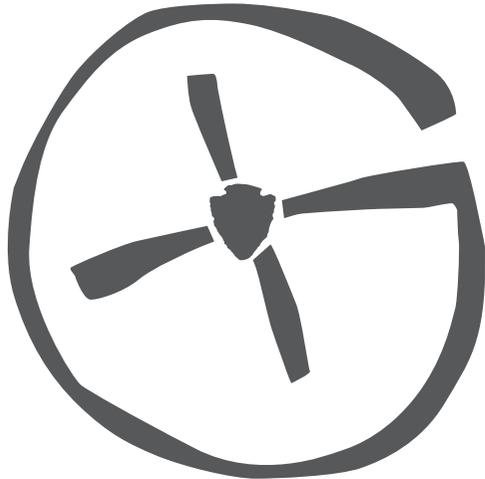


# Geology Parkcaching Challenge



## [pahrk-kash-ing]

An outdoor game of searching for objects or information using Global Positioning System (GPS) coordinates within national parks.

## Highway Geology Parkcaches

Fill in the blanks below using the laminated answer key that you will find attached to a structure or sign at each parkcache located along the 30-mile park highway. If you are starting in the Southwest Area, begin with GPS1 and work your way to GPS11. If you are starting in the Manzanita Lake Area, begin with GPS11 and work your way to GPS1.

### GPS 1 | N40°25.446' W121°32.053'

Every peak in the park is either a volcano or a remnant of one. Rocks in the western area of the park consist of a more viscous (thick) type of lava and result from explosive types of eruptions. This type of activity is common in regions of tectonic \_\_\_\_\_.

### GPS 2 | N40°26.281' W121°32.030'

You are standing in the footprint of Brokeoff Volcano, also known as Mount Tehama. The peaks you see around you are remnants of this \_\_\_\_\_ volcano. Likely once reaching 11,000 feet in elevation, the volcano has gradually eroded over the approximate 600,000 years following its formation.

### GPS 3 | N40°26.936' W121°32.151'

Sulphur Works is one of seven active hydrothermal areas in the park. In these areas, water seeps into the ground and comes in contact with \_\_\_\_\_ (hot or molten rock) several kilometers beneath you. The heated water, now acidic, returns to the surface as steam combined with acidic gas that dissolves the surrounding rocks into clay.

### GPS 4 | N40°26.960' W121°31.218'

Little Hot Springs Valley is one of the lesser known hydrothermal areas in the park. Numerous features along the creek below include boiling springs and \_\_\_\_\_. These openings in the ground emit steam, hot mineral water, and gases. Look closely, can you see puffs of steam rising from the valley below?

### GPS 5 | N40°27.969' W121°30.850'

This overlook highlights the many forces that have molded the Lassen landscape. Thousands of years ago, \_\_\_\_\_ carved and scoured this area, creating the U-shaped valley below you. More recently, heated rock and water formed Bumpass Hell, the park's largest hydrothermal area, accessed via the trailhead here (trail is temporarily closed for rehabilitation).

### GPS 6 | N40°28.489' W121°30.351'

Lassen Peak is one of the largest \_\_\_\_\_ volcanoes in the world. Like composite volcanoes, they are found mainly in subduction areas. Very viscous (thick) lavas called dacite and andesite create these domes and will often plug small vents on the top and sides, creating large bulges of hardened lava. The large plug near the top of Lassen Peak contains a shape referred to as Vulcan's Eye.

### GPS 7 | N40°27.630' W121°27.581'

Sifford Mountain and Mount Harkness can be seen to the east from the highway pullouts near here. These are \_\_\_\_\_ volcanoes, made from a less viscous lava called basalt. Since basalt is more fluid than plug dome lavas such as dacite and andesite, these mountains spread out into a wider base. They are so named because, turned upside down in the imagination, they resemble a Roman shield. Basalt volcanoes are found primarily on the eastern side of the park and form primarily from fissures between larger volcanoes.



Left to right: Lassen Peak dacite, andesite, pumice, basalt

### GPS 8 | N40°29.883' W121°25.631'

The conical mountain that rises northeast of here is called Hat Mountain. It is one of many \_\_\_\_\_ volcanoes in the park. Light, air-filled lava erupts explosively to form these steep-sided volcanoes.

### GPS 9 | N40°30.925' W121°27.912'

Today, some visitors ask why this is called Devastated Area. The forest here has regrown following the explosive eruptions of Lassen Peak more than a century ago. On May 19, 1915 a mudflow of volcanic materials called a lahar flooded the area. The following day, a high-speed avalanche of hot ash, rock, and gas called a \_\_\_\_\_ ripped trees from their roots and carried large boulders to where you are standing.

### GPS 10 | N40°33.485' W121°31.906'

Behind you, passes an historic route called the Nobles Emigrant Trail. The pioneers and their wagons were no match for the rocky domes here at Sunflower Flat and Chaos Crags. Instead, William Nobles led the wagon route through the forest and smaller rock fields of \_\_\_\_\_ to the north.

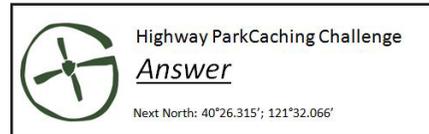
### GPS 11 | N40°32.146' W121°33.783'

Manzanita Lake, Lily Pond, and Reflection Lake were formed by natural dams created by a large rock avalanche from \_\_\_\_\_ about 350 years ago.

## Take the Challenge

To participate in the Lassen Highway Parkcaching Challenge, locate at least 6 of the 11 parkcaches along the park highway using the GPS coordinates provided in this brochure. Use the answer keys at each parkcache to fill in the blanks of facts from Lassen's geology.

1. Make sure you have a GPS device or a GPS-enabled mobile device with a geocaching app. WiFi available only at Kohm Yah-mah-nee Visitor Center.
2. Use the GPS coordinates on the inside of this brochure to locate parkcaches along the park highway.
3. Look for laminated answer keys like the one below attached to park structures or signs. Fill in the blanks on this brochure for each cache with the answer provided. Be sure to leave the answer key where you found it for future participants to use.



4. Present your completed brochure to a park ranger to receive your free, commemorative carabiner.



## Did You Know?

Every visible rock at Lassen Volcanic National Park originated from volcanoes.

The Lassen Volcanic Center contains all four types of volcanoes found in the world—shield, composite, cinder cone, and plug dome.

The greater Lassen area has been volcanically active for about three million years. The most recent eruptions occurred at Cinder Cone (~350 years ago) and Lassen Peak (~100 years ago).

The seven hydrothermal areas in Lassen Volcanic National Park are related to active volcanism and the ongoing potential for further eruptions.

Scientists at the USGS California Volcano Observatory in Menlo Park, CA remotely monitor seismic activity in the park.

The most important sign of an impending volcanic eruption is seismic activity (earthquakes) beneath the volcanic area.



Mount Tehama, also known as Brokeoff Volcano, once covered an area approximately 13 miles (21km) wide. If standing today, the park highway would go straight through the center of the mountain.