	A	N	O	F	O
6	E	K	I	K	S	D	T	P	O	D
7	E	U	L	N	B	A	S	H	O	E
8	T	Q	J	F	P	S	E	E	D	S
9	L	C	X	T	E	H	I	R	V	L
10	E	A	R	T	H	Q	U	A	K	E

VOLCANO
EARTHQUAKE
EXPLODES
BEETLE
GOPHER
PLANTS
ANT
ELK
SOIL
TOAD
SEEDS
FOOD

The Good and the Bad of Volcanoes

Circle whether you think the volcanic after-effects are good or bad. Are any of these results constructive or destructive?

1. G/B Volcanic eruptions kill many plants and animals and destroy the surrounding habitat.



2. G/B Over many years, the volcanic materials break down and make the soil very fertile. Around volcanoes you can find many fertile agricultural areas.



3. G/B Geothermal heat from young volcanic systems provides energy in some areas.



4. G/B Some islands and mountains were built by volcanoes.



5. G/B Pumice, a type of volcanic rock, is added to concrete or used as building blocks. It is also used as an abrasive for cleaning or for smoothing skin (like the dry skin on feet).



6. G/B Another type of volcanic rock, obsidian, is used in cutting blades and knives. Obsidian is formed when lava cools down very quickly. Historically, people made arrowheads out of obsidian.



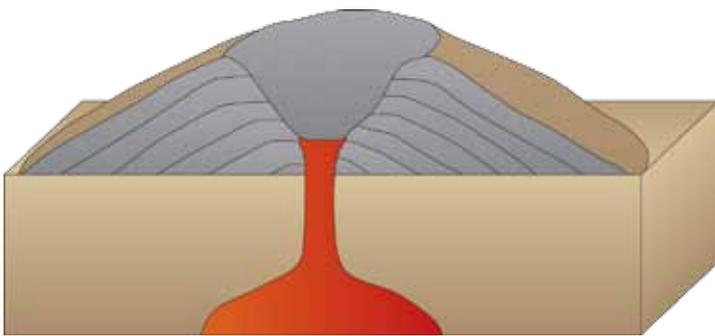
7. G/B Gems used in jewelry like diamonds and opals are found in volcanic areas.



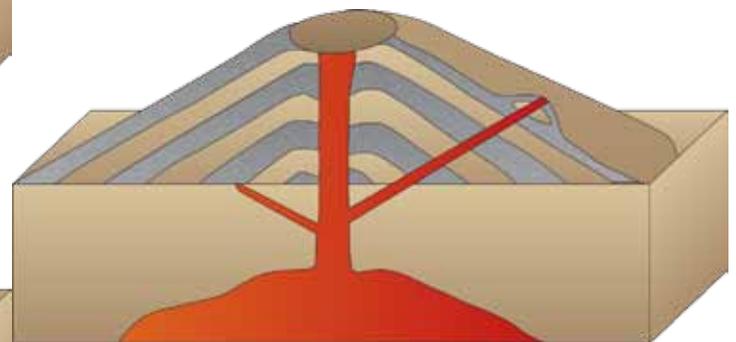
Types of Volcanoes

Magma contains dissolved gasses. The kind of eruption that flows or shoots out from a volcano depends on how much gas and the type of gas dissolved in the magma and the amount of pressure that has built up. Because there are different types of eruptions, there are three major types of volcanoes. Match the description to the type of volcano. Answers are upside down, below. Thanks to Tracey Saxby, IAN Image Library (ian.umces.edu/imagelibrary/), for the use of the images.

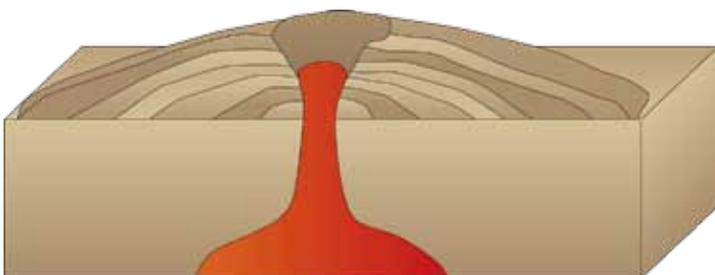
1. The smallest volcanoes rise only about a thousand feet above the surface of the earth. They are most often formed when magma comes in contact with water, creating so much steam that it explodes violently through a vent on the surface of the earth. As the lava explodes into the air it cools and breaks into small pieces that fall around the vent to make a cone.
2. These very large, steep-sided volcanoes are formed by layers of volcanic material (ash, cinders, very thick lava flows, and lava bombs, and blocks) deposited by different eruptions. Some of the most beautiful mountains in the world are stratovolcanoes.
3. These volcanoes have gentle sloping sides and a low profile. They are built by lava with very little dissolved gas so is thinner and flows more easily than the lava erupted by stratovolcanoes (think of the difference between cold honey and hot pancake syrup).



