

Hillside Natural Area Geology Stroll, El Cerrito, CA

Gary Prost, Walk Leader

Overview

- Geologic Setting of the East Bay
- Local Rocks
- Local Faults



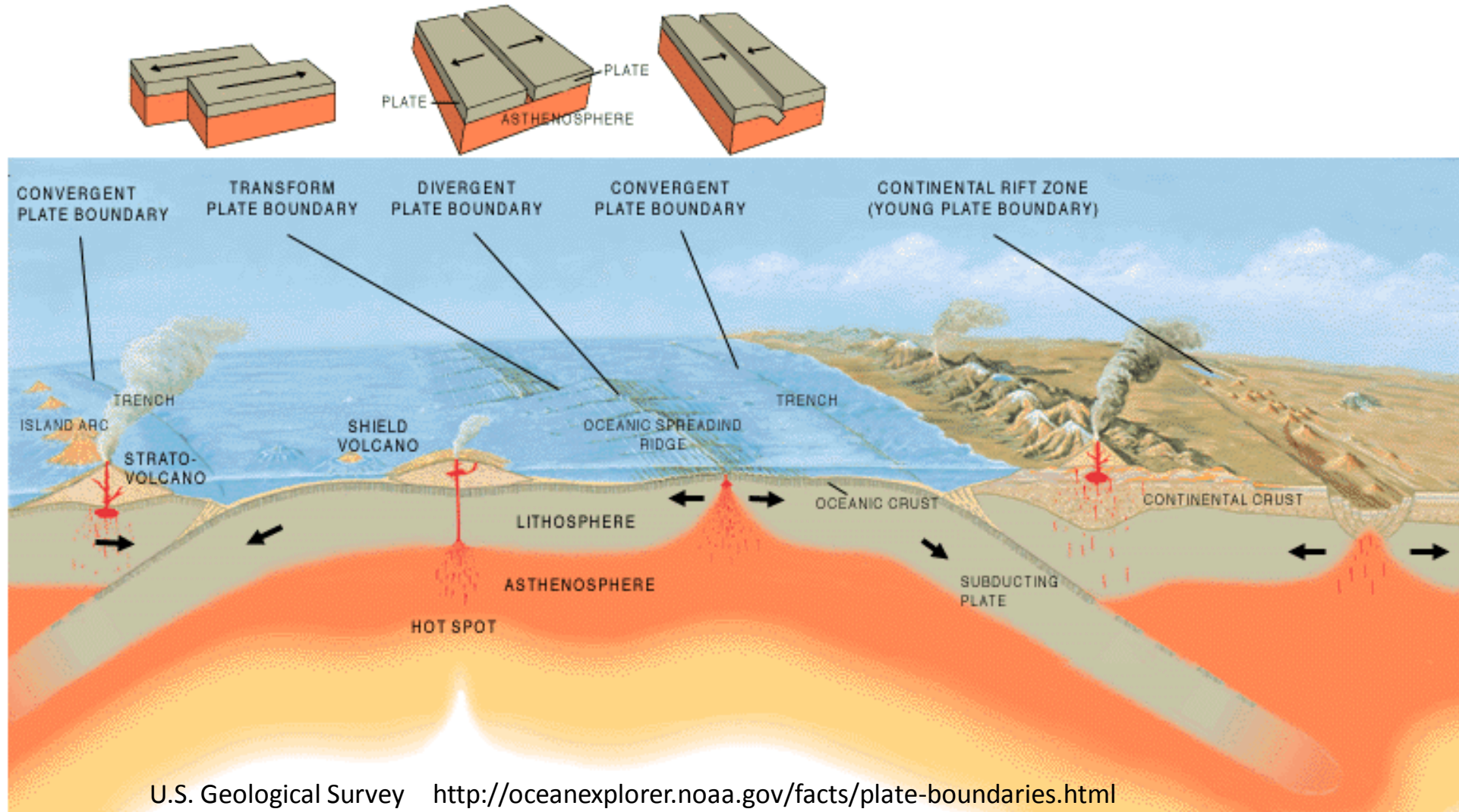
Geologic Setting of the East Bay and World Tectonic Plates



