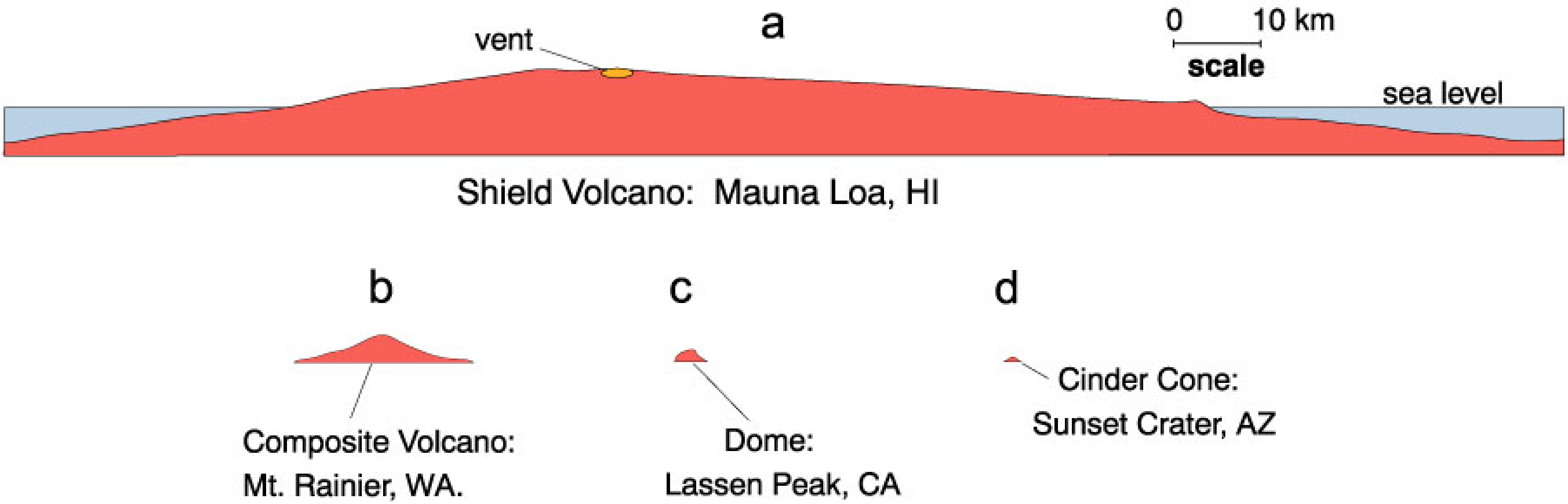
Announcements

- Reading: p. 167-179 again
- Homework 4 due Wednesday
- Field trip handouts due Thursday

Structures and Field Relationships



Volcanic landforms associated with a central vent (all at same scale).

Shield Volcano

Structures and Field Relationships

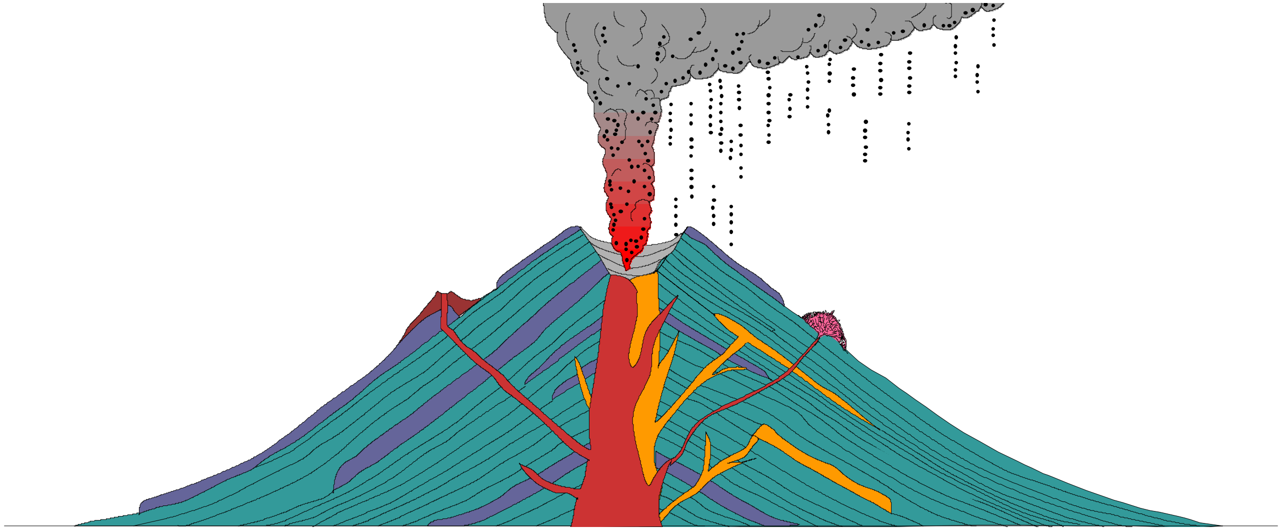


Figure 4-3. **a.** Illustrative cross section of a stratovolcano. After Macdonald (1972), *Volcanoes*. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1-150. **b.** Deeply glaciated north wall of Mt. Rainier, WA, a stratovolcano, showing layers of pyroclastics and lava flows. © John Winter and Prentice Hall.

Structures and Field Relationships

Figure 4-5. Cross sectional structure and morphology of small explosive volcanic landforms with approximate scales. After Wohletz and Sheridan (1983), *Amer. J. Sci*, **283**, 385-413.