Cinder Cone



Composite or Stratovolcano



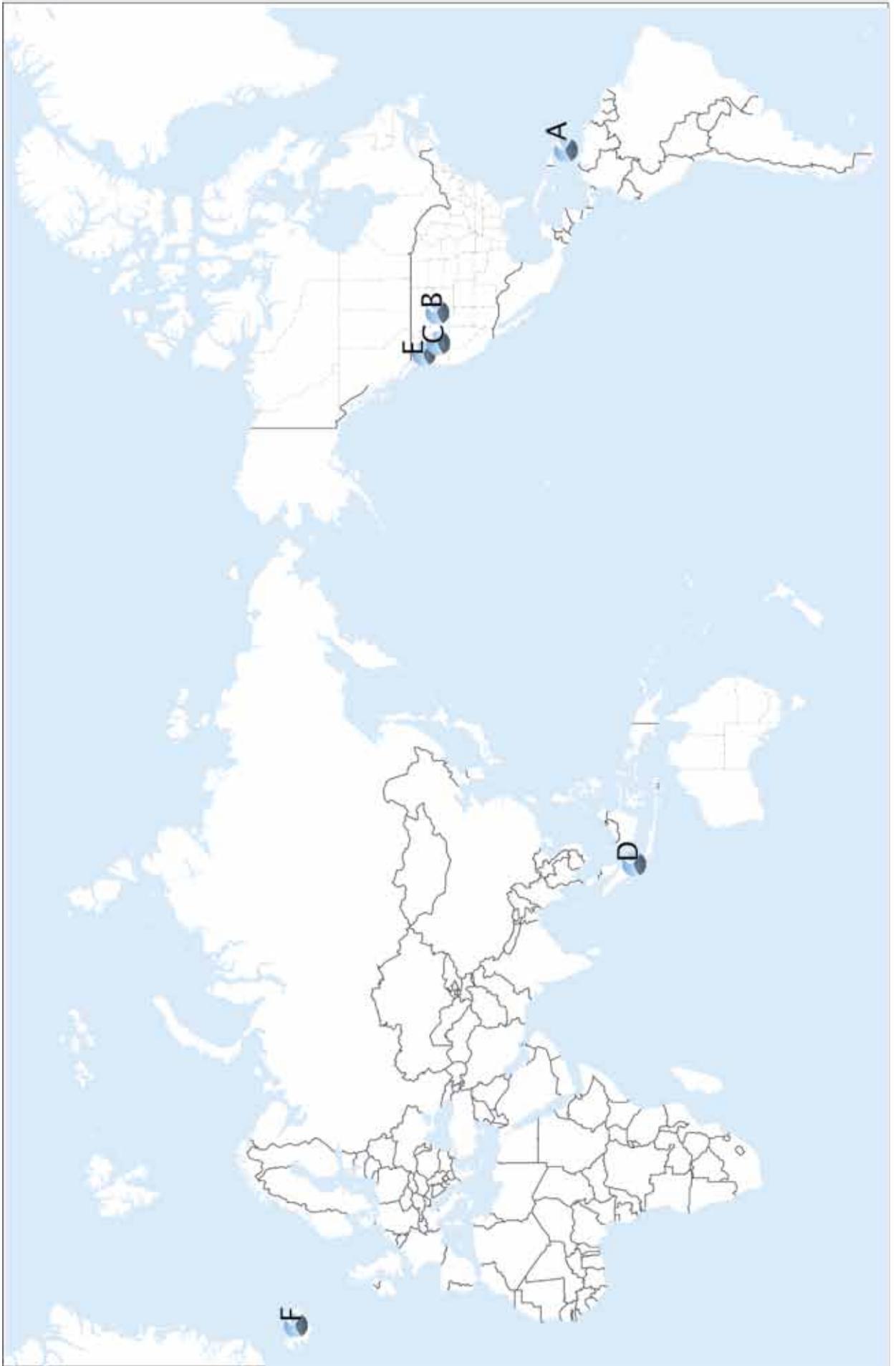
Shield

Some Volcano Fun Facts and Map Activity

- Snakes and insects crawled down the mountain a few days before Mt. Pelee (Caribbean) erupted in 1902. Scientists think that animals may sense the earthquakes that happen before eruptions. Or it could be that they sense a change in pressure. Some scientists in China and Japan have studied animal behavior before earthquakes or large volcanic eruptions. They hope to use animals to help predict these natural disasters. Many other scientists don't think animal behavior would be a reliable, repeatable predictor.
- A caldera is a very large volcanic crater formed when a volcano's vent collapses. Yellowstone National Park is in the caldera of a volcano. Crater Lake is a lake that filled in the caldera of Mount Mazama, a volcano that erupted about 7,000 years ago. (Thanks to Tracey Saxby, IAN Image Library (ian.umces.edu/imagelibrary/), for the use of this caldera image.)
- Many stratovolcanoes are topped by glaciers. When they erupt the blue glacier ice and red-hot lava mix colorfully. But the heat of the explosion melts the glaciers so suddenly that mudflows slide down the sides of the mountain. These mudflows are called lahars and can be very deadly.
- The sound of Krakatoa volcano's eruption in Sumatra, in 1883 was heard 3,000 miles away. A pressure wave created by Krakatoa's explosion circled the earth seven times.
- There was a cone of silence around Mount St. Helens when it erupted. People within 60 miles of the volcano could see the cloud formed by the eruption but did not hear a thing. People outside the 60 mile ring of silence, in many cases, heard many explosions, not just one. This is due to the fact that sound waves are refracted, bent, towards areas where the temperature is cooler. Since the volcano was red-hot and the area above it was still early-morning cool, the sound waves were bent upwards until it hit a hot air barrier about nine miles up from the surface of the earth where they were bent down landing far from the explosion's site. The sound waves bounced up and down creating, in some areas, what sounded like machine guns going off.
- In 2010, the Eyjafjallajökull volcano in Iceland created ash clouds that stopped planes from traveling in the area for days.