This shows we are at the boundary of the Pacific and North American Plates

The 3 Types of Plate Boundary

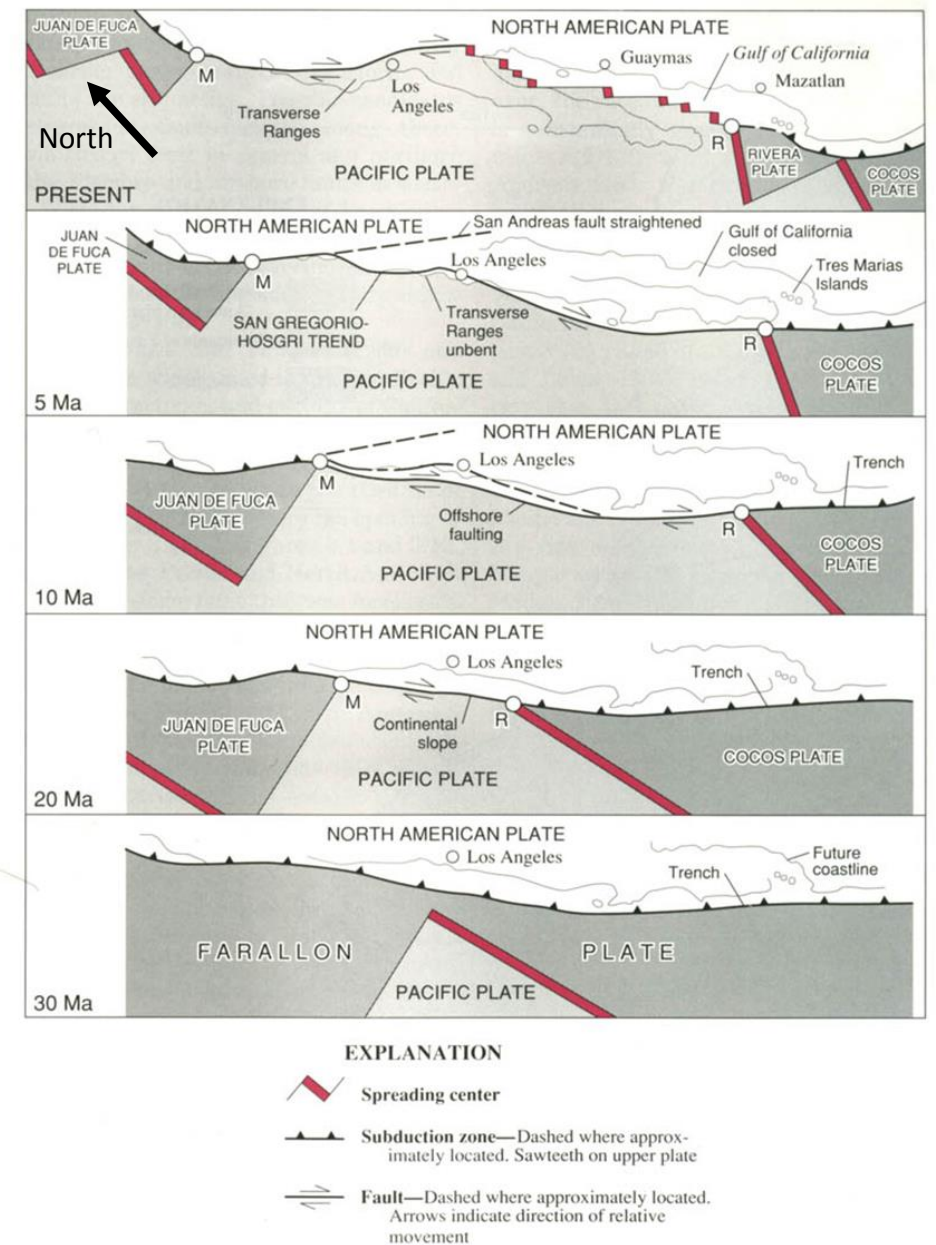
Transform Divergent (Spreading) Convergent (Subduction)



The East Bay was a convergent boundary up to about 30 million years ago; now it is a transform boundary