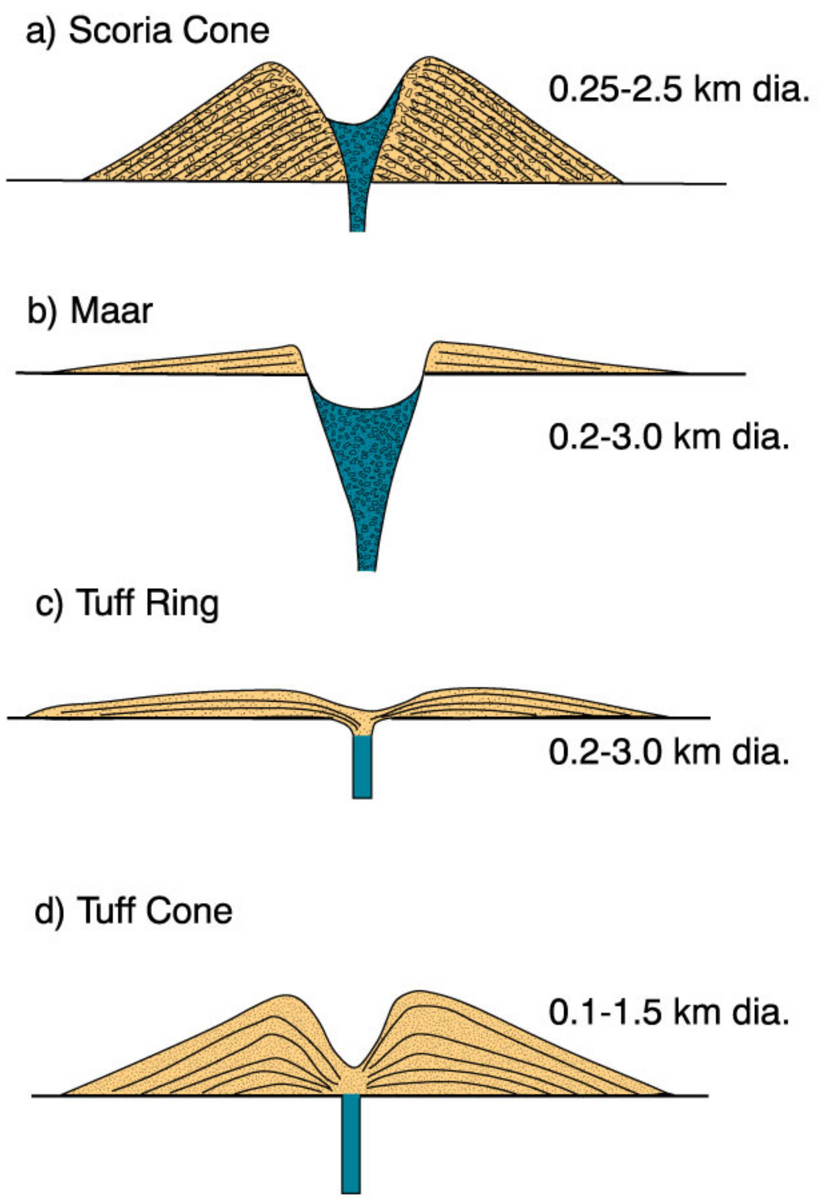


Figure 4-6. **a.** Maar: Hole-in-the-Ground, Oregon (upper courtesy of USGS, lower Winter). **b.** Tuff ring: Diamond Head, Oahu, Hawaii (courtesy of Michael Garcia). **c.** Scoria cone, Surtsey, Iceland, 1996 (© courtesy Bob and Barbara Decker).

Lava Domes

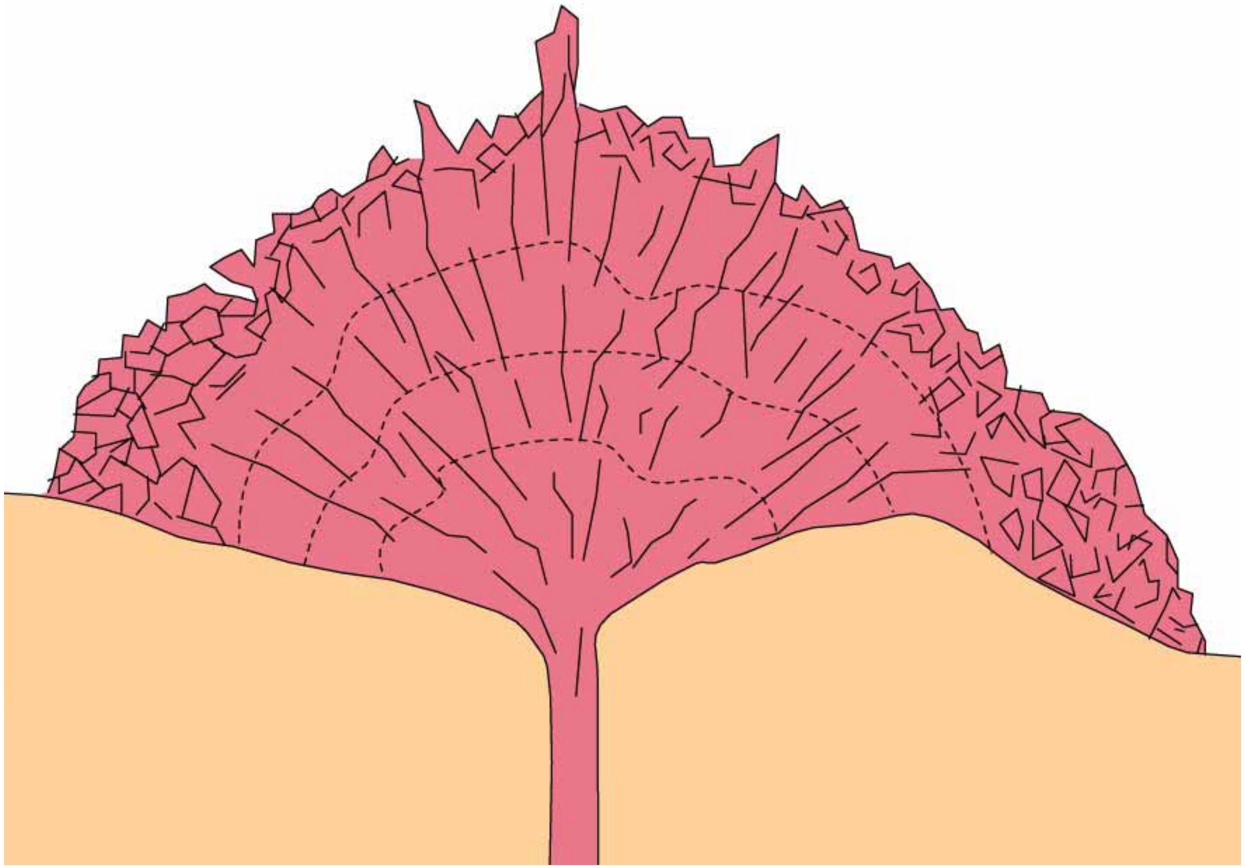


Figure 4-7. Schematic cross section through a lava dome.

