

PLACERITA CANYON GEOLOGY

Presented by Tina White
for
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Basics Reminders

- Mineral: a naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form, and physical properties. Common minerals include quartz, feldspar, mica, amphibole, olivine, and calcite. (USGS)
- Rock: an aggregate of one or more minerals, or a body of undifferentiated mineral matter. Common rocks include granite, basalt, limestone, and sandstone. (USGS)

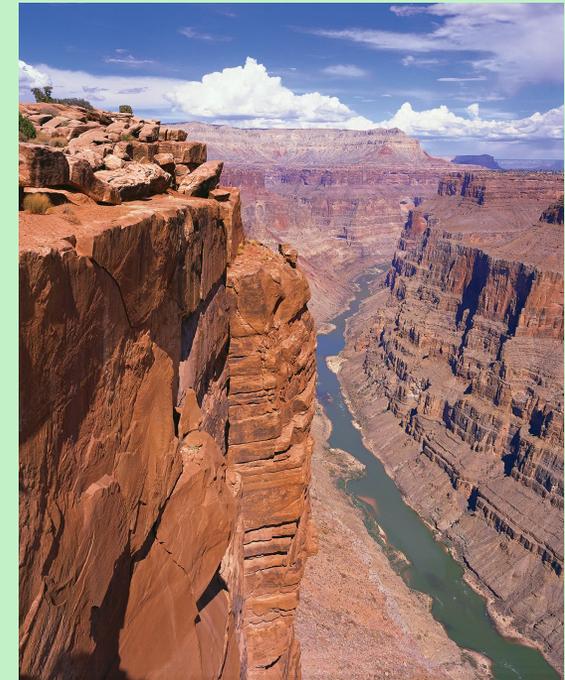
Rock Types:

- Igneous: from fire, formed when hot molten rock crystallizes and solidified.
 - Intrusive: cooled beneath Earth's surface from magma
 - Extrusive: cooled atop Earth's surface from lava
- Sedimentary: deposits of pre-existing rocks or fossils which then lithify, often in distinctive layers or beds.
- Metamorphic: rocks formed from existing rocks that have been subjected to intense pressure, heat, and/or mineral-rich fluids.

Geologic Age Dating

There are two broad categories of age dating:

- Relative: Generally, the rocks below are older than those above
- Absolute: Absolute dating utilizes various analytical processes to evaluate the ages of the constituent minerals in a rock.