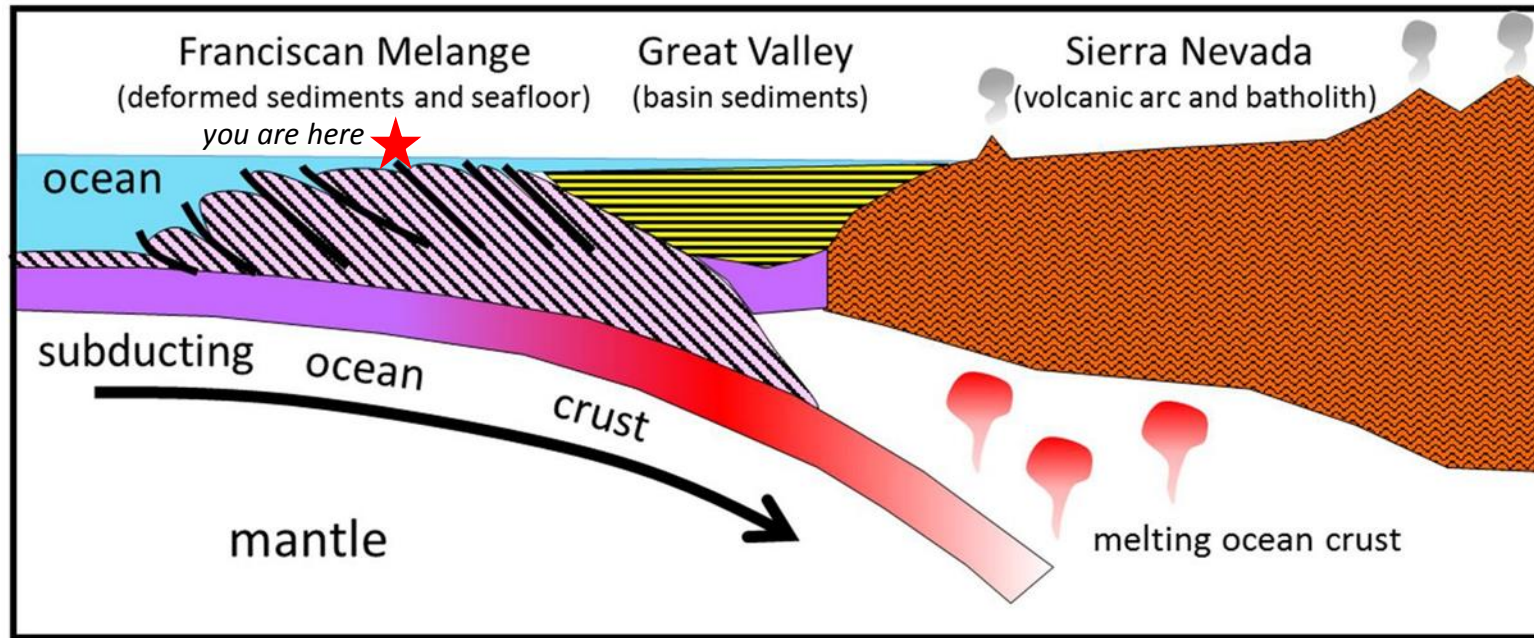


East Bay rocks were deposited near the mid-Pacific spreading center as long ago as 200 million years. They have been moving east since that time. This is where we were 94 million years ago.

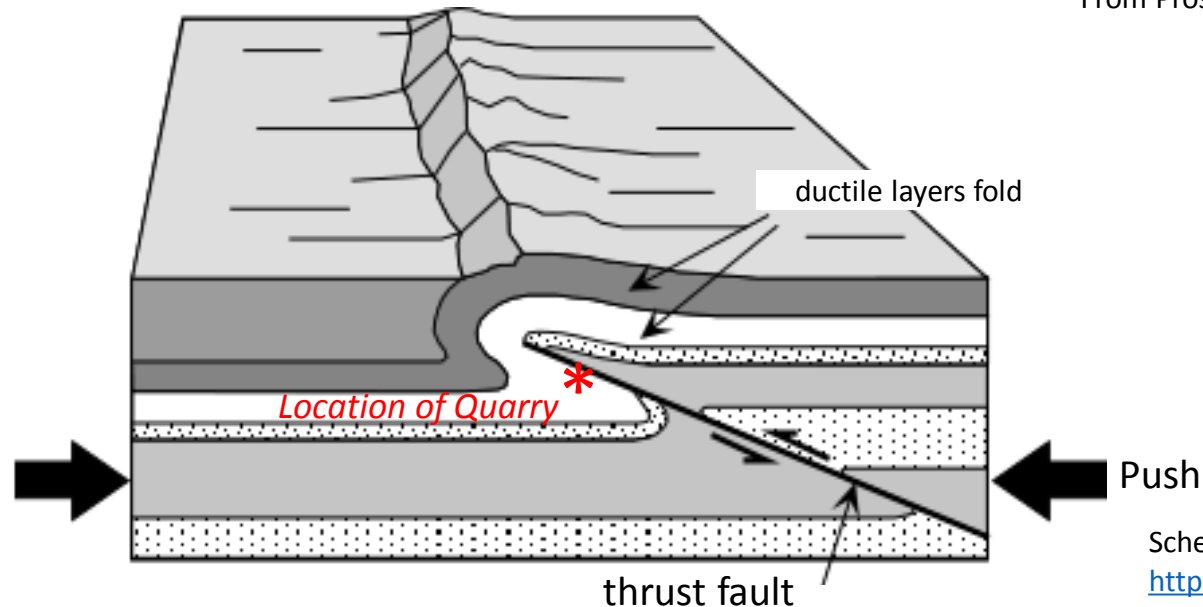


Over the past 25-30 million years the spreading center collided with North American and changed to a transform margin.