Composition: andesitic-rhyolitic

Flow banding

Spines and breadcrust texture

Caldera formation

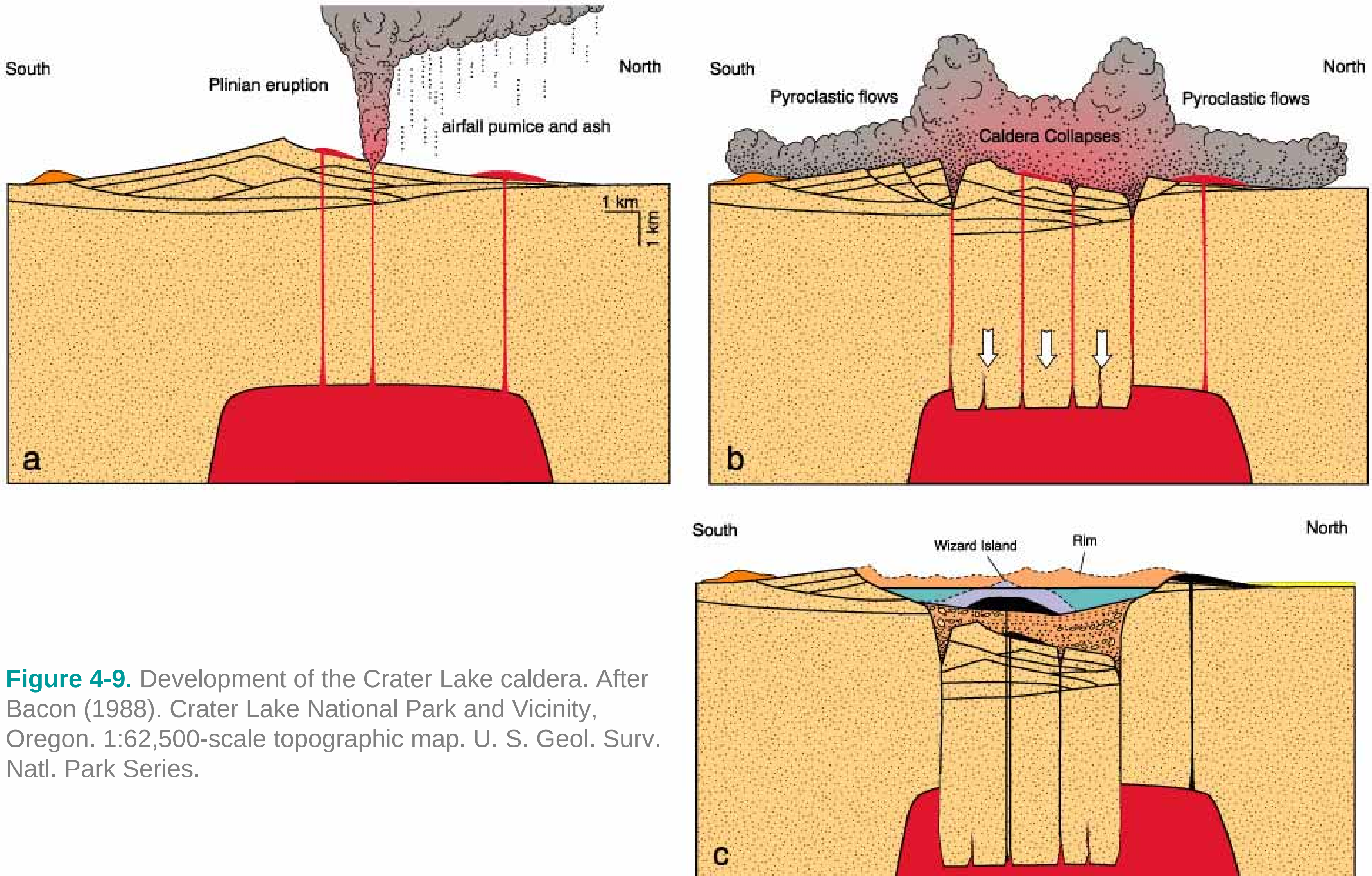
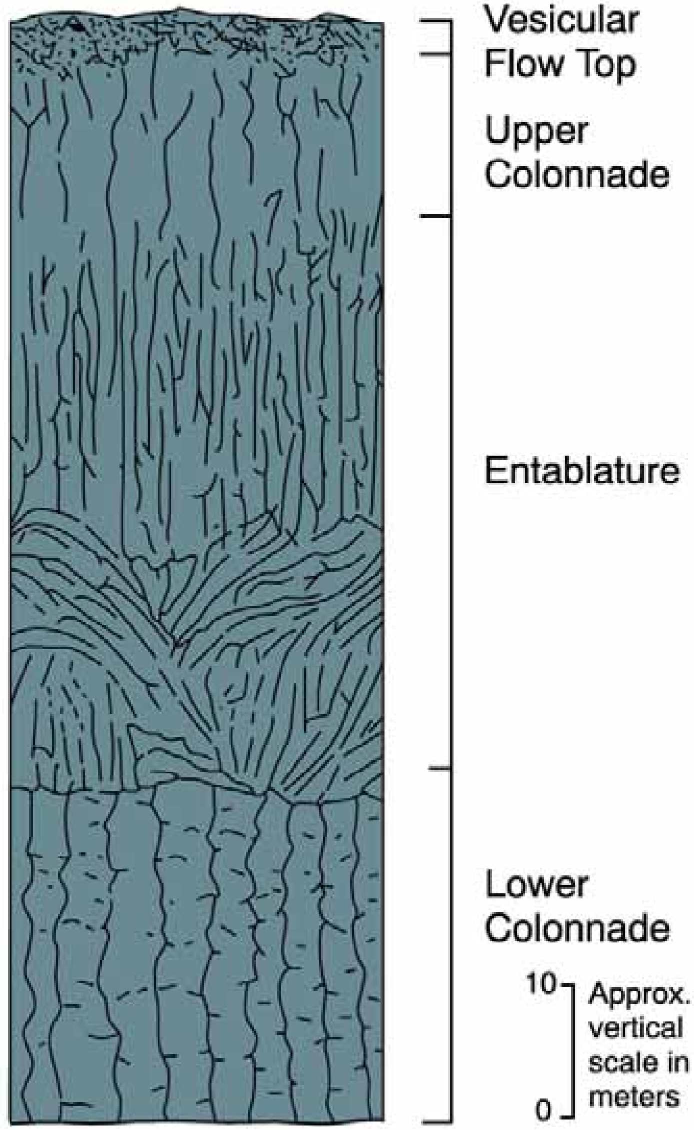


