

Unit 1 Land from the Sea

For this is what the LORD says—he who created the heavens, he is God;
he who fashioned and made the earth, he founded it;
he did not create it to be empty,
but formed it to be inhabited—he says:
“I am the LORD, and there is no other.” Isaiah 45:18



On the third day, God separated land from water.

The Third Day

In the beginning of everything we can know or imagine, God spoke our world into existence. Genesis chapter one tells the story. John’s Gospel expands it when he tells us that Christ, the Son, made all things.

Some scientists think the world began with a “big bang.” If so, such a bang did not take place by accident. God spoke and things happened! (See Genesis 1:1-2.) Genesis also tells us that God used a process when He created our world. At first God’s Spirit hovered or brooded like a mother hen over a shapeless mass. Water covered everything. Water vapor and fog filled the atmosphere. Then God began systematically to create order.

On the third day of creation God separated land from water. That act began many changes in our earth’s surface. *Geology* (jee-OL-u-jee) explores what happened when God spoke—and what has continued to happen as a result.

When God separated the land from the water, perhaps all the land was clumped together in one place. Scientists call such a landmass *Pangaea* (pan-JEE-uh). Perhaps the various continents broke off and gradually drifted away from one another. Scientists call this process *continental drift*. Look at a map of the world and you will see that some of the continents look as though they fit together like puzzle pieces.

If the continental drift theory is true, our world may have once looked like this.

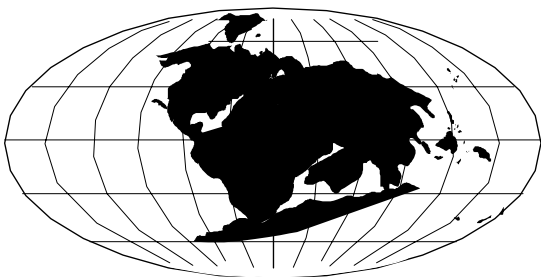


Plate Tectonics

It may have worked this way: A hot mass of melted mineral and rock, or *magma*, forms the center of our world. The surface of this mass has cooled, hardened, and broken into several pieces called plates. Continents ride on the plates and oceans flow over them. Plates drift apart or bump together; the land on top moves with them. This theory is called *plate tectonics* (tek-TAW-niks). According to this theory, Oregon sits on the edge of a *continental plate*. When plates collide, slide under one another, or drift apart many *volcanoes* (vol-KAY-nose) and earthquakes occur. Volcanoes played a major role in shaping Oregon as we know it today.

Fill in the blanks with the correct answers.

1. On the third day of creation God separated _____ from _____.

2. Geology is the study of earth's _____, _____, and _____.
3. Continental drift happened when land broke loose and _____ away from _____.
4. According to the _____ theory, continents ride on plates. These plates float on _____, the earth's molten core.
5. _____ played a large part in shaping the land in Oregon.

Two Islands

Geologists divide Oregon into nine areas, according to the kinds of rocks they find. We begin Oregon's story by discovering some geological facts about our land.

As God worked, interesting things happened. At first ocean waters flowed over much of the area where we now live. Then volcanoes began to erupt and create islands.

As their plates moved, sometimes islands collided with the land. When the islands' plates slid under the continent's plate, the islands became part of the continent. The Klamath Mountains in southwestern Oregon and the Blue Mountains in northeastern Oregon may have once been two such islands. In these two areas, scientists find stone they think is the oldest in Oregon. Pioneer miners found gold in both areas.

In the Blue Mountain region you might wish to see fossils of leaves and animals at the John Day Fossil Beds National Monument. The Klamath Mountain area includes some of the world's most beautiful coastal scenery. Interesting places to see include Cape Blanco (BLAHN-co), the westernmost point in Oregon, Oregon Caves, and upper and lower Table Rocks north of Medford.

Basin and Range Area—Owyhee Uplands

The Basin and Range area of central and eastern Oregon contains steep-walled valleys that open northward. Warner Valley, Catlow Valley, and the Alvord Desert are such valleys. Water from the Basin and Range area has no direct route to the sea.

During the *ice age*, many lakes covered this area. Abert Lake and Summer Lake remain as fragments of larger lakes. The highest point, Steens Mountain, runs northwesterly for 50 miles. Sheer (e-SCARP-ments), or steep cliffs, carved by *erosion* (e-RO-zyun) and glaciers, rise abruptly from valley floors. (See map on page p. 69)

Owyhee (oh-WIE-hee) uplands occupy Malheur (MAL-hyoor) County and extend into Idaho. Rock formations here resemble those in the Basin and Range territory.