Until 25-30 million years ago the East Bay Hills were in a Subduction Zone



From Prost and Prost, 2018, The Geology Companion



Thrust faults in the East Bay Hills moved deeply buried and metamorphosed sediments up and toward the west

Schematic Diagram by US Geological Survey

<https://earthquake.usgs.gov/learn/glossary/?term=blind%20thrust%20fault>

A Few Words about Metamorphic Rocks

- Metamorphic rocks are classified by texture (slate, schist, gneiss) or by composition (blueschist, greenschist, etc)
- Most of what you see in the Hillside Nature Area is a Schist by texture, meaning it has aligned minerals, mainly mica (looks like glitter)
- Compositionally these rocks are a *Blueschist* (the blue color comes from the mineral glaucophane)
- Blueschist is considered a “high pressure, low temperature” metamorphic rock that forms at 15-30 km (9-18 mi) depth and 200 to 500°C (400-930°F)
- Heat and pressure cause the original minerals in a rock to recrystallize and realign themselves

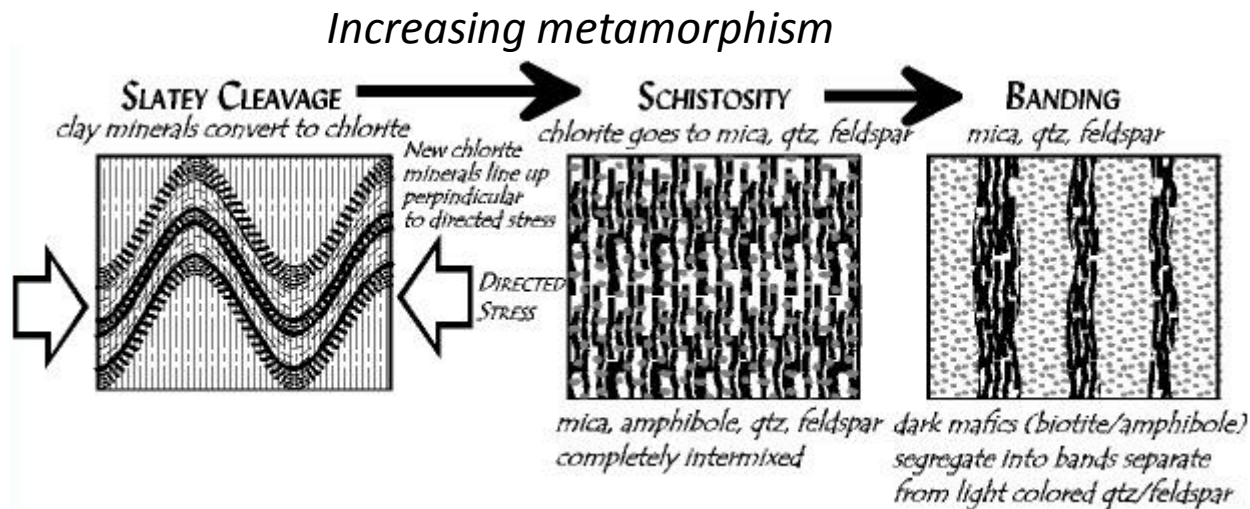
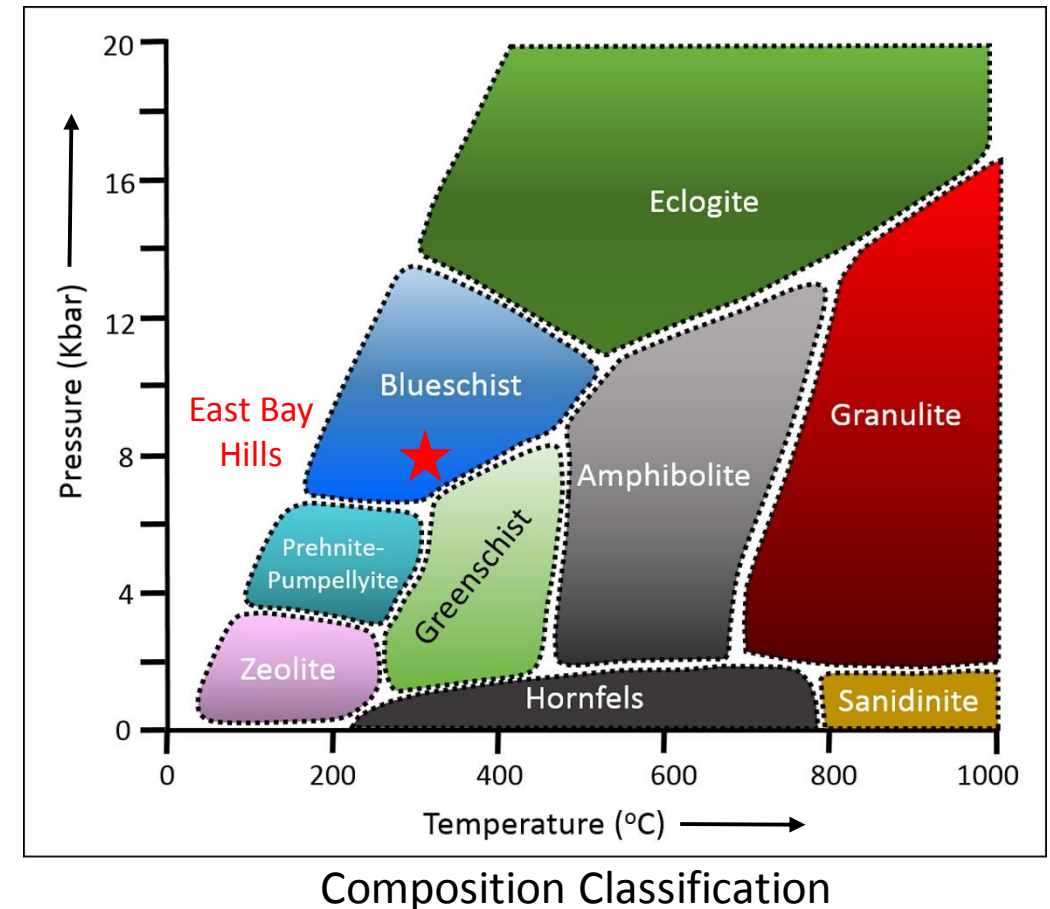