Figure 4-9. Development of the Crater Lake caldera. After Bacon (1988). Crater Lake National Park and Vicinity, Oregon. 1:62,500-scale topographic map. U. S. Geol. Surv. Natl. Park Series.

Columnar Jointing



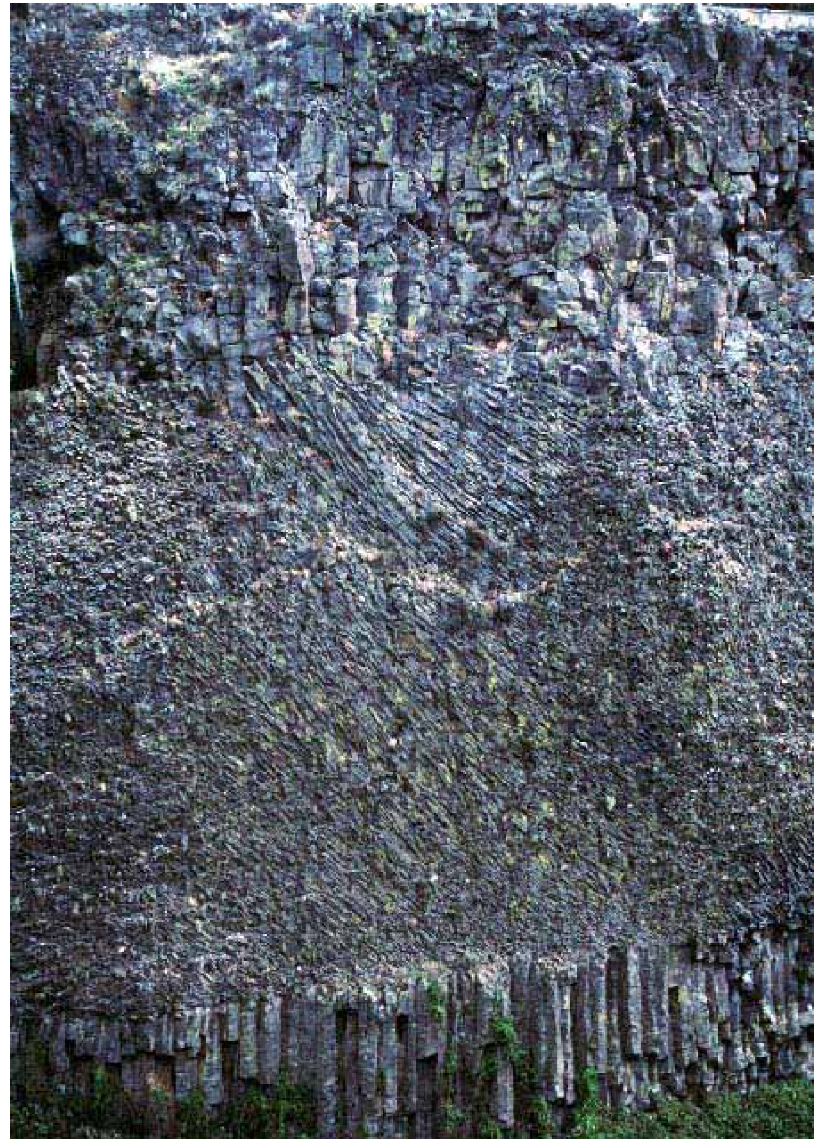


Figure 4-13. **a.** Schematic drawing of columnar joints in a basalt flow, showing the four common subdivisions of a typical flow. The column widths in (a) are exaggerated about 4x. After Long and Wood (1986) © *Geol. Soc. Amer. Bull.*, **97**, 1144-1155.

b. Colonnade-entablature-colonnade in a basalt flow, Crooked River Gorge, OR. © John Winter and Prentice Hall.