Indian Sands State Park south of Gold Beach, Oregon
(photo by Dennis Matchette)





An obsidian flow inside Newberry Crater (photo by Dennis Matchette)

Scientists often group these two areas together. Interesting places to visit in this part of Oregon include Jordan Craters in Malheur County, Steens Mountain, and Owyhee State Park.

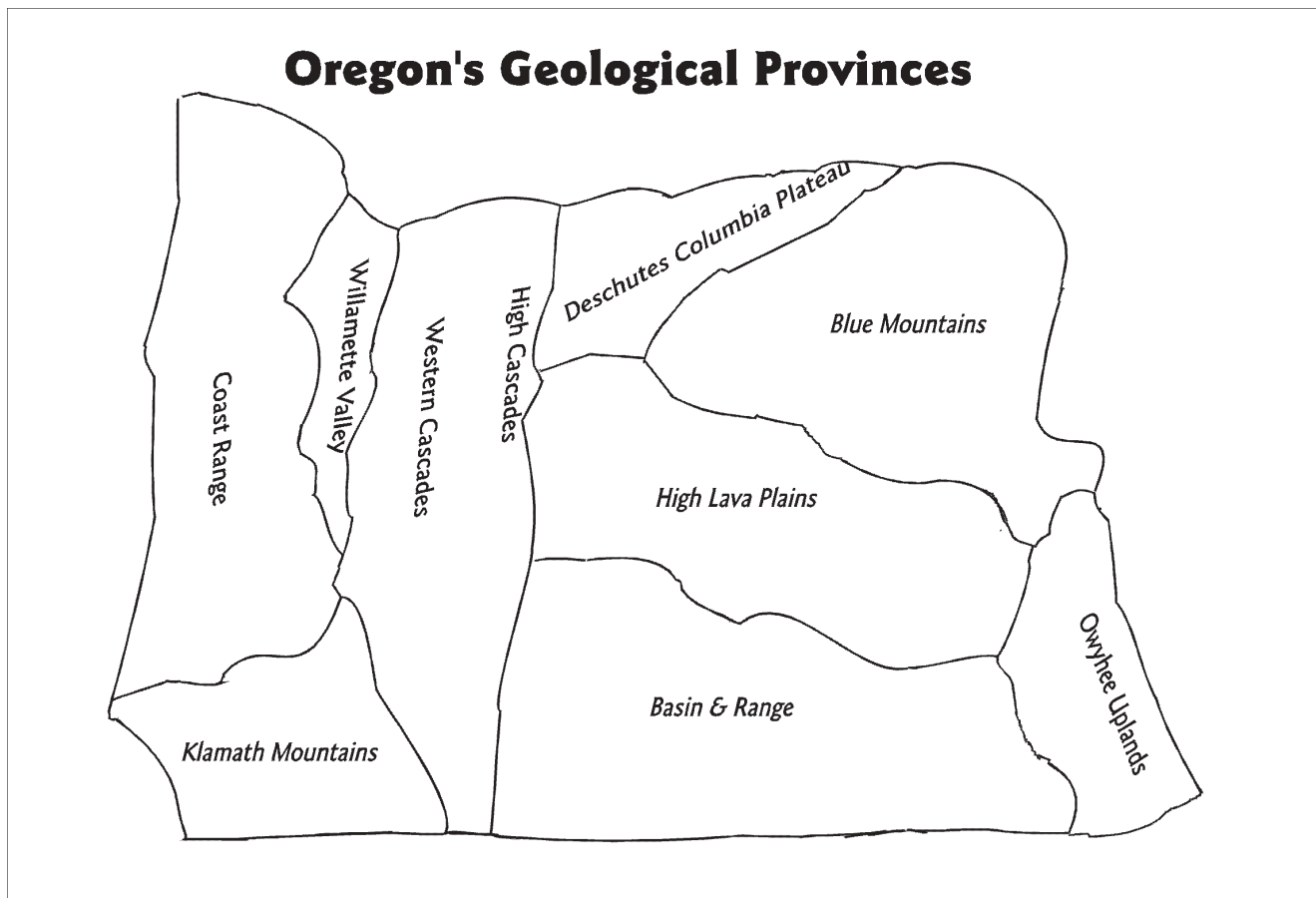
High Lava Plains

The High Lava Plains lie near Oregon’s center. This zone runs from Steens Mountain to Bend. Scientists believe that for thousands of years, volcanoes erupted here almost continuously. Today we find lava everywhere. Little rain falls in this region. This makes the High Lava Plains a good region to see what volcanoes did.