Find the approximate location of the mentioned volcanoes on the map on the next page.

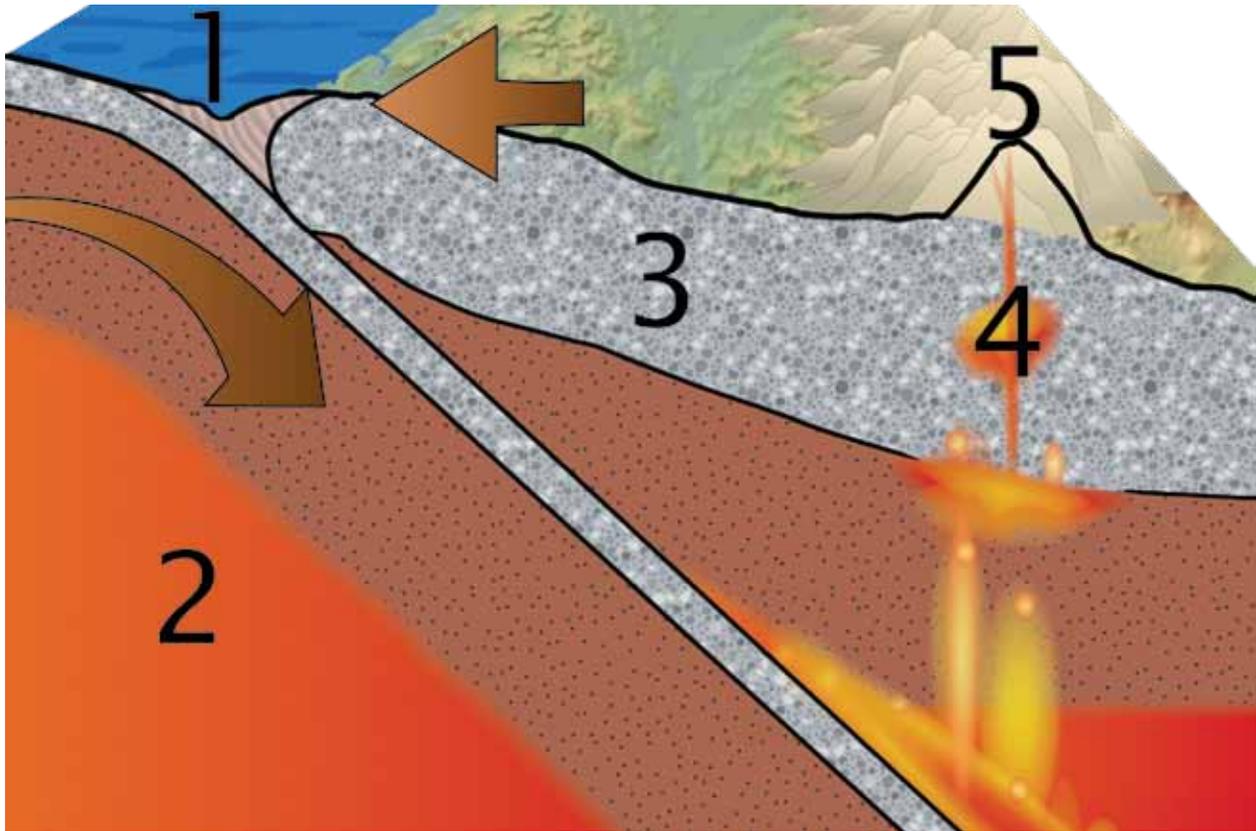
- | | | |
|--------------|---------------------|---------------------|
| A. Mt. Pelee | B. Yellowstone | C. Crater Lake |
| D. Krakatoa | E. Mount St. Helens | F. Eyjafjallajökull |



Volcano Formation

Use the following words to label the volcano formation. See the “For Creative Minds” section in the book for answers.

continental plate magma chamber ocean ocean plate volcano



1. _____
2. _____
3. _____
4. _____
5. _____

Gopher Fun Facts

Digging and tunneling. That's what gophers do. That's what can make gophers the heroes of recovery after a volcano erupts. Going about their normal life, digging tunnels for nests and to find roots and bulbs, they mix the good soil from under the ground with the ash deposited by the eruption. They loosen up the soil and stir up a fungus that allows the soil to hold moisture better. And they turn the hard-packed and baked soil into strips of soil good enough for seeds to sprout and plants to grow.

But gophers also live in farmers' fields. They eat the farmers' crops. Most farmers don't like gophers at all.

Gophers are made for digging. They are pointy on both ends and rounded along the middle, and they are smaller than a squirrel. They measure between six and ten inches and weigh between two and five ounces. Their fur is brownish and sometimes, when they molt, it can seem as if they have bands of color around their bodies. They use their strong claws and huge, sharp, fast-growing teeth to dig. Their skin is loose and their upper body is strong for digging. Since they don't need them much, gophers have very small eyes and ears for their size.