Pyroclastic Flow Deposits: Ignimbrites

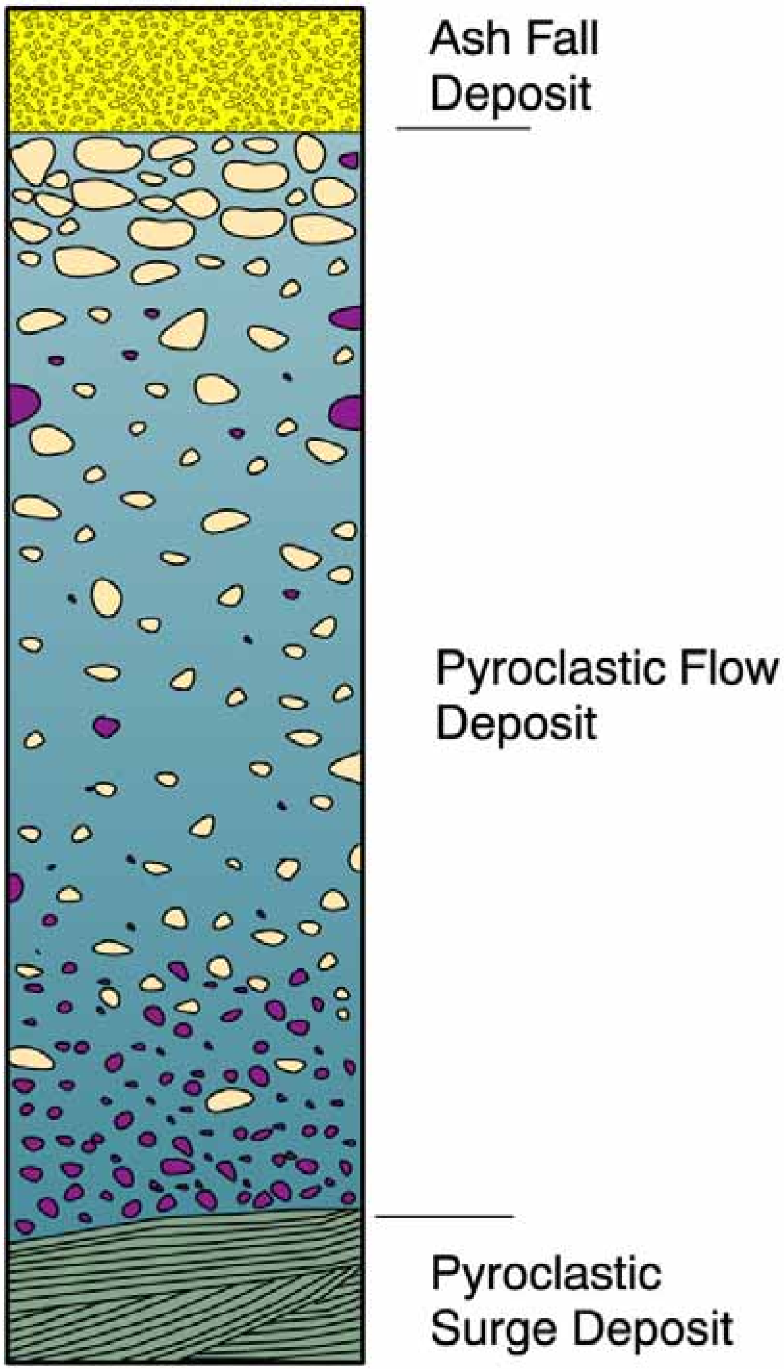


Figure 4-19. Section through a typical ignimbrite, showing basal surge deposit, middle flow, and upper ash fall cover. Tan blocks represent pumice, and purple represents denser lithic fragments. After Sparks *et al.* (1973) *Geology*, **1**, 115-118. Geol. Soc. America