www.britannica.com



Labprotovap.com

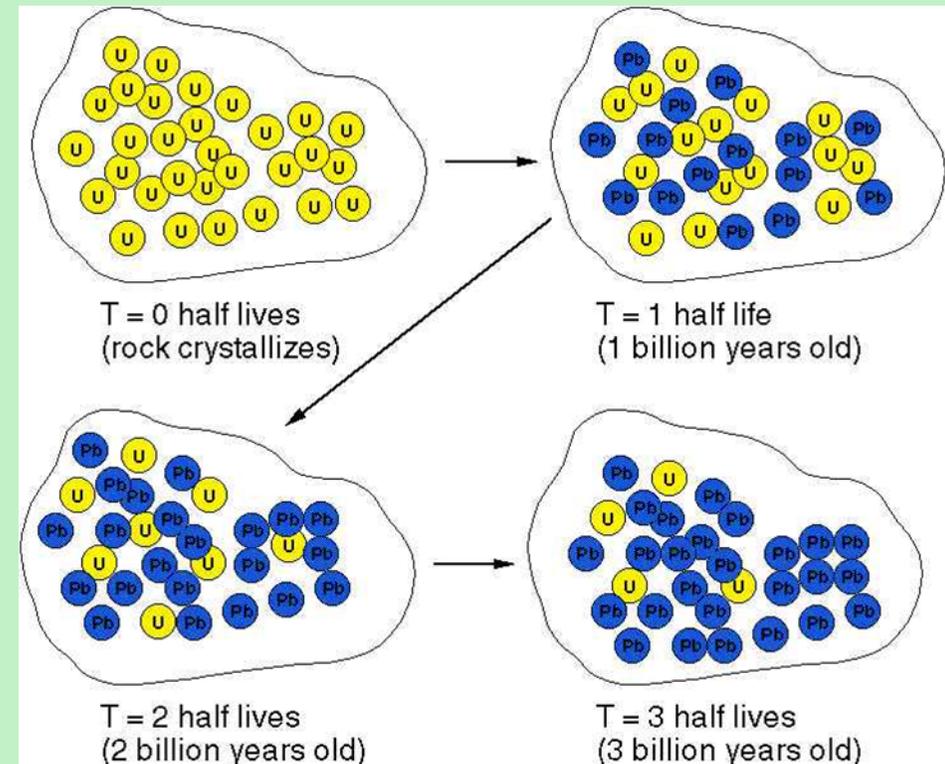
Absolute Dating

Earth is 4.5 billion years old

