The transtensional eastern boundary of the Sierran microplate (Walker Lane rift) currently accommodates 25% of the plate motion between North America and the Pacific plate. The Sierran microplate formed at the same time as the Gulf of California rift (about 12 Ma), both by transtension within the thermally- and structurally-weakened axis of a subduction-related arc. Structural trends are the same in both, with short NE oblique slip normal faults (Walker Lane) or seafloor spreading centers (Gulf of California) connected by long NNW strike slip faults. Because rifting has not yet succeeded in the Walker Lane, structural controls on rift volcanism can be observed on land.

The biggest volcanic centers in the Walker Lane rift are sited on major releasing bends. Active centers include the Long Valley rift volcanic center and the Lassen arc volcanic center, and we have found two large Miocene-Pliocene (Ancestral Cascades arc) centers: (1) An 11 – 9 Ma volcanic center at Sonora Pass includes “flood andesite” lavas that fill grabens over an ~ 50 X 50 km area, as well as an overlying smaller silicic explosive volcanic center (the long-recognized Little Walker caldera). The “flood andesites” were erupted from 6–8 km long fault-controlled fissures and ponded in grabens to thicknesses of 400 m, with single flows up to 25 km$^3$ in volume. (2) The remains of the 4 - 5 Ma Ebbetts Pass stratovolcano complex (>30 km$^3$), whose original volume cannot yet be calculated due to repeated collapse into grabens.