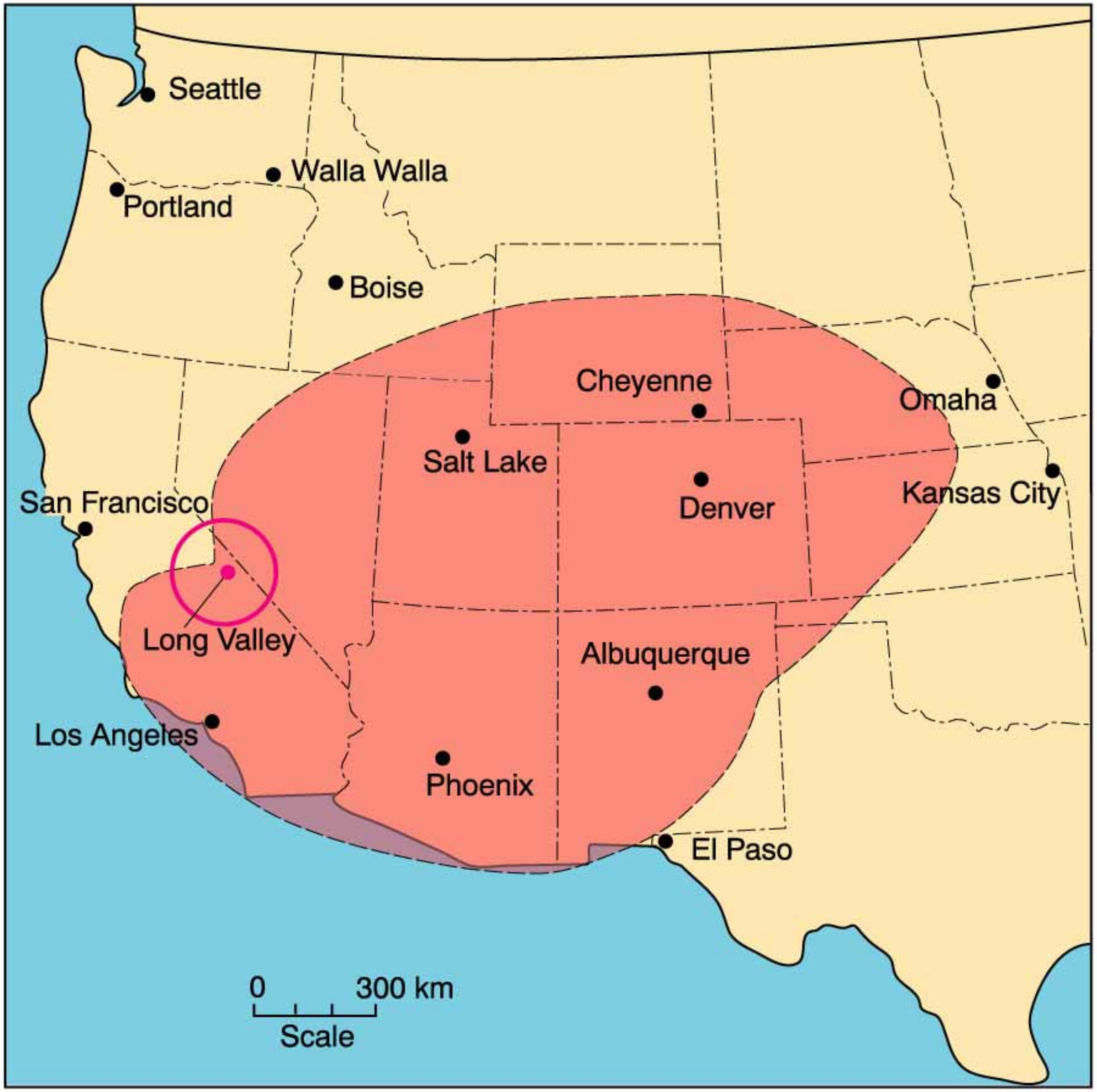
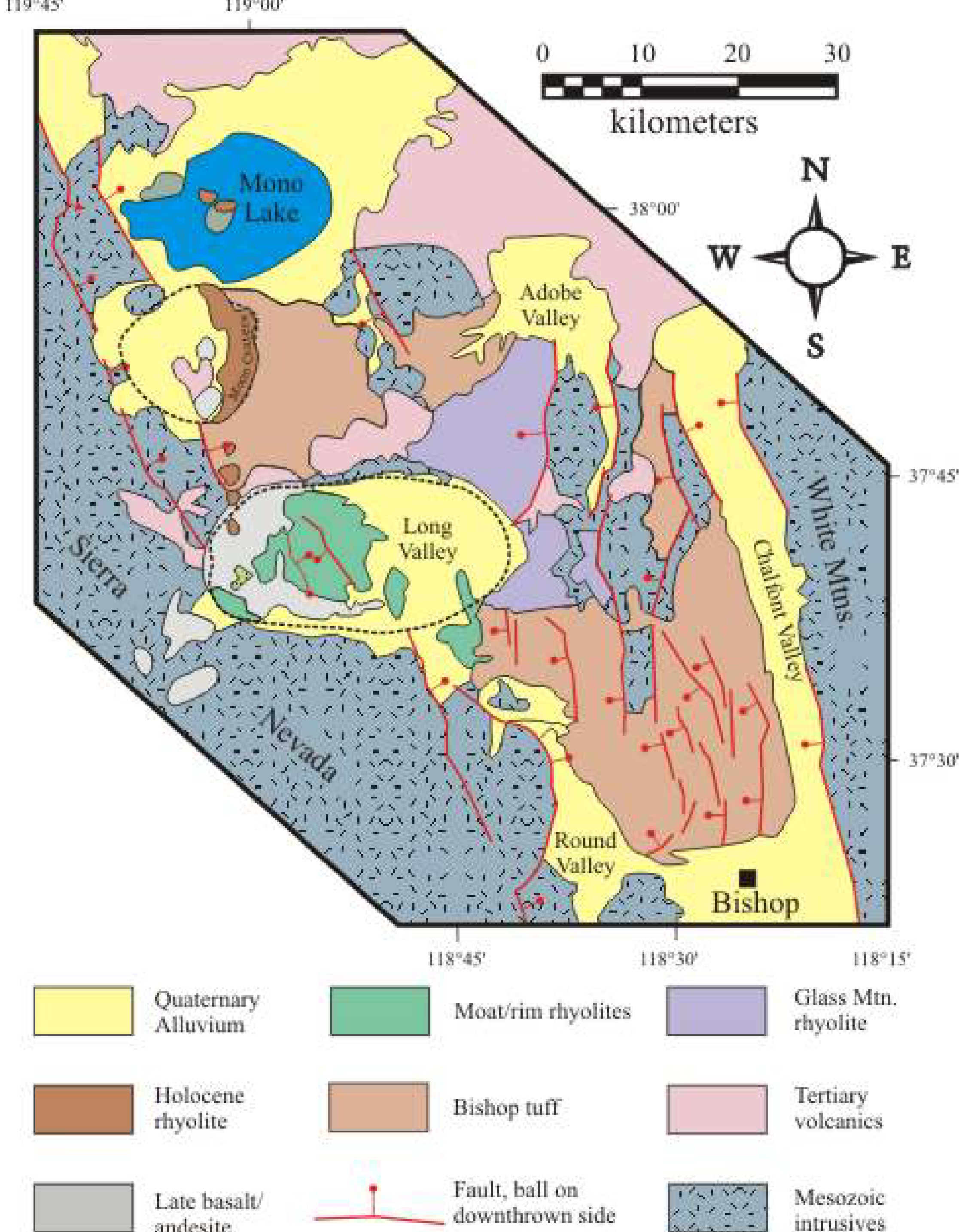


Figure 4-17. Maximum aerial extent of the Bishop ash fall deposit erupted at Long Valley 700,000 years ago. After Miller *et al*. (1982) *USGS Open-File Report* 82-583.