Gophers live most of their life alone in their own tunnels, except during mating season.

Gopher's tunnel systems can be as long as five hundred feet, and they consist of two levels. The upper level, eight to eighteen inches below ground, is used as a bathroom where they store their poop. Gophers recycle their poop if they can't find other food. The lower level, is used for nesting and storing food. These tunnels can reach down to 6 feet deep,

In winter, gophers dig tunnels through snow and line them with soil. When the snow melts, these make perfect strips where seeds can take hold and send up shoots.

A mother gopher will have a litter of four to seven babies once each spring and will nurse them for about forty days. When the babies are two months old, they leave their mother's tunnels and make their way out, away from the nest, to make their own tunnels. Scientists have found that the babies sometimes move more than 900 feet from their nest to start their own homes.

Some gophers, pocket gophers, move their food by stuffing it in fur-lined pouches, or pockets, behind their ears on the outside of their head. Sometimes they stuff the pockets so full they drag the ground.

Gopher: Hero or Pest?

Here are some ways gophers behave in their daily life. Gophers can be heroes in the recovery of areas damaged by volcanoes, but farmers think gophers are pests. Do you think the gopher behavior is a hero (H), a pest (P), neither (N), or both (B)? Explain why.

1. H P N B Gophers tunnel under a farmer's field and reach up through their tunnel and grab a tuber, like a turnip, a carrot or a potato. All the farmer sees is a hole where a veggie should have been. This definitely angers the farmer.
2. H P N B Gophers will tunnel under meadows on the volcano and munch on the tubers, roots, and bulbs, under the earth that the eruption did not damage.
3. H P N B From their tunnels they will also chomp down the roots of plants the farmer has planted or any roots they can find.
4. H P N B Gophers sneak up above ground and munch on whatever the farmer has planted.
5. H P N B Gopher tunnels may damage farmers' equipment
6. H P N B Gopher tunnels provide places for seeds to sprout and grow
7. H P N B When gophers dig, they break up the farmers ground, they stir up a fungus that allows the soil to hold moisture better and produce better and healthier plants. They fertilize the soil.



Science Journal

volcano

my definition

my drawing

ash

my definition

my drawing

mantle

my definition

my drawing

magma versus lava

my definition

my drawing

Volcano True or False?

Circle whether you think the statement is true or false. Answers are upside down, below.

1. T/F Dormant volcanoes are sleeping or resting. They have not erupted within the last 10,000 years but could possibly erupt at some point in the future.
2. T/F A caldera is a very large volcanic crater made when the rocks around a volcano's vent collapse into the empty chamber.
3. T/F Some volcanoes are underwater. The Hawaiian Islands started as underwater volcanoes.
4. T/F Some volcanoes are covered with glaciers.
5. T/F Not all volcanoes erupt violently. Some erupt slowly, over long periods of time.
6. T/F Lava can erupt through the top or the sides of a mountain.
7. T/F Most volcanoes are located along tectonic plate boundaries. The "Ring of Fire" is the name given to an area along the border of the Pacific Tectonic Plate with a high concentration of volcanoes.
8. T/F Volcanoes are considered extinct when there is no more lava supply. It can be quite difficult for scientists to know if and when this is the case.
9. T/F Yellowstone Caldera in Yellowstone National Park hasn't erupted violently for approximately 640,000 years, but scientists consider it to be dormant, not extinct.
10. T/F Dangers from volcanoes come from lava flows, bursting steam, pyroclastic flows, ash clouds, and mudflows.

Tools and Technology

Objective: Science: Recognize that scientists perform different kinds of investigations. Explain how technology is used in science for a variety of purposes.

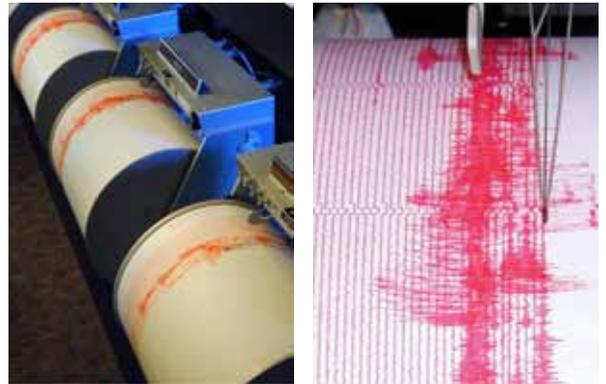
Scientists who study volcanoes are called volcanologists. If they can predict an eruption, they can warn people to leave the area. In recent years, scientists have saved thousands of lives by predicting volcanic eruptions.



Photo credit: Tim Plucinski and the Alaska Volcano Observatory / U.S. Geological Survey

Steam or smoke coming out of a volcano may be one of the first signs that it is “waking up” or becoming active.

Earthquakes are another early sign that a volcano is coming to life. Some earthquakes may be too small to feel but will show up on a seismograph—a special machine that records the earth vibrations. Seismographs measure the size of earthquakes.