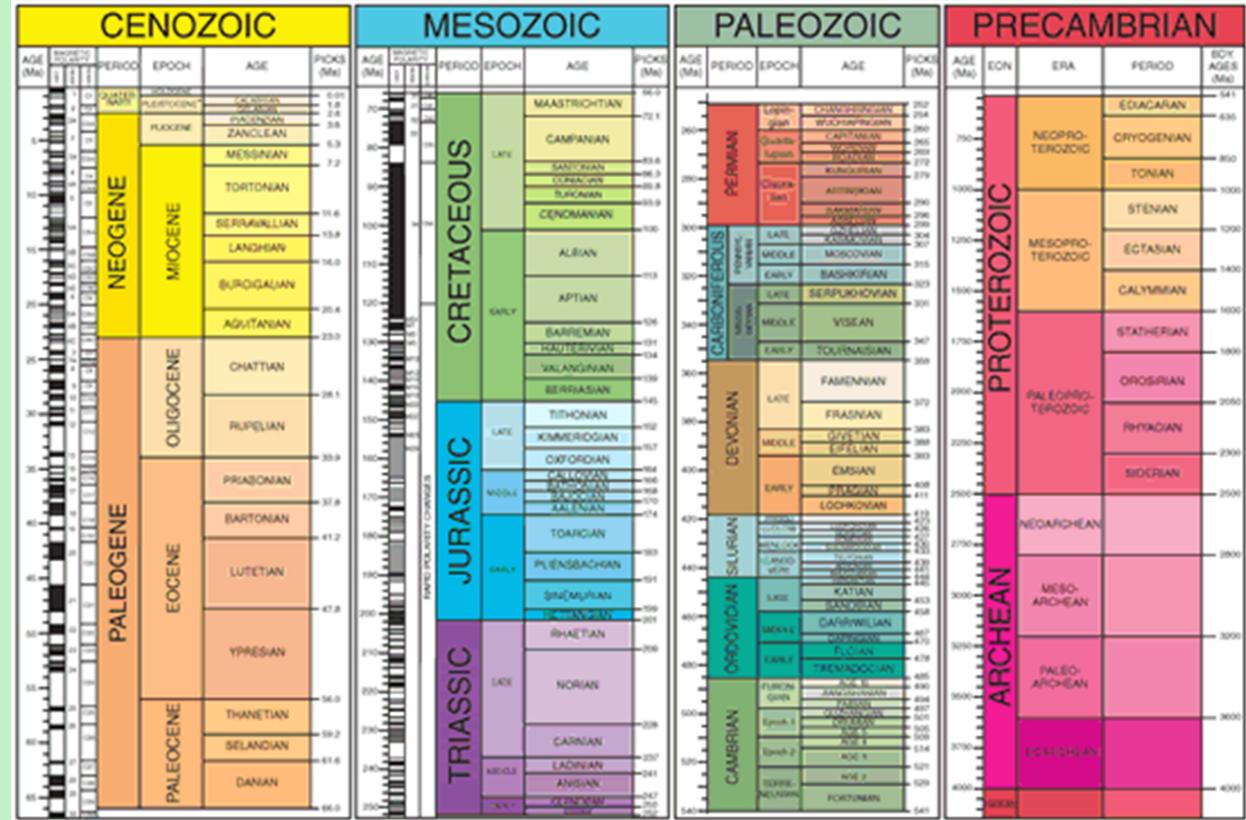
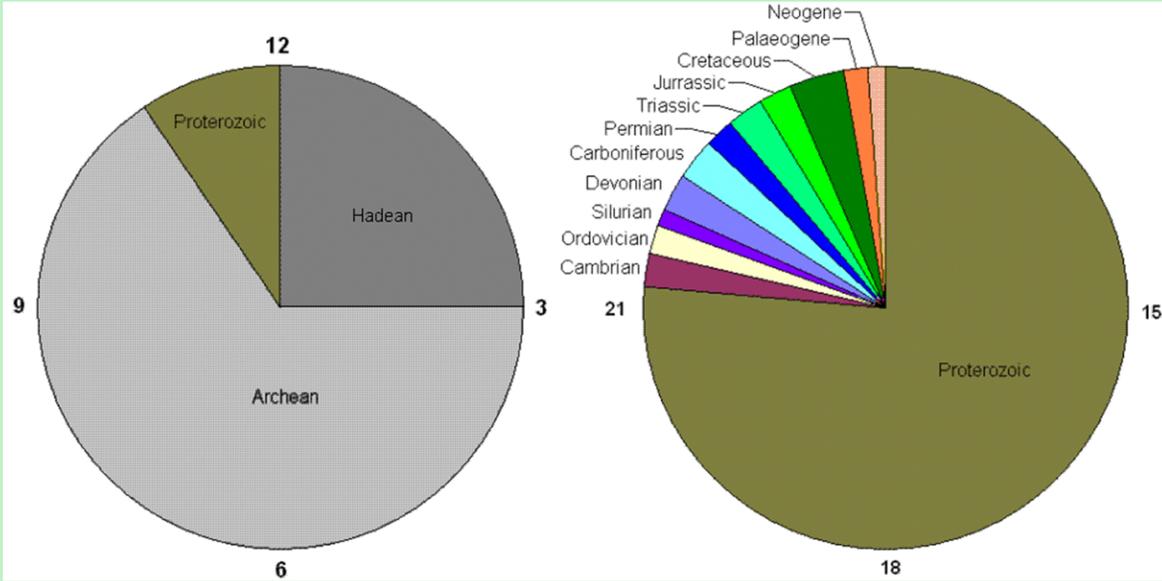
This has been determined using radiometric dating