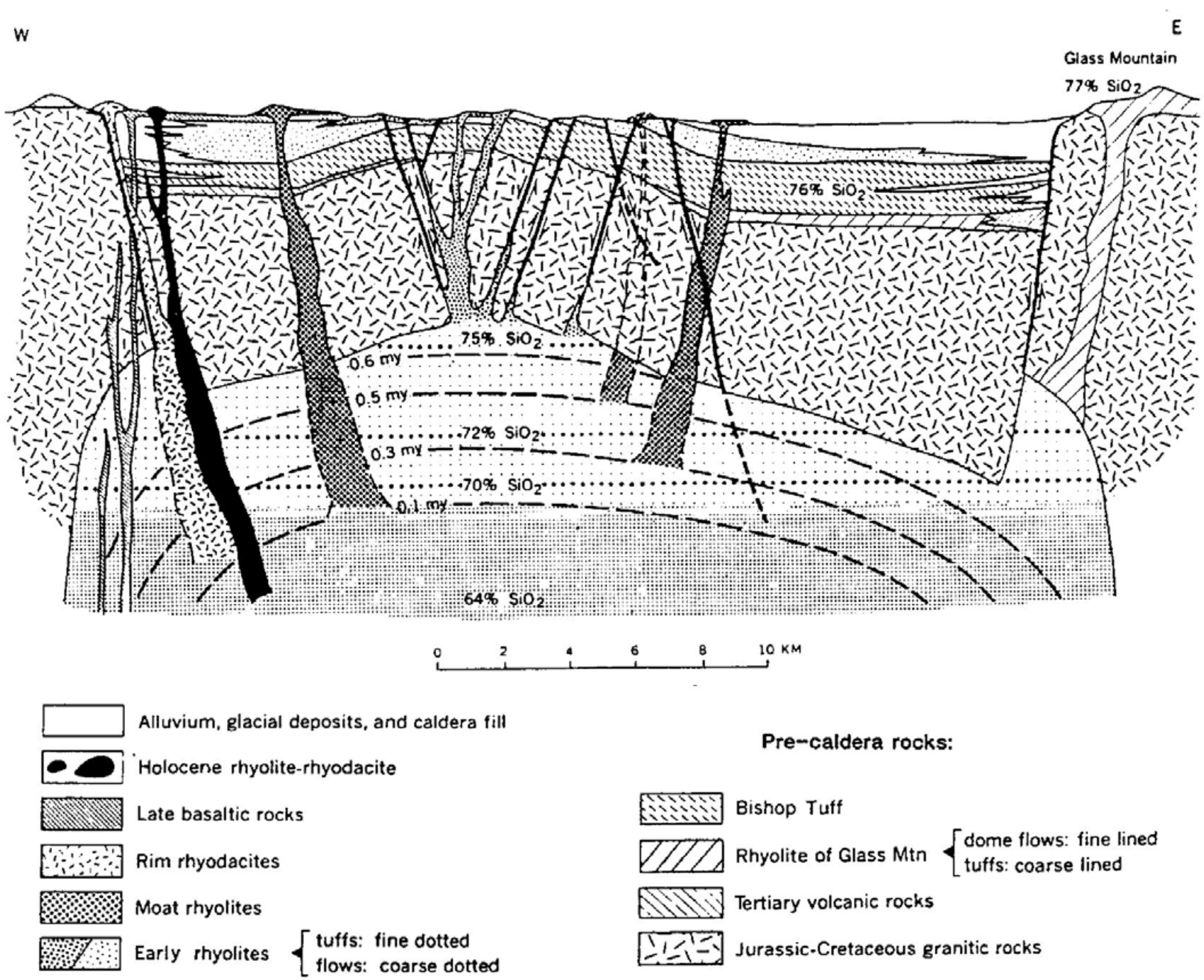


119°45'
119°00'
0 10 20 30
kilometers
N
W
E
S
38°00'
37°45'
37°30'
118°45'
118°30'
118°15'
Mono Lake
Mono Craters
Adobe Valley
Long Valley
Sierra Nevada
White Mtns.
Chalfont Valley
Round Valley
Bishop
Quaternary Alluvium
Moat/rim rhyolites
Glass Mtn. rhyolite
Holocene rhyolite
Bishop tuff
Tertiary volcanics
Late basalt/ andesite
Fault, ball on downthrown side
Mesozoic intrusives

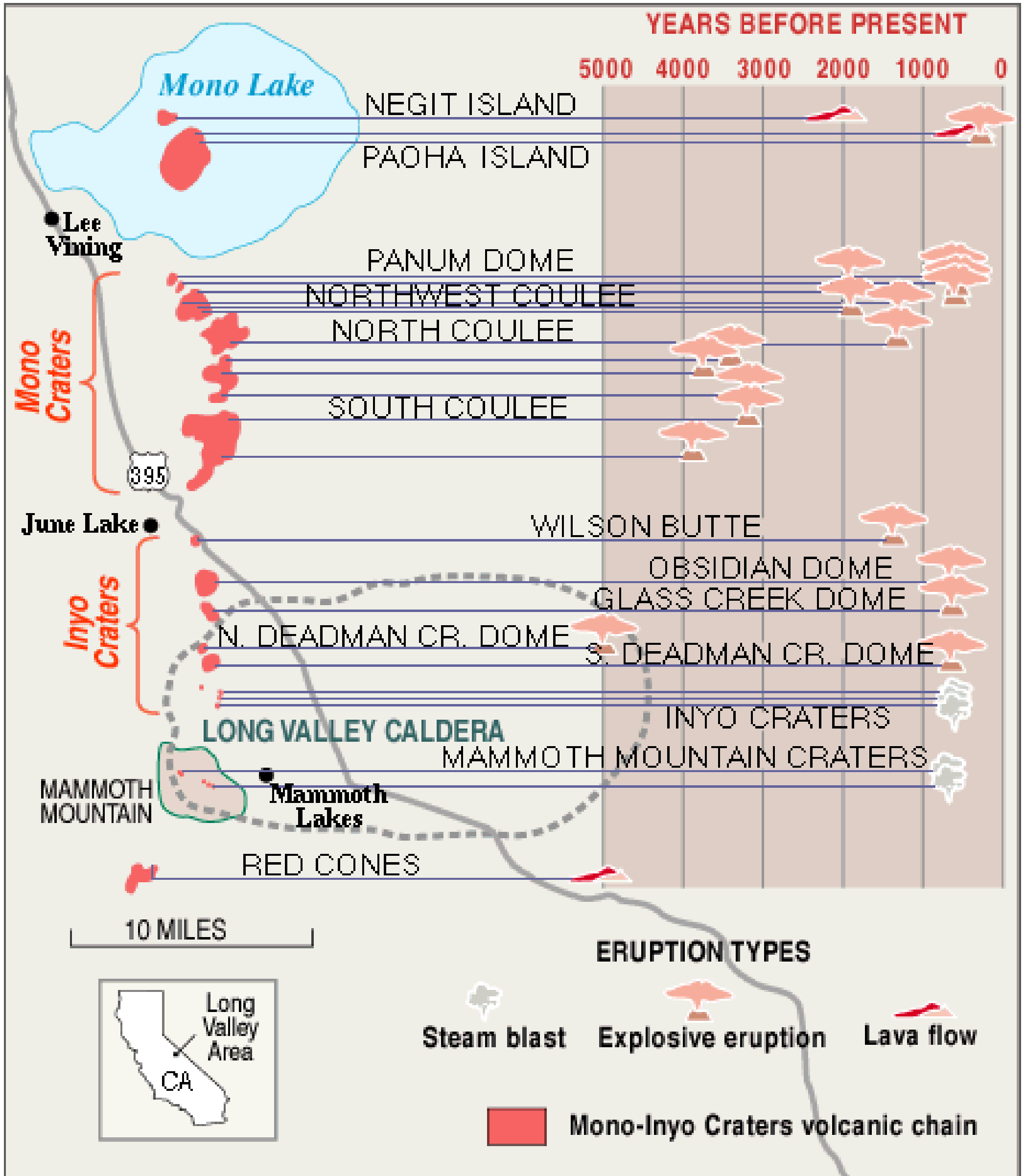
A brief history of volcanism in Long Valley