During the ice age, vast lakes covered eastern and central Oregon. One lake extended from near Steens Mountain to the modern-day location of Burns.

Malheur, Harney, and Mud lakes are all that remain of this great lake. They grow and shrink according to rainfall. Around 1930 the lakes nearly dried up during a drought. In 1984, record rainfall flooded the lakes. Today these lakes form part of Malheur National Wildlife Refuge. Fort Rock is an *extinct* volcano found in another dry lake bed near present-day LaPine.

You might enjoy visiting Smith Rock State Park, Fort Rock State Park, or the Newberry Volcanoes National Monument in this region of Oregon.



Deschutes-Columbia Plateau

Volcanoes also created the area of the Deschutes (Deh-SHOOTS)-Columbia Plateau. This area extends over parts of Oregon, Washington, and Idaho. The Oregon section borders the Columbia River on the north and the Cascade Mountains on the west. Here the Columbia River and the rivers that flow into it have cut deep canyons through the lava of the plateau.

Scientists believe that during the ice age, glaciers may have dammed up a river in what is now Montana. When the ice broke open, floodwaters gushed to the sea, scouring southeastern Washington and Columbia Gorge.

Interesting places to visit include Cove Palisades State Park and the headwaters of the Metolius.



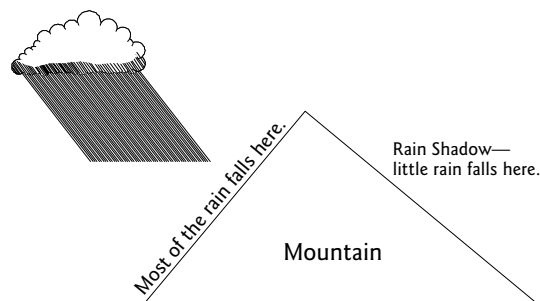
Fort Rock rises abruptly from an ancient lake bed.

Fill in the blanks with the correct answers.

- _____ may have helped form mountain ranges in southwestern Oregon and northeastern Oregon. Scientists believe the _____ here are very old.
 - Miners found gold in the _____ Mountain and _____ Mountain areas.
 - Many _____ once covered parts of central and eastern Oregon.
 - Water from the Basin and Range area has no direct route to the _____.
 - We find the High Lava Plains in _____ Oregon.
 - _____ created the High Lava Plains.
 - _____ once filled depressions in central and eastern Oregon.
 - Malheur and Harney lakes _____ when it rains. In times of drought they _____.
 - _____ created the Deschutes-Columbia plateau.
 - During the ice age a glacier dam broke, pouring flood waters down _____
-

Cascade Mountains

Long ago the Oregon coastline lay along the eastern edge of the Willamette Valley. Then, scientists think, separating plates created many volcanoes. Evidence indicates these volcanoes erupted violently and frequently. This created mountains we know today as the Cascades. These mountains gradually tipped westward. Today moist air from the ocean collides with the mountain tops and rains on their western side. Because of this, little rain falls on the eastern side. We call this *rain shadow*. Rain shadow causes the *arid* (or very dry) “eastern Oregon” climate we know today.



These first volcanoes gradually burned themselves out. One extinct (ex-TINCT) volcano, Mount Tabor, is found inside the Portland city limits. Newer mountains cover some extinct volcanoes.

Newer High Cascade volcanoes form a familiar part of the landscape in the Willamette Valley and central Oregon. They include Mount Hood, Mount Jefferson, Three-Fingered Jack, and the Three Sisters. Well-known Washington volcanoes are Mount Rainier and Mount Saint Helens.

On May 18, 1980, Mount Saint Helens erupted with a boom heard hundreds of miles away. Winds carried ash for thousands of miles into the Midwest. Oregon too has volcanoes that could erupt. Scientists class Mount Hood as *dormant* (DOOR-munt). It last erupted in 1865. The South Sister in the Three Sisters group is the youngest volcano of the three. It last erupted about 1,900 years ago. It could erupt again. Mount Mazama (mu-ZAH-ma), the home of Crater Lake, is dormant and could erupt again. Several less-known mountains appear extinct, but scientists are not sure.