Seismograph photo credits: Hawaiian Volcano Observatory / U.S. Geological Survey

As the magma gets closer to the Earth’s surface, the land itself might bulge or swell. But these changes might not be easily visible to us by just looking. Tiltmeters use bubbles to show changes in the land’s slope. GPS satellite imaging shows changes in land using the same technology as the GPS your parents might use for driving directions. Scientists even compare photographs taken from the exact same location to determine changes in the bulge

Gases in the air and water around the volcano are monitored too. Scientists look for increases in the amount of gas. The type of gases can affect the strength of the eruption. Machines can be set up in or around volcanic vents to measure gases from a safe distance.

Math: Measuring (compare & contrast)

Objective Core Mathematics Measurement:

Order three objects by length; compare the lengths of two objects indirectly by using a third object. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length.

How thick is it?

Compare the width of the four layers of the Earth to distances on a map or that you might drive.

The Earth's crust is 5-25 miles (8-40 km) deep. How does that compare to places you go on a regular basis? How far is it from your house to your school, grocery store, or library?

The mantle is about 1,600 miles (2,600 km) thick. It is approximately 1600 miles from Washington, DC to Denver, CO.

Outer core: about 1,400 miles (2,250 km).

Inner core: about 800 miles (1,300 km).

Which layer is thinnest and which is thickest?

Can you put the four earth layers in order from thinnest to thickest?



Math: Elapsed Time of Recovery

Objective: elapsed time, sequencing

Thanks to the USGS/Cascades Volcano Observatory for the use of these photos.

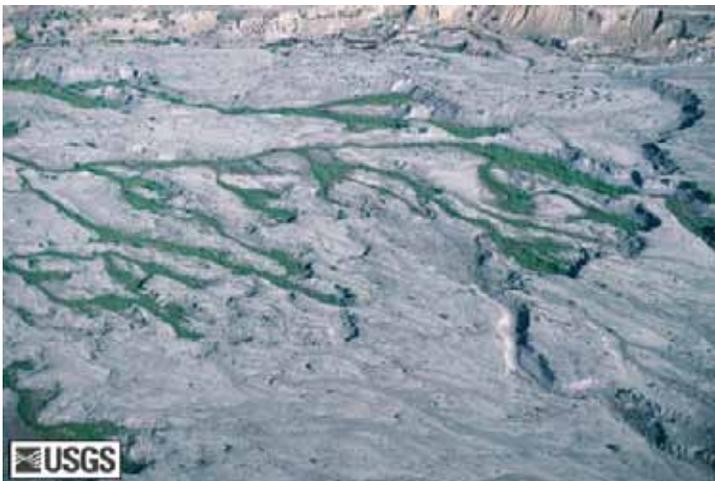
How long after the eruption was the photo taken?

Print and cut out the photos or download high-quality images from <http://vulcan.wr.usgs.gov/Volcanoes/MSH/Images/recovery.html>.

Put the photos in time order or on a timeline of the recovery.



