Watershed Geology

General Overview

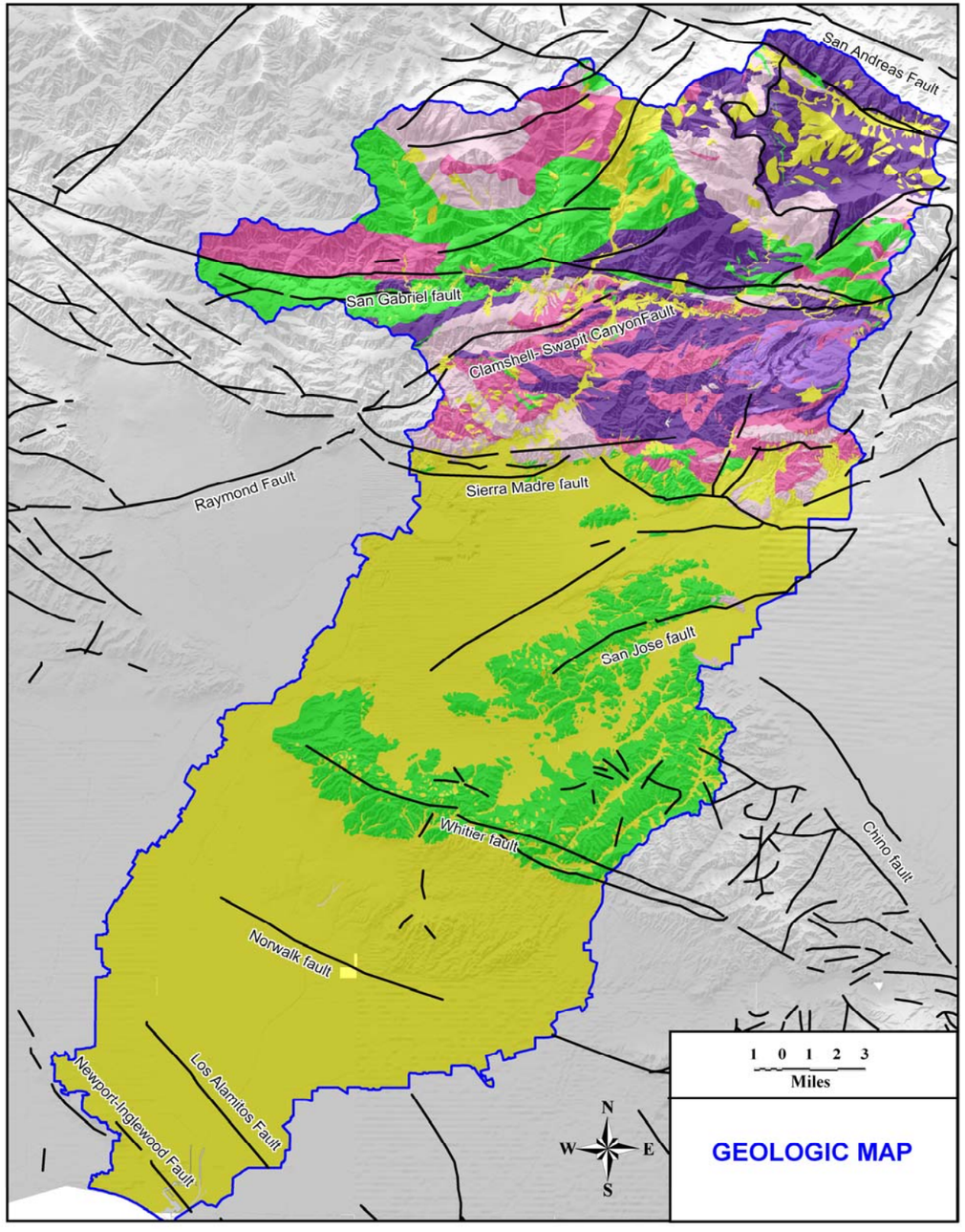
Located on the western margin of the North American plate, the San Gabriel Mountains comprise the central segment of the Transverse Ranges. Initial uplift of the Transverse Ranges commenced approximately 60 million years ago when the Pacific and North American plate boundary changed from subduction to a transform plate boundary. Currently the Pacific plate is moving north relative to the North American plate along the San Andreas fault at a rate of about 30 to 50 mm/yr. Plate interaction between the North American and Pacific plates has strongly influenced the geologic history of the San Gabriel Mountains resulting in a myriad of rock types and faults. Various processes such as faulting, mountain building, and natural drainage in the region have collectively contributed to the formation of the San Gabriel River Watershed.

Geologic History and General Stratigraphy

The San Gabriel Mountains are dominated by a series of intrusive granodiorite plutons ranging in age from late Cretaceous (65 million years old) to Precambrian (4.5 billion years old). These plutons have been subsequently intruded by Mesozoic aged dikes (65 to 248 million years old). During the late Paleocene (55 to 61 million years old), the San Gabriel Mountains experienced a period of metamorphism. This is evidenced by the presence of the Pelona Schist and other metasedimentary rocks found throughout the entire mountain range. Weathering and erosion of these rocks contributes to the creation of large alluvial fans adjacent to the San Gabriel Mountains and also, in part, comprise the alluvial material filling the San Gabriel and Los Angeles Basins.

Regional Tectonics

The San Gabriel Mountains are geologically young and still tectonically active. The mountain range is bounded to the north-northeast by the active San Andreas fault and to the south-southwest by a series of active oblique thrust faults and the non-active San Gabriel fault. The active oblique thrust faults include the Santa Monica, Raymond Hill, Sierra Madre, and Cucamonga fault zones. Much of the uplift of the San Gabriel Mountains has occurred within the last 3 to 5 million years and is associated with the inland migration of the San Andreas fault approximately 5 million years ago. The Los Angeles Regional Seismic Experiments (LARSE-I and II) have discovered that the Moho is 26 kilometers shallower beneath the San Gabriel Mountains region than it is beneath the basin to the south, or the Mojave Desert Basin to the north (Zhu, 2002). This is not what is expected beneath mountain ranges, and is evidence that this region is tectonically active. Recent events in the area include the 1988 M=5.0 Pasadena and 1991 M=5.8 Sierra Madre earthquakes based on the Richter Scale.



Legend

- Holocene Sedimentary
- Tertiary Sedimentary
- Tertiary Sedimentary
- Cretaceous Metamorphic and Igneous Rocks
- Mesozoic Metamorphic and Igneous Rocks
- Paleozoic Metamorphic and Igneous Rocks