- ^{238}U – ^{206}Pb : 4.7 billion year half-life
- ^{235}U – ^{207}Pb : 710 million year half-life

*Half-life = time for one-half of atoms
to decay to other atoms*



Geologic Time



Regional Big-Picture History

Miocene Epoch: 23 – 5.3 million years ago

- Sea level fluctuated, falling toward the end of the epoch
- Much of southwestern North America remained under water

Pliocene Epoch: 5.3 – 2.6 million years ago

- Sea level rose again
- Marine formations exposed along the CA coast

Pleistocene Epoch: 2.6 million to 11,700 years ago

- Glacial periods came and went, affecting temperature and sea level dropped as much as 390'

Regional Geologic Setting

The Transverse Ranges

- These mountains are oriented E/W, perpendicular to most of the other mountain ranges in CA
 - This is the result of the Pacific Plate pushing against the North American Plate and the greater LA Basin rotating clockwise in response

- The Soledad Basin is bounded by the San Gabriel Mountains on the ESE and the Sierra Pelona Mountains on the NNW just south of the San Andreas Fault

- The Valley floor is filled with alluvium (sediments) weathered out of those ranges that then moved down steep canyons 30 – 1.8 million years ago

The San Gabriel Mountains

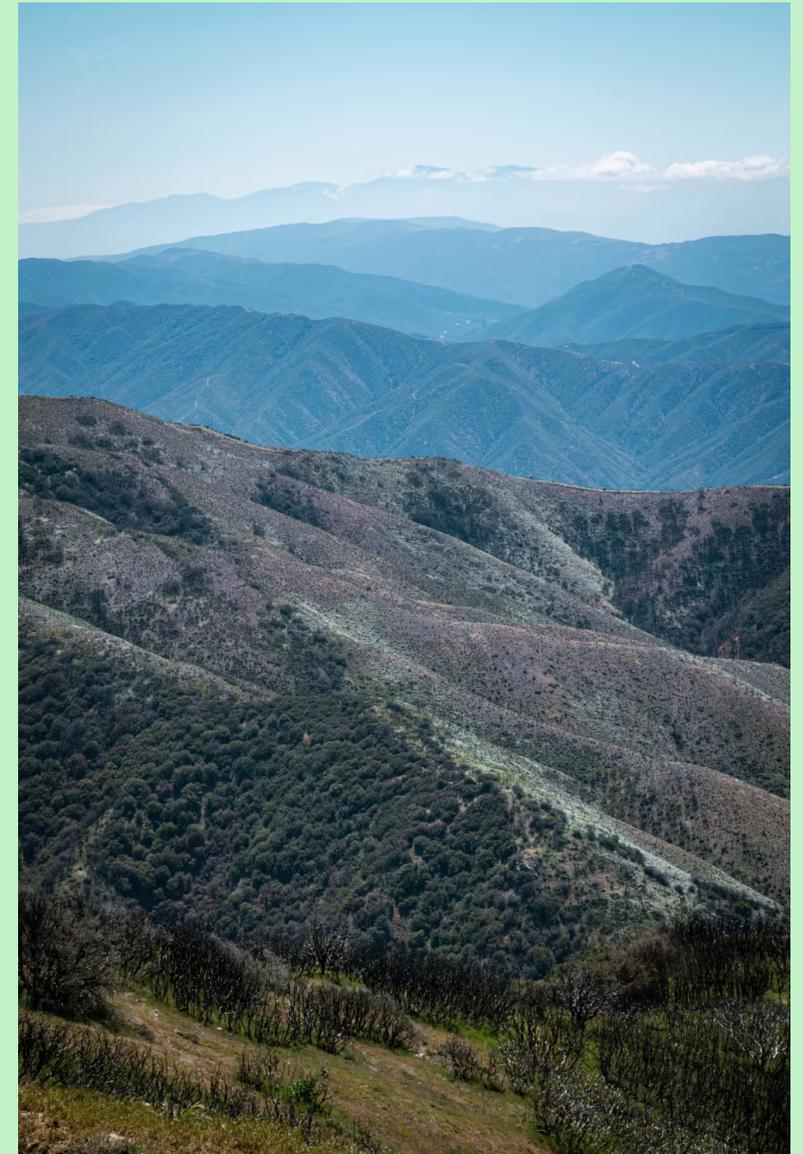
- Primarily plutonic granites and metasedimentary rocks
- Anorthosite (moon rock) is present in the core
- Initially formed 12 million years ago
- Over the past 3 million years rapid uplift this has led to extremely steep slopes (65% - 70%)
- Among the fastest-rising mountains in the world at 1.9-2.0 mm/year
- At a current rate of .35 mm/year, erosion has deposited massive amounts of sediment downslope



James Staub

Sierra Pelona Mountains

- Primarily composed of the blue-grey
- Pelona Schist
 - Metamorphosed marine sediments from over 66 Million years ago
- Intensely folded as it is bounded by the San Andreas and San Gabriel Faults
- Structurally it is a plunging anticline, steeper on the southern slopes



<https://www.onxmaps.com/offroad/trails/us/california/the-highest-peak-of-the-sierra-pelona#photos>

The Valley

- This Valley first took form in the Pliocene as a shallow sea
- Sediments from these mountains were washed offshore for over 30 My, leaving the oldest at the bottom with younger sediments atop as time went on
- It was a shallow off-shore environment that supported gastropods, shellfish (clams, oysters), fish, cetaceans (whales, dolphins) and a variety of saltwater plants – many of which left behind fossil remains
- The water was warmish, but not warm enough for tropical species like corals and the beautiful saltwater fish found farther south
- During the Pleistocene the Coast Ranges were uplifted, and the Soledad Basin/Santa Clarita Valley was broader and shallower.
- Runoff from the Coast Ranges dissected much of the valley floor, leaving behind stream terraces and fluvial deposits atop the marine sediments