May 18, 1980
eruption



Date of Photo: May 15, 1989
Plants growing through ash



Date of Photo: June 18, 1980
tree protected by snowbank



Date of Photo: June 25, 1980
Revegetation on the northwest flank



Date of Photo: October 1980
bear tracks in ash



Date of Photo: June, 1980
Smith Creek drainage



Date of Photo: June 1986
new growth Smith Creek drainage



Date of Photo: September 4, 1984
Fireweed



Date of Photo: July 26, 2005
Carbonate Springs

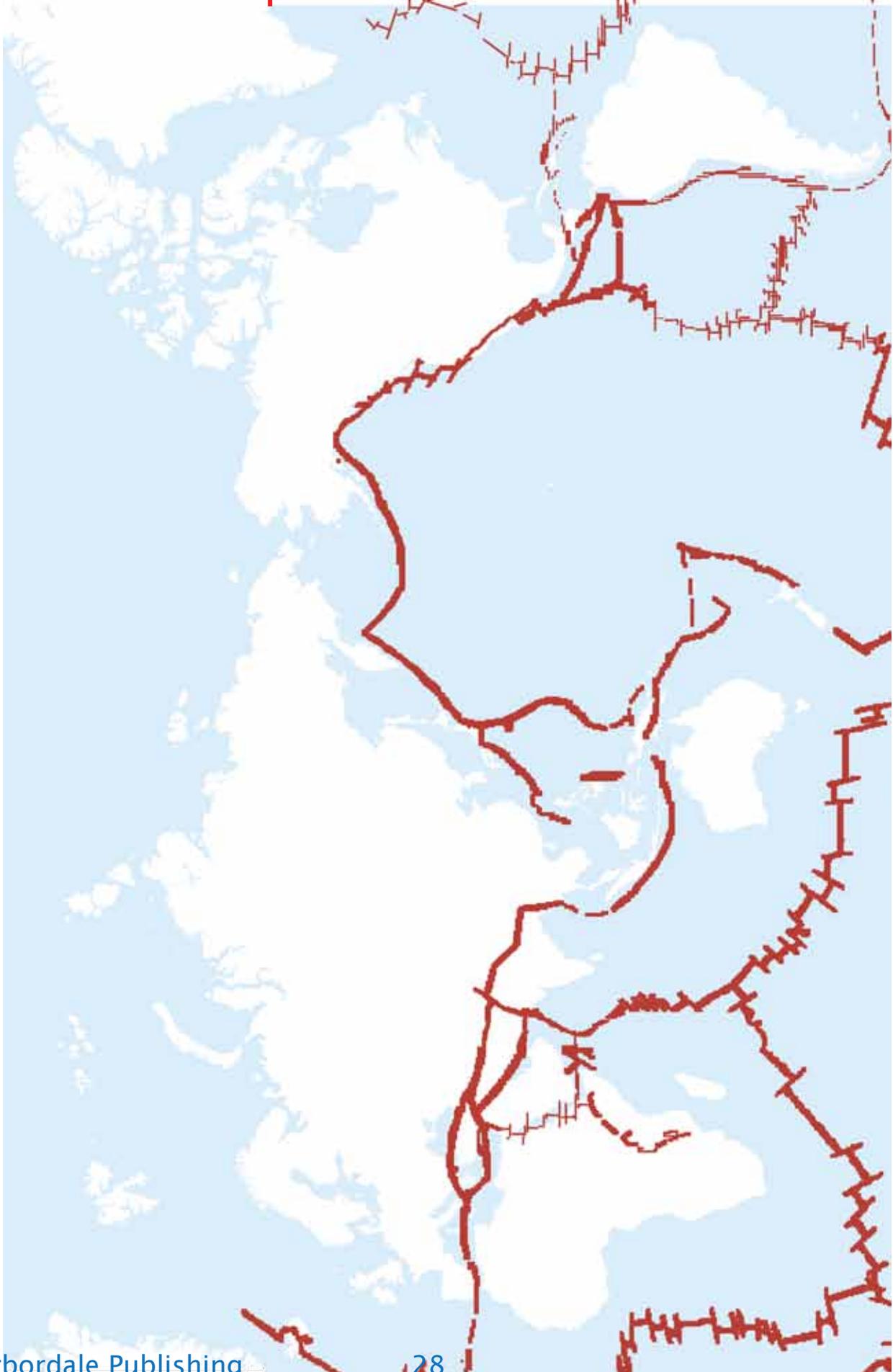


Date of Photo: July 26, 2005
growth at Carbonate Springs



Date of Photo: August 1984
taken from Harry's Ridge

Maps: Name the Plates



Glossary

Word	Definition	Part of Speech	Spanish
active	having lots of energy, doing a lot of things	adjective	activo
active volcano	a volcano that is erupting or expected to erupt in near future	noun	volcán activo
ash	small, fine dust-size pieces of rock	noun	ceniza
boundary	a line indicating the limit of a country, state, or other political jurisdiction	noun	limite
build	to put pieces together, to make bigger	verb	construir, fabricar
caldera	a very large volcanic crater formed when a volcano's vent collapses	noun	caldera
carbon dioxide	One of many gases in Earth's atmosphere that can dissolve in magma. Carbon dioxide is also produced by combustion and respiration	noun	bióxido de carbono
continental plate	the tectonic plate under continents	noun	placa continental
cool	just warmer than cold	adjective	fresco
core	the Earth's central region, believed to be composed mostly of iron and nickel	noun	núcleo, centro
crater	a large hole on the surface of a planet caused by a volcanic explosion or meteorite hit	noun	cráter

Word	Definition	Part of Speech	Spanish
crust	solid, outer layers of the earth	noun	corteza terrestre
dense	an object with high mass per volume	adjective	densidad
destroy	to put an end to, to kill, to wreck	verb	destruir
dig	break up and move earth with a tool or machine, or with hands , paws, snout, etc.	verb	cavar
disaster	a destructive event, caused by man or nature	noun	desastre
dissolve	to mix a solid into a liquid so that the solid becomes part of the liquid	verb	disolver
dome	a steep-sided mount that forms when very viscous lava is extruded from a volcanic vent.	noun	domo tapón, bulto, bóveda
dormant	1) resting or sleeping, 2) non active	adjective	durmiente, inactivo
dormant volcano	an inactive volcano that may erupt again	noun	volcán durmiente
dry	not wet or moist	adjective	seco
erupt	to explode suddenly with a lot of violence or noise	verb	hacer erupción
eruption	solid, liquid, and gaseous materials ejected into the earth's atmosphere and onto the earth's surface by volcanic activity	noun	erupción volcánica
extinct volcano	a volcano that is not expected to erupt again	noun	volcán extinto
food	what is eaten to sustain life, provide energy, promote growth, etc	noun	alimento
gas	a state of matter that has no definite shape or volume	noun	gas

Word	Definition	Part of Speech	Spanish
glide	to move smoothly without any apparent effort	verb	deslizarse, planear
gray	a color	adjective	gris
habitat	an address: the ground, rocks, water, climate, and all of the living things in that same place	noun	hábitat
hot	having a high degree of heat or a high temperature, ; Dolch Sight word, grade 3	adjective	calor
hotspot	spots in the Earth's crust not at plate boundaries, through which magma erupts	noun	puntos calientes
igneous rocks	rocks formed from melted volcanic rock that has cooled and solidified	noun	rocas ígneas
landform	a feature on the Earth's surface	noun	forma terrestre,
lava	magma that reached the Earth's surface through a volcanic eruption	noun	lava
lava flow	the stream of molten rock (lava) that erupts relatively nonexplosively from a volcano and moves downslope	noun	lava fluida
lava lake	the surface of lava that is ponded is smooth	noun	lago de lava
lava tube	a tunnel formed when the surface of a lava flow cools and solidifies, while the still-molten interior flows through and drains away	noun	tubo de lava
magma	molten rock beneath the surface of the earth	noun	magma

