



PROMINENT LANDFORMS OF THE EASTERN SIERRA

Mammoth Rock.....	1
Crystal Crag.....	1
Lakes Basin.....	1
Earthquake Fault.....	2
Ritter Range.....	2
San Joaquin Ridge.....	2
Inyo Craters.....	2
Lookout Mountain.....	3
Obsidian Dome.....	3
Mono Craters.....	3
References.....	3

The unique Eastern Sierra landscape has been shaped by ice and fire over millions of years, resulting in rare and distinctive landforms (see *Geology*). Following are a few of the most prominent landmarks from the Town of Mammoth Lakes north to Mono Lake. For more information, see *references* at the end of the section.

Mammoth Rock



Mammoth Rock is located along the base of the Sherwins, a locally named small range of peaks southeast of Mammoth Lakes, overlooking Old Mammoth. This rock pillar is composed of marble (metamorphosed limestone) and fine-grained sandstone that withstood erosion as the weaker surrounding rock was carved away by glaciers. Rocks at the base of the pillar contain *fossil crinoids*, ancient relatives of sea urchins providing evidence of the origin of the Sierra Nevada Mountain Range (see “Formation of the Sierra Nevada Mountain Range” in *Geology*).

Crystal Crag

Crystal Crag, a prominent outcropping of granite rising over the southern side of the Lakes Basin, is the remnant of a ridge that once separated the drainages of Crystal and T.J. lakes. The crag is known as a *cleaver*, a resistant body of granitic rock that forces a glacier to split and flow around it. The crag was named for quartz crystals embedded throughout.



Lakes Basin



Located immediately south of Mammoth Mountain, the Lakes Basin contains five major lakes, ranging from 8,540 feet to 9,008 feet in altitude, and numerous small ones. Twin Lakes, Lake Mary, Lake Mamie, Lake George, and Horseshoe Lake can be accessed via a paved road in the summer or by cross country skis or snowshoes in the winter. There is no “Mammoth Lake” as many visitors are led to believe; however, the Town of Mammoth Lakes did derive its name from this area

and Mammoth Mine (see *History*).

The numerous lakebeds, and the basin itself, were carved by glaciers during the Pleistocene Epoch about 20,000 years ago. Twin Lakes is currently infested with aquatic weeds, transplanted by fishermen in an attempt to enhance fish habitat, from nearby Hot Creek. At Horseshoe Lake, stands of trees have died as carbon dioxide (CO₂) slowly seeps up from underground volcanic activity and suffocates their roots. While Horseshoe Lake has no outlet – a formation known as a *terminal lake* – the water level fluctuates seasonally and percolates rapidly into extremely porous soils and volcanic bedrock.

Earthquake Fault

The “Earthquake Fault” is located along Highway 203 about one mile downhill from Mammoth Mountain Ski Area’s Main Lodge. This crack in the ground is one of many fractures covering the north side of Mammoth Mountain, but it is not actually a true fault, which is more accurately defined as a rift where rock on one side moved in a different direction from rock on the other side. Instead, the ground at the Earthquake Fault appears to have simply opened, and the two sides would fit perfectly if pushed back together. However, the crack is aligned with true faults to the north, suggesting the same underground forces caused it to open.

Ritter Range

The Ritter Range is located west of Mammoth Mountain in the Ansel Adams Wilderness and is best viewed from the top of Mammoth Mountain or Minaret Vista. Uplifted millions of years ago, the basalt range is composed of numerous jagged pinnacles and peaks shaped by the carving power of ancient glaciers moving down both sides of the crest below the peaks. The peaks are shaped by wind, rockslides, earthquakes, and freeze-thaw cycles shearing off rock layers. Mount Ritter, the most prominent of the peaks at 13,157 feet high, was first attempted in 1864 by an American team who named it after Karl Ritter, the founder of Modern Comparative Geography. John Muir was the first person to successfully summit its peak in 1872.



Immediately to the north of Mount Ritter is Banner Peak, which stands 12,945 feet high. Banner Peak was first climbed in 1883 by a United States Geologic Survey topographer who named it after the cloud “banners” streaming across the summit.

Immediately to the south of Ritter and Banner stand 17 jagged peaks known as The Minarets. These peaks were named as a group due to their resemblance to towers on mosques (*minaret* means “pillar” or “tower” in Arabic). Individual peaks have since been named by those who first climbed them. Clyde Minaret is the tallest at 12,281 feet.

San Joaquin Ridge

West of Mammoth Mountain, the San Joaquin Ridge is the dividing line between the eastern and western slopes of the Sierra Nevada. Precipitation falling on the western slope feeds the San Joaquin River, supporting agriculture and residents in the Central Valley and eventually flowing into the Pacific Ocean. Drainages on the eastern slope feed the Owens River and the California Aqueduct, supplying water to dry southern California regions including Los Angeles.

Inyo Craters

One of the more recent eruptions in the Inyo-Mono volcanic chain occurred about 600 years ago, forming the Inyo Craters on the south flank of Deer Mountain. These explosion craters were formed when groundwater contacted rising magma and became superheated, producing a violent eruption of steam and pulverized rock. The two lower craters each measure approximately 600 feet across and contain small lakes, while the summit crater is dry. Detailed studies of the pumice layers around these craters and Deer Mountain indicate that the steam eruptions occurred in sequence



from north to south within days, possibly hours, of each other.

Lookout Mountain

Technically a *resurgent dome*, Lookout Mountain is located east of the Scenic Loop/Highway 395 intersection and stands 8,352 feet high. This uplifted feature was formed approximately 150,000 years after the collapse of the Long Valley Caldera (see *Geology*) and is mainly composed of silica-rich rhyolite, which has the same composition as obsidian and pumice.

Obsidian Dome

West on Obsidian Dome Road (north of Crestview) from Highway 395 stands the 300-foot-high, mile-long formation named Obsidian Dome. This dome, possibly as old as 5,000 years, was formed when thick, slow-moving, silica-rich lava oozed to the surface through a volcanic vent. Rapid cooling prevented the formation of mineral crystals in the rock, resulting in the dark colored volcanic glass called *obsidian*, renowned as a favorite material among American Indians for making arrowheads and spearpoints.

Mono Craters

The Mono Craters consist of overlapping lava domes, coulées, and craters created by repeated volcanic uplift and extrusions that began about 35,000 years ago. The north end of the chain is located in Mono Lake, where the crater known as Paoha Island was formed about 250 years ago during the area's most recent volcanic eruption. Panum Crater, located to the east of Highway 395 along Highway 120, is the most well known of the Mono Craters and is easily accessible by a short, steep walk. Check with the Mono Basin Scenic Area Visitor Center for information regarding interpretive walks in the Panum Crater at: (760) 647-3044.



References

1. Irwin, S. 2002. *California's Eastern Sierra: A Visitor's Guide*. Cachuma Press and the Eastern Sierra Interpretive Association, Los Olivos, California, 144 pages.
2. Hill, M. 2000. "Geologic story" in G. Smith (ed.), *Sierra East: Edge of the Great Basin*. University of California Press, Los Angeles, pp. 37-69.
3. Smith, Genny, ed. 2003. 7th edition. *Mammoth Lakes Sierra: A Handbook for Roadside and Trail*. Genny Smith Books, Mammoth Lakes, California, 251 pages. Distributed by Live Oak Press, <http://www.liveoakpress.com/html/lakes.html>
4. Sowaal, M. 1985. *Naming the Eastern Sierra: Dirty Sock to Bloody Canyon*. Chalfant Press, Inc., Bishop, California, 125 pages.

