

## EarthCache Site

### McClellan Peak Basalt Flow at Mustang, Washoe County, Nevada

**GPS Coordinates:** N39° 31.133', W119° 37.970' (WGS 84 datum)

#### Short Description

The prominent knob of dark rock just north of the Mustang Exit #23 off Interstate 80, about 10 miles east of Reno, Nevada, is a remnant of a lava flow of McClellan Peak Basalt. It is a product of one of the most recent volcanic events in northwestern Nevada. The composition of this lava flow is different from the composition of huge thicknesses of lava that erupted earlier in this region over several millions of years. The change in volcanic composition represented by this rock signifies an important change in the style of tectonic activity in this part of the western United States.

#### Long Description

Much of northwestern Nevada is covered by lava flows hundreds to thousands of feet thick that erupted throughout much of the Oligocene and Miocene epochs of geologic time (about 35 million to about 7 million years ago). These rocks comprise most of the Virginia Range south of here and the Pah Rah Range to the north. As you drive along the Truckee River canyon between Reno and Fernley, most of the rocks you see exposed in the canyon walls and slopes are this type of andesitic (medium silica content) volcanic material. The lavas and tuffs came from volcanic eruptions that occurred as a result of subduction of the Juan De Fuca tectonic plate to the west under the edge of the North American plate, causing the ancestral Cascade volcano chain to actively erupt over much of northwestern Nevada.

About 10 million years ago the last subduction gradually ceased to our west and migrated north to the current active subduction site located off the coast of northern California, Oregon, and Washington. After this time, extension, or pulling apart, became the dominant time of tectonic activity in this part of Nevada, and it was accompanied by a different type of volcanic activity dominated by eruption of "bimodal" basaltic (low-silica content) and rhyolitic (high-silica content) volcanic rocks instead of andesite. The McClellan Peak Basalt seen here at this outcrop is representative of this later style of volcanic activity. The McClellan Peak Basalt has been dated at 1.44 million years old by means of Argon 40/Argon 39 radiometric dating techniques. The lava flow probably blocked the Truckee River for a time before it was eroded away, leaving this remnant outcrop of the lava flow here and on the lower slopes of the hill immediately to the west. McClellan Peak Basalt is exposed several other places in the mountain ranges to the north and south.

The probable source of the lava flow is a vent in the vicinity of Cinder Mountain in the Virginia Range about 10 miles southeast of this outcrop. The lava flows are up to 5 meters thick. The lava is vesicular (has abundant holes or vesicles), which were probably gas bubbles trapped in the molten lava as it solidified.

The McClellan Peak Basalt in the Mustang outcrop is grayish black when freshly broken but is often reddish-brown colored on weathered surfaces because of oxidation of iron,

which is abundant in the basalt. The rock is called an augite olivine basalt because it contains augite (a calcium-magnesium-iron silicate mineral of the pyroxene group), and olivine (a greenish-brown magnesium-iron silicate mineral). Although basalt is by definition a fine-grained volcanic rock, you may be able to see a few phenocrysts (larger crystals) of these minerals in the basalt as well as lath-shaped crystals of gray plagioclase feldspar (calcium-sodium aluminosilicate) without the aid of magnifiers.

**Question to be answered in order to log this EarthCache site:** In what part of the basalt lava outcrop do the vesicles (holes) appear to be most abundant (top, bottom, east, west, north, south)? Please e-mail your answer to the site developer along with a photo of your group at the EarthCache site, and include the number of people in your group.

### **CAUTION IN USING GPS UNITS AND TOPOGRAPHIC MAPS**

Note that GPS coordinates are relative to a particular datum used to describe the nearly spherical shape of the Earth's surface. Most topographic maps published by the U.S. Geological Survey use the North American Datum of 1927 (NAD 27), but most GPS units are set for either the North American Datum of 1983 (NAD 83) or the World Geodetic System of 1984 (WGS 84). NAD 83 and WGS 84 give nearly identical locations with hand-held GPS instruments, but NAD 27 can be off considerably. In this part of Nevada, there is little change in latitude between the 1927 and 1983 data, but for longitude the datum of 1983 is shifted relative to the datum of 1927, such that, if you use your GPS unit to measure a location using WGS 84, the point will plot on the U.S. Geological Survey topographic map approximately 100 meters farther east than its true location on the map. If your GPS unit is set to NAD 27, you need to look for the WGS 84 waypoint approximately 100 meters farther east from your location.

### **BASIC VISITOR-USE AND PUBLIC SAFETY INFORMATION FOR PUBLIC LANDS IN NEVADA**

All visitors need to plan ahead and prepare for outings in Nevada's public lands by:

- Knowing the regulations and special concerns for the area you are planning to visit (obeying laws that prohibit collection or destruction of artifacts);
- Carrying a map and a GPS unit and/or compass (Maps are available for purchase at all BLM offices and from the Nevada Bureau of Mines and Geology, [www.nbmng.unr.edu](http://www.nbmng.unr.edu).);
- Staying on existing roads and trails;
- Staying away from all mine shafts and adits;
- Planning for extreme weather, hazards, and emergencies;
- Carrying a full-size spare tire, extra food, water, and warm clothing;
- Being aware that cell phones DO NOT usually work in the rural areas away from the major highways;
- Leaving your travel plans with a responsible party, including the date and time of your return;
- Linking to "Tread Lightly and Leave No Trace" websites ([www.treadlightly.org](http://www.treadlightly.org) and [www.lnt.org](http://www.lnt.org)).

Please see [www.nbmng.unr.edu/EarthCache/ec.htm](http://www.nbmng.unr.edu/EarthCache/ec.htm) for more information about other Nevada EarthCache and GeoCache sites of geologic interest. Thank you.

## References

- Bell, John W. and Bonham, Harold F., Jr., 1987, Geologic map of the Vista 7.5' Quadrangle, NBMG Map 4Hg. *This map is available online at:* <http://www.nbmq.unr.edu/dox/4Hg.pdf>
- Schwartz, Kenneth M., Faulds, James E., and Henry, Christopher D., 2002, Cenozoic magmatic evolution in the western Virginia Range, western Nevada: Transition from subduction- to extension-related magmatism in the western Great Basin; Geological Society of America Cordilleran Section - 98th Annual Meeting, Corvallis, Oregon.
- Schwartz, Kenneth M., and Faulds, James E., 2004, 2004, Preliminary Geologic Map of most of the Chalk Hills Quadrangle, Storey County, Nevada, NBMG Open-File Report 04-11. *This map is available online at:* <http://www.nbmq.unr.edu/dox/of0411.pdf>