Diagram from Atlantis Online, <http://atlantisonline.smfforfree2.com/index.php?topic=1379.15>



Main Rock Types Found In The Hillside Nature Area, El Cerrito



Franciscan Assemblage (150 to 66 million years old)

Metagreywacke

Rust-colored metamorphosed dirty sandstone, probably ancient beach or near-shore deposits

Blueschist

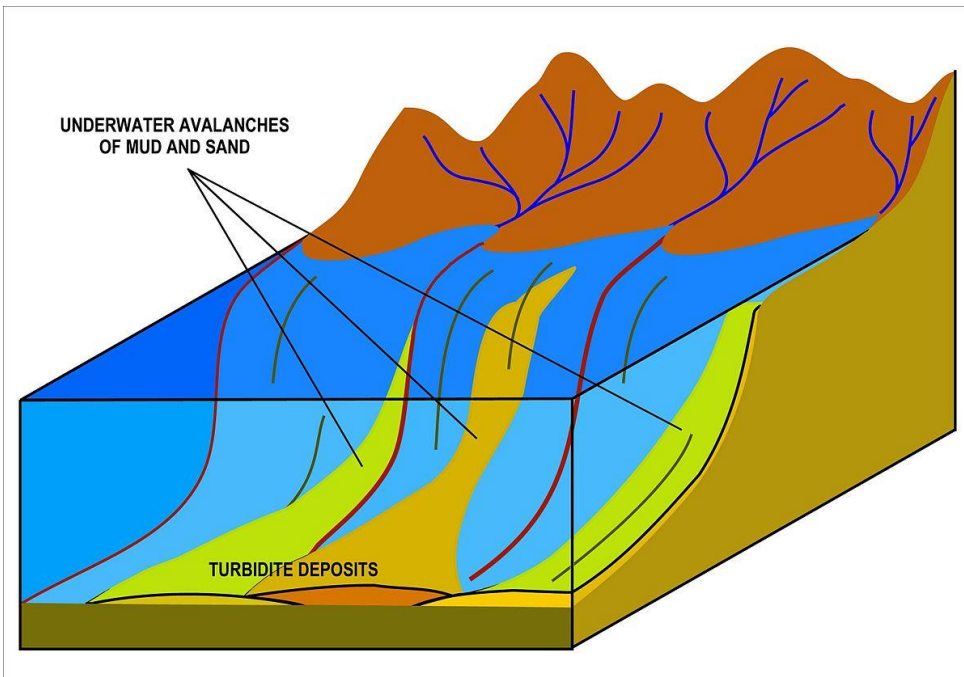
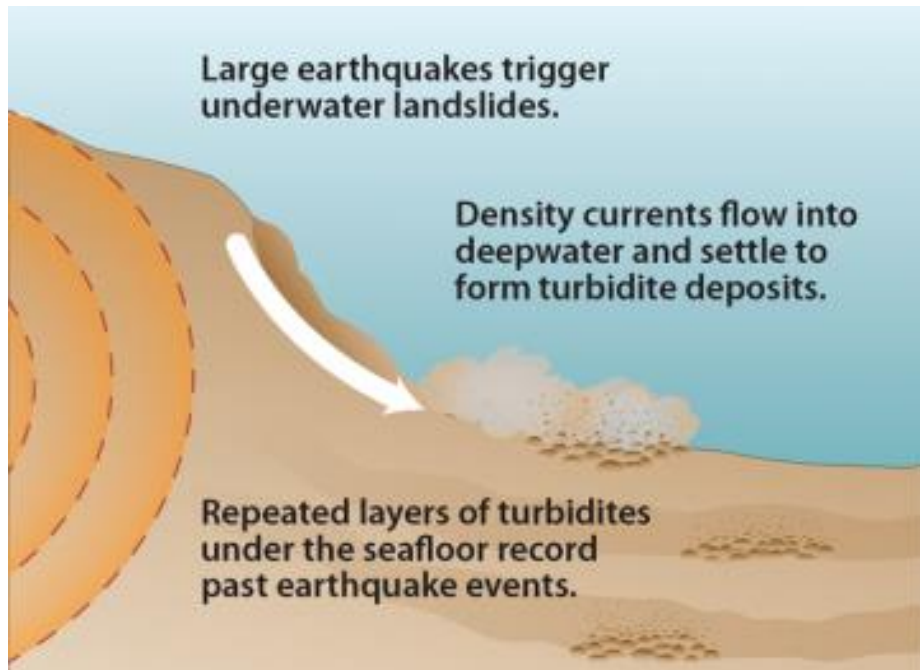