To see an active volcano firsthand, you might want to visit the Newberry National Volcanic Monument about ten miles south of Bend. You will find a variety of volcanic formations there. The National Monument has two visitor centers. For more information, contact Deschutes National Forest.

Willamette Valley

Willamette Valley is Oregon's only natural lowland of any size. It is a part of a larger lowland that reaches north to Puget Sound. At one time what we know as Willamette Valley lay under the ocean. As the ocean retreated, lava covered the valley surface. Later ice age floods scoured the valley. Willamette Valley lies near two moving plates, which means that at some point, a huge earthquake will likely occur.

The Coast Range

The Coast Range is a belt of moderately high mountains and coastal headlands. It extends southward from the Columbia River about two hundred miles. The highest point, about 4,000 feet, is Mary's Peak near Philomath. These mountains cause some rain shadow effect in the Willamette Valley. A great deal of rain falls on the Willamette Valley, but even more drenches the western side. The coastal mountains rose gradually and they continue to rise as the San Juan Plate slides under the North America Plate.

Cape Blanco rises one inch every three years and Astoria an inch every 36 years. In contrast, Vancouver, Washington, sinks an inch every 40 years, while Seattle sinks an inch each 11 years.

Our coastline is moving east. Each year we lose about two feet of land. Nature causes some of this. Man-made structures also contribute to the change. Offenders include

Crater Lake came into being when Mount Mazama erupted explosively.



riprap, piers, breakwaters, and poorly constructed jetties. Between 1936 and 1960, Tillamook Spit retreated 50 feet. Cape Meares lost about 320 feet during the same period. It moved back another 75 feet during 1960-61.

Along the coast, wet weather triggers huge landslides. Between 1940 and 1943 in Newport, a large block slid seaward taking 15 houses. This created a wide opening that separated pavement and water mains. Today the sea attacks and erodes the other side of this mass. Another landslide occurred at Ecola State Park in 1961. A 125-acre area slid down at a rate of about three feet per day. In fall 1997 the sea destroyed 200 feet of jetty on the north side of the Columbia and eroded away a parking lot at Fort Canby State Park in Washington.

Interesting places to visit include Oregon Dunes National Recreation Area, the Three Capes (Kiwanda, Lookout, and Meares), the Devil's Elbow, Devil's Churn, and Devil's Punchbowl (Otter Rock), and Mary's Peak.



Winter storms scour the beaches of Fort Stevens State Park and reveal the skeleton of the Peter Iredale, Oregon's most famous shipwreck. (photo by Dennis Matchette)

Fill in the blanks with the correct answers.

1. The Willamette Valley is a _____.
 2. _____ grew into the Cascade Mountains.
 3. The Cascades have a _____ on the eastern side.
 4. Rain shadows cause _____ climate.
 5. Oregon volcanoes that could erupt again include _____, _____, and _____.
 6. Three volcanoes you can see from central Oregon and the Willamette Valley include _____, _____, and _____.
 7. What city has an extinct volcano within its city limits? _____
 8. Crater Lake lies at the top of Mount _____.
 9. Wet weather triggers _____ along the Oregon coast.
 10. Oregon loses about _____ feet of land each year.
-

Summary

Our world began when God spoke it into existence. On the third day of creation, God separated land from water. Some scientists believe that at first, all the continents were one landmass. They call this Pangaea. Some scientists believe earth's land sits on large plates that float on earth's molten core. This theory is called plate tectonics.



Lava flow in Newberry National
Volcanic Monument (photo by Dennis
Matchette)

Geology is the science that studies earth's origin, history, and structure. Geologists divide Oregon into nine areas. We find Oregon's oldest rocks in the Blue Mountain and Klamath Mountain areas. These areas also contain gold.

Volcanoes played a large part in forming Oregon's topography. During the ice age, large lakes covered much of eastern Oregon.

The Cascade Mountains keep much rain from falling on their eastern side. In the Cascades, several dormant volcanoes could erupt again. These volcanoes include: Mount Hood, the South Sister (in the Three Sisters), and Mount Mazama, which holds Crater Lake. Mount Tabor City Park in Portland is built on an extinct volcano.