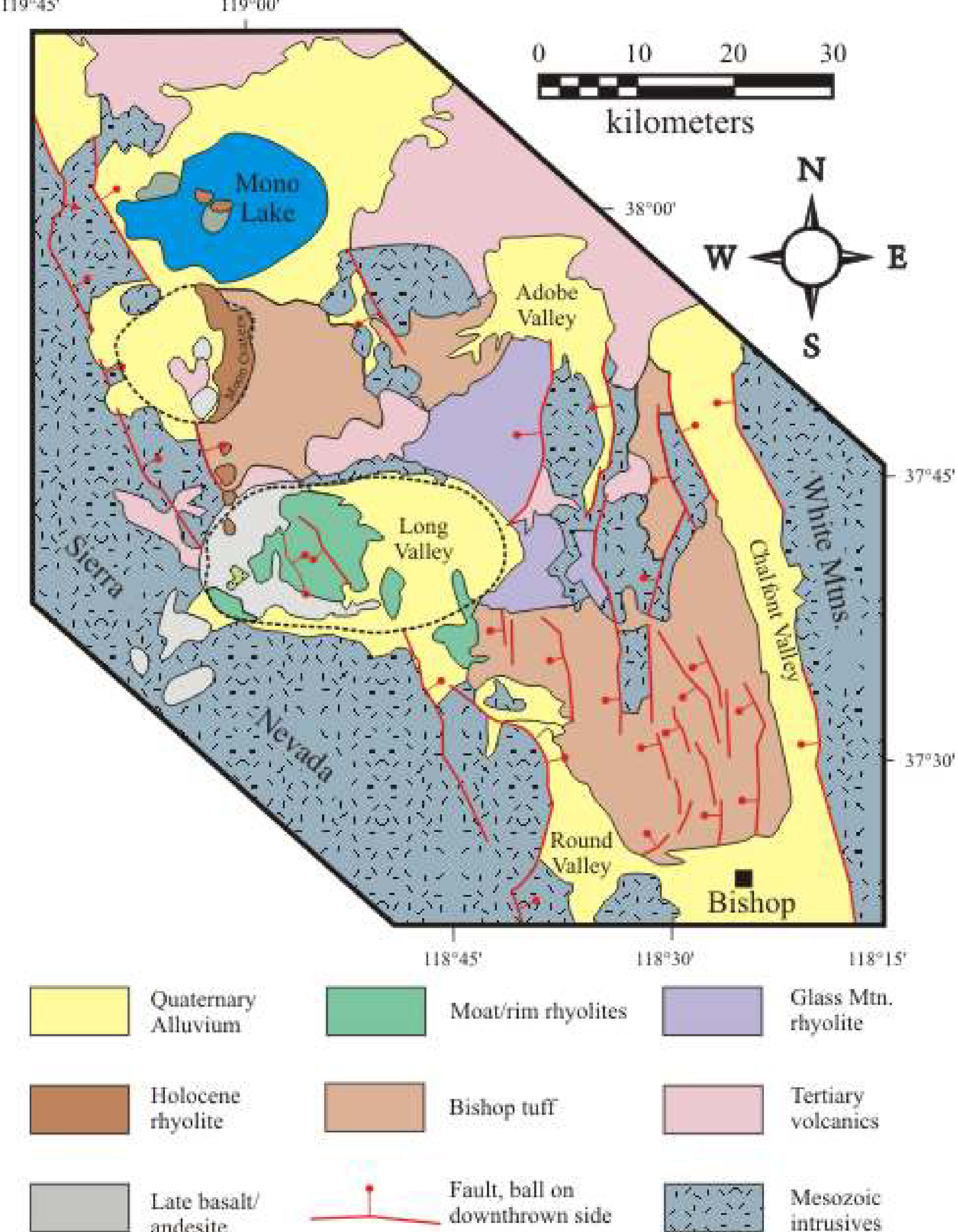
- Basement rocks: Mezosoic crystalline and Tertiary basalts
- 2.0-1.7 Ma; 1.1-0.85 Ma Glass Mountain Volcanism
- 0.76 Ma: Eruption of the Bishop Tuff and collapse of the Long Valley Caldera, infill with ash
- Resurgent doming and “early rhyolites”: 0.73-0.63 Ma in caldera
- Moat rhyolites: 0.5-0.1 Ma (ring fractures in resurgent dome)
- Late basalts: 0.2 to 0.06 Ma
- Recent (Holocene) small domes and craters (Mono <5000 yr; Inyo <1000 yr)

Progressive tapping of a large magma reservoir?



Recent small-scale events





Where are we going?

- Look at Caldera
- Mono Lake
- Mono Craters
- Resurgent dome area
- Bishop Tuff (gorge and pumice quarry)
- Tungsten Hills Granite
- Basaltic cinder cone