Blue-ish rock derived from marine sediments and seafloor basalt; has compositional banding and abundant mica, but little or no primary texture such as bedding

Northbrae Ryolite

Light-colored (quartz-rich) 11.5 million-year-old lava flow. Same unit forms Indian Rock in Berkeley. The source volcano may have been northeast of Hollister.

Environment Where Graywackes Accumulate

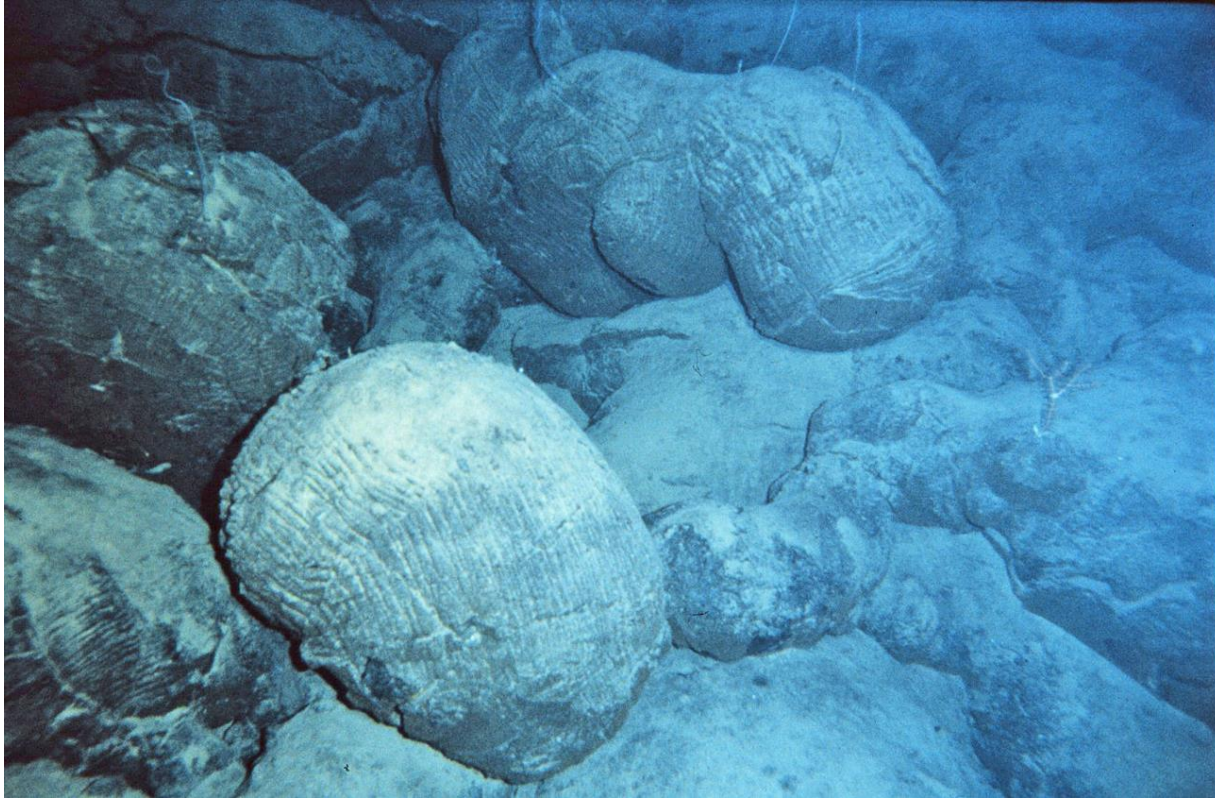
Graywackes are deposited by submarine landslides known as “turbidites.”