Faulting, Past & Present

San Gabriel Fault

- 15-10 million years old
- Right-lateral strike-slip fault trending NW/SE with concordant normal faulting
- The Placerita Fault is a splay of this larger fault

San Andreas Fault

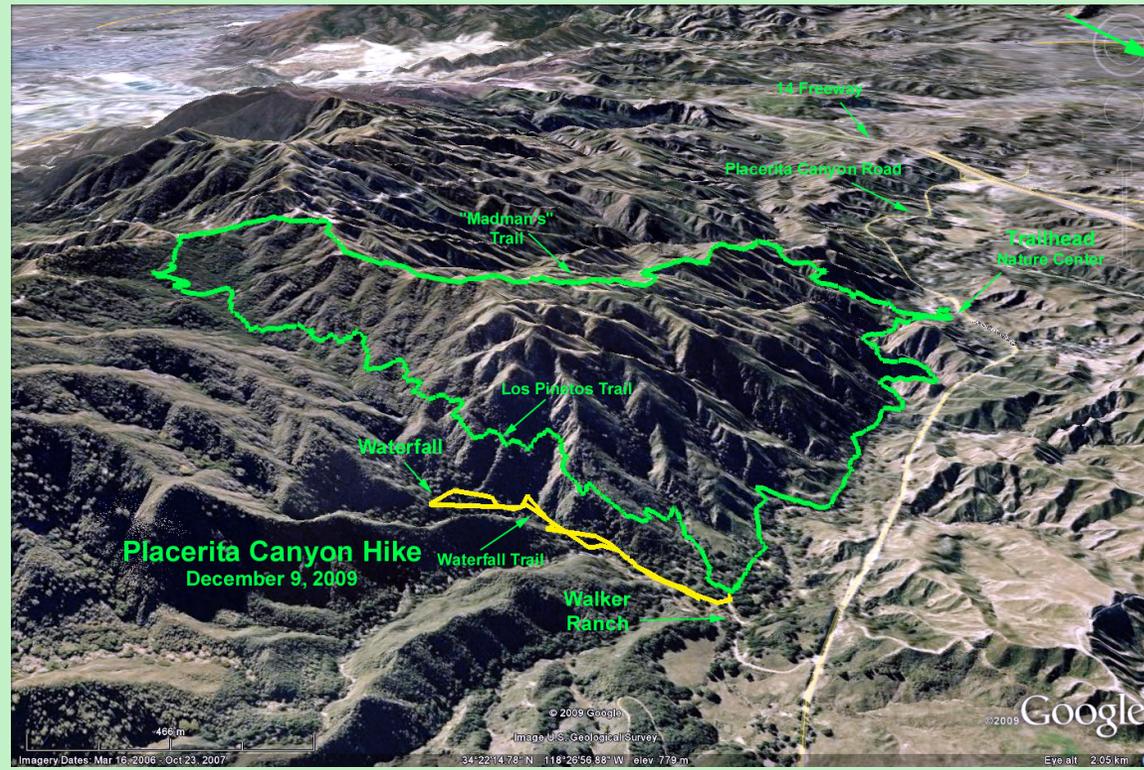
- 30 million years old
- Right-lateral strike-slip fault trending NW/SE

Sierra Pelona Fault

- 25 million years old
- Normal fault trending NW/SE

Placerita Canyon

- The canyon itself runs east-west
- The canyon was formed along the Placerita Fault where bedrock has been fractured and sediments eroded by the water flowing seasonally through Placerita Creek (and its fluvial predecessors)



Black Gold!

- Ancient marine organic matter was buried, creating heat and pressure over millions of years
- The organic matter turned to petroleum products
- Oil and gas were trapped by the area's complex structure of folds and faults
- In some places, the oil seeped to the surface through weak spots in the sandstones
- A pool of possibly unique "white oil" (actually transparent), naturally filtered through the schist, is found off the Canyon Trail
- The first commercial drilling took place in 1859 in Pico Canyon
- The Pioneer Oil Refinery opened in 1876 in Newhall; the first commercial oil refinery in the Valley
- Commercial drilling continues, particularly around Placerita Canyon and Castaic

Gold Gold!