At one time the eastern side of Willamette Valley was the coastline. Now the Willamette Valley lies between the Cascade Mountains and the Coast Range, which is still rising in the west. Oregon's coastline moves about two feet east each year. Mary's Peak is the Coast Range's highest peak.

What Have You Learned?

Write the correct letter in the blanks.

- On the third day God _____.
(a) created plants (b) separated land and water (c) lit the stars
- Geologists study _____.
(a) people (b) ancient animals (c) rocks and the earth's structure
- _____ played a major part in creating the land of Oregon.
(a) Volcanoes (b) Hurricanes (c) People
- Oregon's coast is moving _____ at the rate of about _____ feet a year.
(a) east (b) west (c) north (d) south (e) 10 (f) 6 (g) 2
- Volcanoes that have not erupted for a long time, but still could are called _____.
(a) active (b) extinct (c) dormant
- _____ lies on top of Mount Mazama.
(a) Abert Lake (b) Crater Lake (c) Malheur Lake
- _____ is the highest mountain in the Coast Range.
(a) Green Peak (b) Mary's Peak (c) Mount Jefferson
- _____ is not in the Cascade Range.
(a) Mary's Peak (b) Mount Saint Helens (c) Three Fingered Jack
- _____ keep(s) much rain from falling east of the Cascade Mountains.
(a) Desert conditions (b) Hot weather (c) Rain shadow
- In western Oregon wet weather causes _____.
(a) earthquakes (b) landslides (c) mountains to rise
- If the _____ theory is true, continents float on plates.
(a) continental drift (b) plate tectonics (c) relativity
- Some people believe at first all the land was in one place. Scientists call this continent _____.
(a) Atlantis (b) Panacea (c) Pangaea

13. Long ago many lakes covered _____.
 (a) the Cascade Mountains (b) eastern Oregon (c) the Oregon coast
14. During the ice age _____ scoured the Willamette Valley.
 (a) floods (b) volcanoes (c) hunters

Match the words with their definitions:

15. ___ Geology a. the theory that the earth's crust is made of semi-rigid plates
16. ___ Magma b. earth's molten core
17. ___ Pangaea c. science that studies earth's origin, history and structure
18. ___ Plate tectonics d. a single huge continent that broke apart
19. ___ Dormant e. the "dry" side of a mountain range
20. ___ Rain shadow f. not active

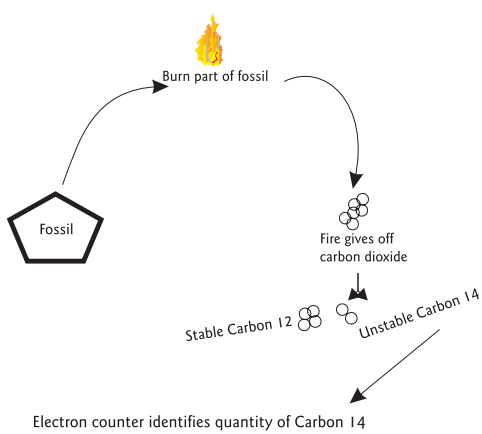
Oregon—Land of Immigrants

God put the Garden of Eden in an area known as the "Fertile Crescent." We know it today as the Middle East. Here Adam and Eve lived with their descendants. From there, people traveled into other parts of the world. *Anthropologists* (an-throw-POLL-u-jists—scientists who study people) agree that every people group in the Americas came here from somewhere else. Early travelers probably followed game or looked for areas where they could harvest roots and berries.

Paleo-Indians

Where did the first Americans come from? Anthropologists have suggestions, although they do not all agree. Most believe that the first Americans crossed from Asia to America on a land bridge where the Bering Strait is today. During the most recent ice age much of the world's

How Old Is It?



About 50 years ago an American chemist discovered an accurate way to find out how old something is. It works like this:

Some of the carbon in carbon dioxide is radioactive carbon 14. Plants absorb it. Animals eat plants, and carbon 14 reaches their bodies too.

When plants and animals die, their bodies begin to lose carbon 14. Scientists measure the carbon 14 in an object and compare that quantity with the carbon 14 in a similar living object.

Many archeologists do not trust carbon 14 dating alone. Errors as great as 2,000 to 5,000 years can occur. However, carbon 14 dating is a useful tool.