Fairly young turbidite, Baja California

We recognize turbidites by multiple sand-to-shale layers

The Blueschist was Originally Basalt Lava Erupted on the Seafloor at the Pacific Spreading Center



“Pillow” lava offshore Hawaii



The basalt became a blueschist during deep burial and metamorphism.
This pillow lava is at the Pt. Bonita Lighthouse trail.

Source of the Northbrae Rhyolite



Stories in Stone at Sibley Preserve

by [Gordy Slack](#) on April 01, 2005

Ten million years ago, when three-toed horses and long-necked camels roamed our region, volcanic eruptions tore through an alluvial fan, forming what would become Oakland's Round Top. This artist's conception shows what one of the Round Top eruptions might have looked like, with the still-volcanic Sierra in the distance. <https://baynature.org/article/voice-of-the-volcano/>

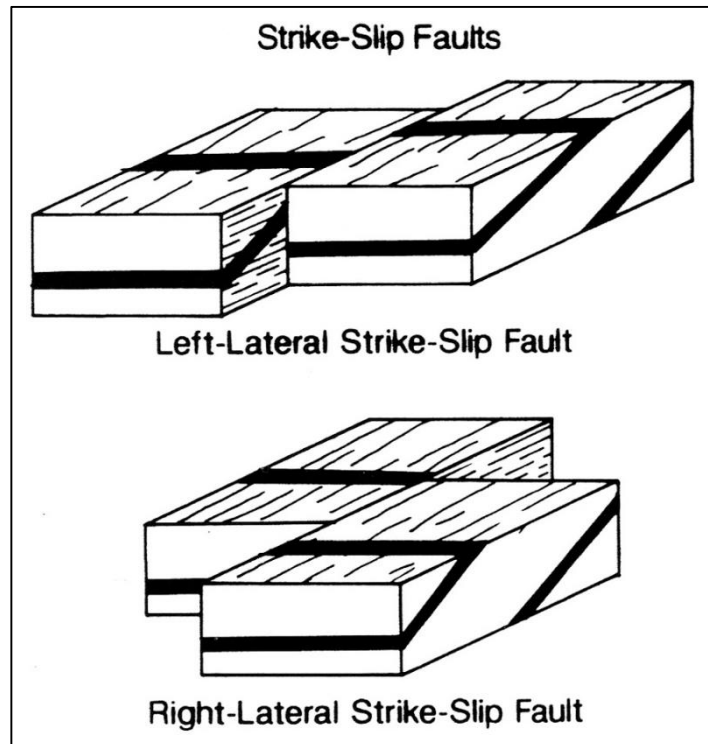
The lava either flowed here, or was carried here by the Hayward Fault