The story is charming, but...

- Francisco Lopez was a trained mineralogist, per his family
- He did find gold, most likely placer deposits in the steam channel (hence, *Placerita*)
- Lopez had previously found gold in Pico Canyon, or was it Piru Creek, or ???
- Gold mining continued in the Valley until the mid-1940s
- Individuals continue to find gold “float” after rains near Acton

Modern Geologic Phenomena

Earthquakes

1857: Fort Tejon est. 8.2M, 200 miles of rupture

1893: Pico Canyon est. 6.0M, damage in Mentryville, landslides

1952: Arvin/Tehachapi 7.0M, anticlinal ridge uplifted near Grapevine

1971: Sylmar/San Fernando 6.5M, epicenter E of Soledad Canyon Rd. & Sand Canyon Rd. on the Sierra Madre Fault, 2 meters vertical and left-lateral offset

1994: Reseda/Northridge 6.7M, blind thrust fault, extensive damage to infrastructure and residences in the SCV

Mass Movement

Generally small events triggered by saturated hillsides and/or steep slopes (natural or graded), these occur frequently throughout the entire SCV. Larger events include:

1987 – late 1990s: “Slippery Hills” off Golden Valley & Via Princessa, caused by unwise grading and later saturated slopes

2015: Vasquez Canyon Road Slump, caused by past road construction cutting off the “toe” of the slope

2019: Above The Trestles off Soledad Canyon Rd, likely caused by cutting off the toe of the slope above during construction

2023: Skyline Ranch post-2.9 earthquake with saturated soil



Images from
Santa Clarita
Valley Signal



Flooding

The risk of flooding in the SCV is ever-present, given the presence of the Santa Clarita River Channel and the numerous smaller streams flowing out of the mountains surrounding the Valley.

Placerita Creek is seasonal – as are most of the waterways in the Valley – but all pose risks when rainfall has been heavy and channels are full.

The channel lined with boulders and the channel itself has sediments ranging from coarse sands – boulders.

[Peace in the Canyons - Santa Clarita Waterfall](#)

Overhead Views

- https://www.geophile.net/FieldTrips/Geol1500_WSGM/station04.html#

Sources:

- Ballard, M.F. *Brief Explanation of the Geology of the Santa Clarita Valley 1995-2025* https://www.socalregion.com/geology/los-angeles-geology/scv_geology/ Accessed 1/17/2026
- Ballard, M.F. *Geology of the Santa Clarita Valley – Earthquakes.* <https://www.socalregion.com/geology/los-angeles-geology/quakes/>, Accessed 2/16/2026
- Buttleman, M. *The First Gold Was Discovered in Placerita on Mar. 9, 1842* The Signal, 3/3/2024
- Crowell, J.C. *Strike-Slip Displacement of the San Gabriel Fault, Southern California* Geology of Southern California I Bulletin 170, Chapter 4: Structural Features, State of California Department of Natural Resources I Division of Mines 9/1954
- Dixon, B. *Shifting Land Destroys Backyard, Threatens More Homes in Canyon Country*, SCVnews.com, 3/22/19 Accessed 2/16/26
- Eaton, J.E. *Pleistocene of Southern California*, APPG Bulletin (1928) 12 (5): 559-560 <https://doi.org/10.1306/3D9327F8-16B1-11D7-8645000102C1865D> Accessed 2/10/2026
- Merriam-Webster www.merriam-webster.com Various pages. Accessed 2/15/26
- Muehlberger, W.R. and Hill, H.S. *Geology of the Central Sierra Pelona, Los Angeles County, California* American Journal of Science, Vol. 256 11/58 p. 630-643
- Thornhill, G. *Landslides Occur During Grading* [SCV History.com](http://SCVHistory.com) Accessed 2/16/26
- US Geological Society <https://pubs.usgs.gov/gip/geotime/age.html> Accessed 2/15/26
- Wikipedia *en.Wikipedia.org/wiki/* Various pages Accessed 2/10 - 16/26