Word	Definition	Part of Speech	Spanish
magma chamber	the subterranean pocket containing magma, if a tube or pipe is opened to the surface, a volcanic eruption is possible	noun	cámara magmática
mantle	the earth zone below the crust but above the core	noun	manto
melt	to change from a solid into a liquid	verb	derretirse
melting point	the temperature at which a solid becomes a liquid at standard atmospheric pressure	noun	punto de fusión
molten	1) a solid that is so hot it becomes liquid 2) molten rock is magma (below the Earth's surface) or lava (above the Earth's surface)	adjective	derretido
mudflow	flowing mixture of water and debris that forms on the slopes of a volcano	noun	flujo de lodo
natural disaster	a naturally occurring (not caused by man) destructive event or force of nature: avalanche, earthquake, flood, hurricane, lightning storm, tornado, tsunami, volcanic eruption, or wildfire	noun	desastres naturales
nutrient	a substance that provides the nourishment needed for the survival of an organism	noun	nutrientes, alimentos nutritivos, sustancia nutritiva
ocean plate	the tectonic plate under the ocean that subducts (goes under) continental plates	noun	placa oceánica

Word	Definition	Part of Speech	Spanish
outer	on or around the outside of something, far from the center of something	adjective	externo
plate boundaries	the edges of plates or the junction between tectonic plates	noun	tectónica de placas
plate tectonics	a theory that explains the global distribution of earthquakes, volcanoes, continental drift, and mountain building	noun	placas tectónicas
plates	puzzle-like pieces of crust and brittle uppermost mantle that cover the Earth's surface. The plates move very slowly over, or possibly with, a viscous layer in the mantle at rates of a few to several centimeters per year.	noun	placas
predator	an animal that depends on or preys on other animals for food	noun	animal de rapiña, predadores
pressure	1) a force pressing on something or 2) the amount of force that a gas or liquid produces in an area or container	noun	presión
prey	an animal that is hunted, killed, and eaten by other animals	noun	presa
puzzle	a toy or game that needs time and patience to put together	noun	rompecabezas
puzzle-like	like a puzzle	adjective	como un rompecabezas
rift volcano	volcano formed when two plates pull apart	noun	volcán de rift