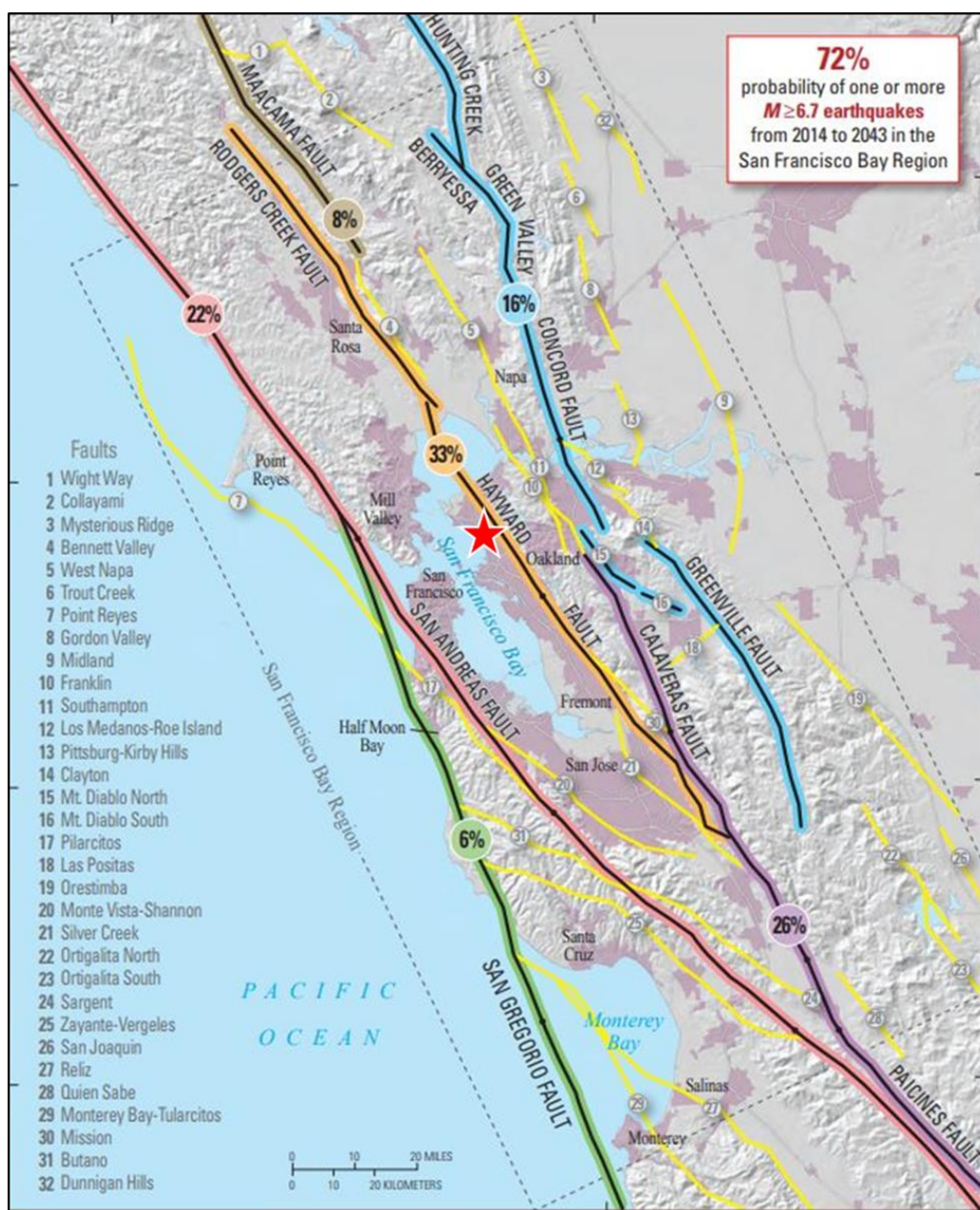


Julian Drive outcrops near Madera School.

Situation in the East Bay Hills since 25-30 million years ago

- The Hayward Fault is a right-lateral strike-slip fault, part of the San Andreas System
- Here it's creeping about 1.6" every 10-20 years
- The last large offset here was ~1705 (trench across golf club)
- Total offset on the creeping strand ~ 3 miles in past 12 million years





USGS estimates a 30% chance of a ≥ 6.7 on Hayward Fault in next 30 years. Last major quake was a 6.8-7.0 in 1868, max offset 3 ft, in Hayward.



Olive Ave, Richmond Heights (2 inches in 40 years)



Façade of U.C. Berkeley Stadium



The Hayward Fault in the Berkeley Country Club (El Cerrito) and where it crosses Thors Bay Drive



Local Geologic Map by John Wakabayashi

What this map tells you:

- There are four layers of old metamorphic rock
 - Blueschist (blue, highest)
 - Tiburon Melange (green)
 - Angel Island Nappe (white)
 - Alcatraz Nappe (green, lowest)
- Above these old rocks there is a lava layer, the Northbrae Rhyolite (pink)
- There are some large landslides in the Potrero and Moeser areas (yellow)
- The Hayward Fault cuts just above Arlington

