

Late Tertiary Volcanism

Reading:

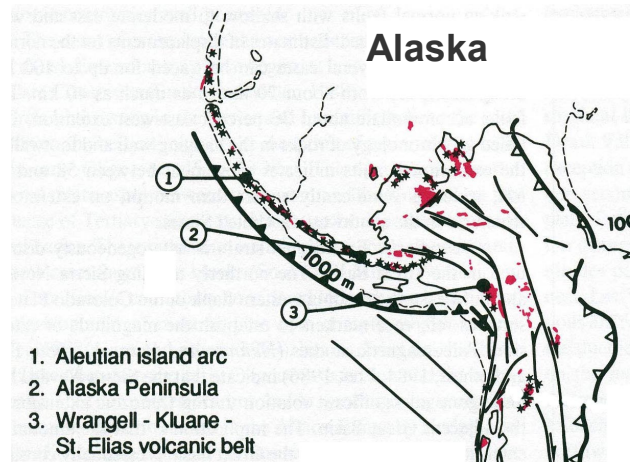
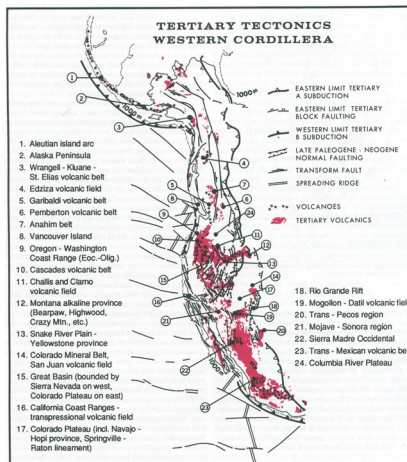
DNAG volume G3, Ch. 7

Main Divisions

- Two principal time divisions with an important break
- Oligocene until Mid-Miocene (15-17 Ma)
- Mid-Miocene to present (<15 Ma)

Volcanic Overview

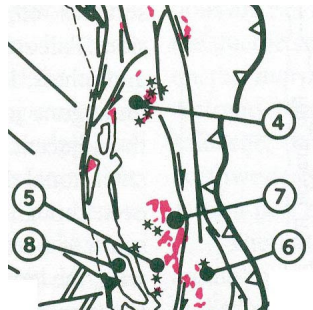
- Alaska
- Canada
- USA
- Mexico



Canada

Magmatism active 22 to 8 Ma

- Edziza Volcanic Field (4)
- Garibaldi Volcanic Field (5)
- Pemberton Belt (6)
- Anahim Belt (7)
- Vancouver Island (8)

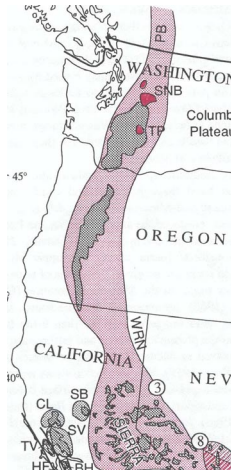


Washington

- Large composite granodiorite plutons
- Tatoosh Pluton (18 to 14 Ma) – Beneath Mt. Rainier
- Snowqualmie Batholith (20 - 17 Ma) – North of Mt. Rainier
- Ellensberg Fm (17 to 14 Ma) – Flood basalts (Columbia Plateau Basalts)

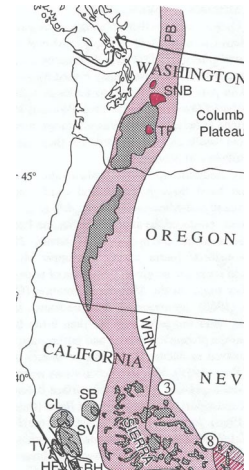
Washington

- Snowqualamie Batholith
- Tatoosh Pluton
- Ellensberg Fm (17 to 14 Ma Columbia Plateau)



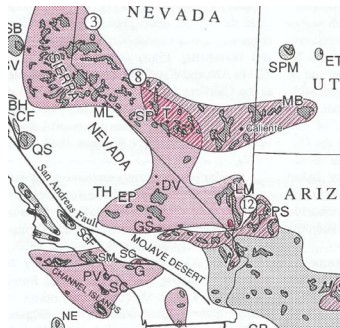
Northern to Central Oregon

- Magmatism from 18 to 8 Ma
- Lavas and related volcanoclastic sediments
- Calc-alkaline pyroxene andesites and basalts



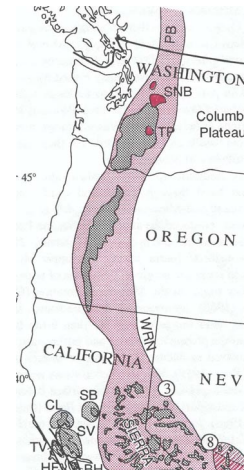
Central Nevada

- Stratovolcanoes 17-12 Ma
- Alta and Kate Peak Fms
- Pyroxene andesite and hornblende pyroxene andesite lavas