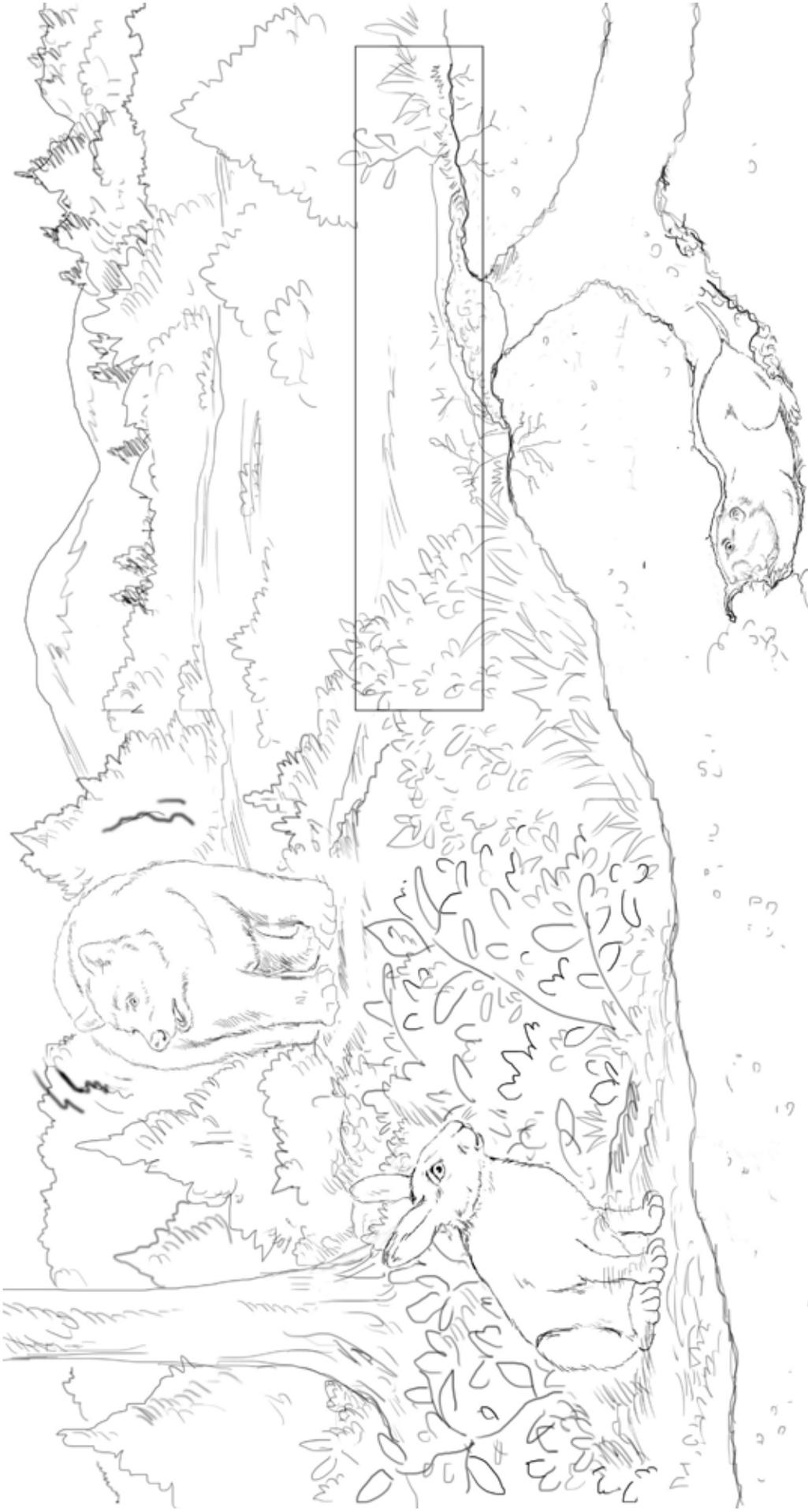
Word	Definition	Part of Speech	Spanish
ring of fire	the regions of mountain-building earthquakes and volcanoes around the Pacific Ocean.	noun	Anillo de Fuego
sapling	a young tree no longer a seedling but not yet a pole	noun	árbol joven
seismograph	a sensitive instrument that can detect, amplify, and record ground vibrations too small to be perceived by human beings	noun	sismógrafo
sense	touch, taste, hearing, smell, or sight	noun	sentido
sense	to touch, to feel, to see, to hear, to sight	verb	sentir
shelter	a structure that provides privacy and protection from danger	noun	lugar protegido
silica	the basic building block of volcanic rocks and the most important factor controlling the fluidity of magma	noun	sílice
sink/sinks	to disappear or lower below the surface, to go under	verb	hundir, hundirse
soften	to make soft	verb	suavizar
solid	a state of matter that has a definite shape and volume	adjective	sólido
tectonic	relating to the structure and movement of the surface of the earth	adjective	tectónico
temperature	the warmth or coldness of something; measured with a thermometer	noun	temperatura
thin	narrow, skinny	adjective	delgado

Word	Definition	Part of Speech	Spanish
vent	the opening at the earth's surface through which volcanic materials reach the surface	noun	abertura
volcano	a vent in the Earth's surface where magma, gases, and ash erupt, the landform constructed by erupted material.	noun	volcán
water vapor	water in a gaseous state	noun	vapor de agua



Gopher to the Rescue!

A Volcano Recovery Story



Gopher to the Rescue!

A Volcano Recovery Story

Answers

	A	B	C	D	E	F	G	H	I	J
1										E
2							P			X
3				A	N	T	L	E	R	P
4			S	E		O	A	G		L
5	B	V	O	L	C	A	N	O	F	O
6	E		I	K		D	T	P	O	D
7	E		L				S	H	O	E
8	T					S	E	E	D	S
9	L							R		
10	E	A	R	T	H	Q	U	A	K	E

VOLCANO	5B
EARTHQUAKE	10A
EXPLODES	1J
BEETLE	5A
GOPHER	4H
PLANTS	2C
ANT	3D
ELK	4D
SOIL	4C
TOAD	3F
SEEDS	8F
FOOD	5I

Silly Sentences

1. A volcano is a **vent** in the Earth's surface where magma, **gases**, and ash erupt. It also refers to the **landform** constructed by erupted material.
2. Erupting **lava** builds new land but volcanic explosions can **destroy** the area around them.
3. Volcanoes are **active** (erupting or expected to erupt in near future), **dormant** (like sleeping), or **extinct** (not expected to erupt again).
4. The Earth is made up of **four** layers. The outer layer is the Earth's **crust** It is very **thin** compared to everything else.
5. The next layer is the Earth's **mantle** It is a **dense, hot** layer of **semi-solid** rock. The Earth's two inner layers (called the core) are mostly iron and nickel.
6. The Earth's crust and the top part of the **mantle** are broken into **puzzle-like** pieces called **tectonic** plates. These plates glide past, pull away from, or move toward each other.
7. When the **cool**, dense ocean plate **sinks** into the mantle of the continental plate, **temperatures** are hot enough to drive water out of the plate.
8. The water causes part of the mantle to **melt**—making **magma**. Since magma is less dense than the rock around it, it moves up—just as a balloon floats up.
9. As it moves up, it melts the **solid** rock in the Earth's crust along the way.
10. The magma pools together in a large space called a **magma chamber**.
11. Gases in the magma can cause it to **erupt**.

The Good and Bad of Volcanoes

Answers may vary but in general, all would be considered good except for number 1.

Gopher: Hero or Pest?

The answers depend on individual perspective and the questions serve as a launch pad for discussion.

Volcano True or False?

All are true



