

## LONG VALLEY CALDERA SUMMARY

**WHERE:** Long Valley Caldera is located in eastern California (see the figure below), up against the east side of the Sierra Nevada Mountains. The town of Mammoth Lakes and Mammoth Mountain ski resort are located on the edge of the caldera.

**WHAT:** Long Valley is a true caldera (like Crater Lake). It formed after a large eruption about 760,000 yrs ago. Approximately  $700 \text{ km}^3$  of pyroclastic rock was erupted that formed a layer of pyroclastic rock up to 200 m thick and covering  $2200 \text{ km}^2$ . By comparison, Mt. St. Helens ejected approximately  $1 \text{ km}^3$  of material. The layer of pyroclastic rock that was deposited is called the Bishop Tuff.

The area has remained active virtually to today. Mammoth Mountain itself was built on the rim of the caldera by 12 eruptions between about 220,000 and 560,000 years ago. Mammoth Mountain may have formed on the rim of the caldera because the collapse of the caldera formed cracks in that area that provided a pathway for magma to reach the surface.

In the past 5000 years there has been a series of volcanic eruptions and steam blasts along a linear trend extending from Mammoth Mountain north the Mono Lake (see the figure below). These events include the formation of rhyolites domes (such as Wilson Butte), steam blast craters (Inyo Craters – note that Inyo is a geographic name), and pyroclastic flows. Steam blasts occur when magma that is rising towards the ground surface contacts and rapidly boils groundwater. The most recent eruptions occurred about 300 years ago. The linear trend of these events probably is the result of the upward movement of magma along a large crack underground to form a dike and volcanic features where the magma reached the ground surface.

Beginning in 1978, a renewed episode of underground magmatic activity began. The upwards movement of magma was revealed by earthquakes, increased hot springs activity, release of volcanic gasses that killed large numbers of trees, and subtle uplift of the ground in the caldera. The cause of this activity probably is the emplacement of a new dike underground. Unlike the dike that probably exists under the Inyo Craters, Wilson Butte and the other volcanic features listed above, the magma in this one has fortunately not reached the ground surface – although activity continues today. The unrest did, however, create political controversy when the U.S. Geological Survey (USGS) issued a volcanic hazard warning and the local real estate and tourism markets plummeted. The USGS's Long Valley Volcanic Observatory (<http://lvo.wr.usgs.gov/>) continues to monitor the area.



Long Valley Caldera and associated volcanic features.