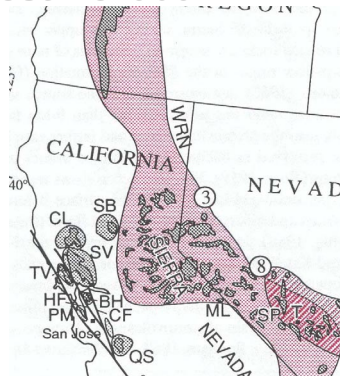
Southern Oregon and Northern California

- Western Cascade volcanism ended about 17 Ma
- Magmatic arc to the east largely buried by younger rocks



East Central California & Northwest Nevada

- Andesitic to dacitic calc-alkaline magmas
- Lavas and breccias of the Mehrten Fm in Sierras

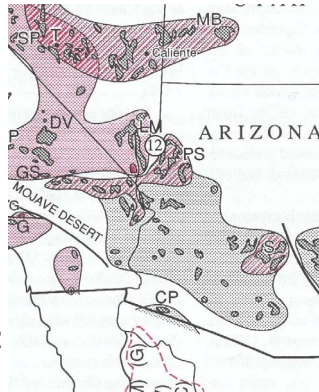


Southwest Nevada & Eastern California

- Predominantly andesitic lavas
- Yerington - Tonopah (21 to 15 Ma)
 - Mono Lake (13 to 8 Ma)
 - Silver Peak Range (16 to 11 Ma)
- Calc-alkali to rhyolite stratovolcanoes
 - Tonopah and Goldfield (20 Ma)
- Calc-alkaline andesite and dacite
 - Death Valley through the Mojave
 - 17 to about 12 Ma

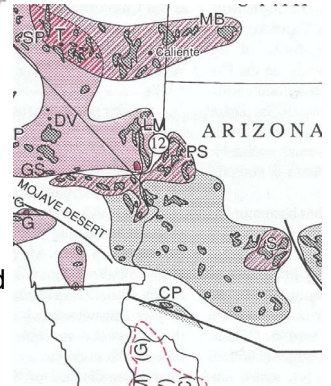
Lake Mead Area

- Calc-alkali magmatism
- Patsy Mine Volcanics (15 to 12 Ma)
- Overlain by rhyodacite tuff and pluton
- Hamblin Cleopatra stratovolcano (13 Ma)
- Basaltic volcanism
- Younger than 10 to 12 Ma



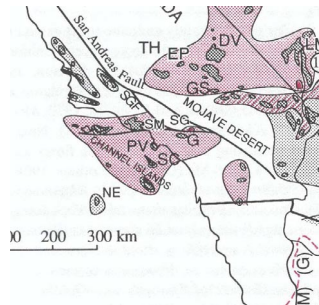
Lower Colorado River Trough

- Predominantly basaltic to bimodal basalt-rhyolite volcanism
- Associated with high-angle Basin and Range faulting



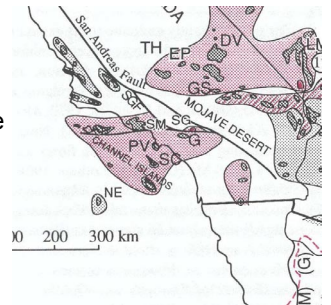
Coastal Southern California

- Calc-alkaline intermediate rocks (20 to 12 Ma) extends into Mexico
- Santa Monica Mts.
 - 16 to 13 Ma Conejo volcanics
- Malibu coast fault
 - 15 Ma Zuma Volcanics
- San Clemente
 - 16 to 13 Ma



Coastal Southern California

- Santa Catalina
 - 19 Ma quartz diorite stock
 - 15 to 13 Ma rhyodacite
- Palos Verdes Hills
 - 15 Ma andesite and basalt

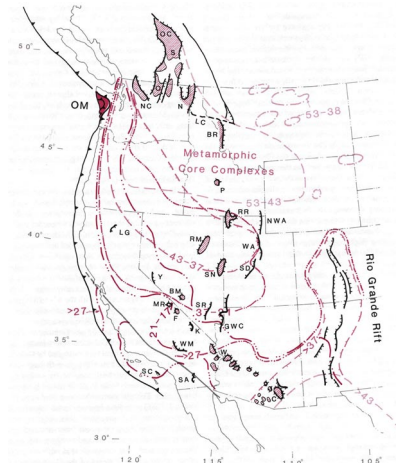


Mexico

- South of the Mexican border
 - 20 to 15 Ma
 - Basalt and andesite
- Gulf of California
 - 22 to 8 Ma calc-alkaline basalts and rhyolites

General Migration of Volcanism

- Waves of volcanic intensity
- Movement from center of B&R outward



Summary

- A major change in magmatic patterns occurred in mid-Miocene (21 and 17 Ma)
- Andesitic calc-alkali centers extended from Canada to the southern tip of Nevada
- A gap of 300 to 400 km from Nevada to Mexico
- The belt continued southward in to Mexico east of the continental margin arc
- A belt of basalts or bimodal basalt-rhyolites accompanied a zone of widespread extension

Interpretation

- Pre Miocene volcanism in the cordillera followed a wide arc
- Mid-Miocene calc-alkaline volcanism establishes a linear continental margin arc
- Magmatic gap in the mid-Miocene arc
 - Located where subduction had ceased
 - Followed contact of Pacific and North American Plates