

The Mesozoic Cordillera

Laramide Orogeny 80-40 Ma

Sevier Orogeny 165-80 Ma

Nevada Orogeny 140-150 Ma

Sonoma Orogeny 280-200

Klamath Orogenies

(Dates subject to adjustment without notice.)

Orogeny

- “Mountain building event”
- Occur over a period of time lasting millions of years
- Dates determined from sediments in adjoining basins
- Location of faulting, volcanism, uplift, etc changes during orogeny

Laramide Orogeny



Pike's Peak, Colorado

http://www.flickr.com/photos/kayla_hopi/2178373178/



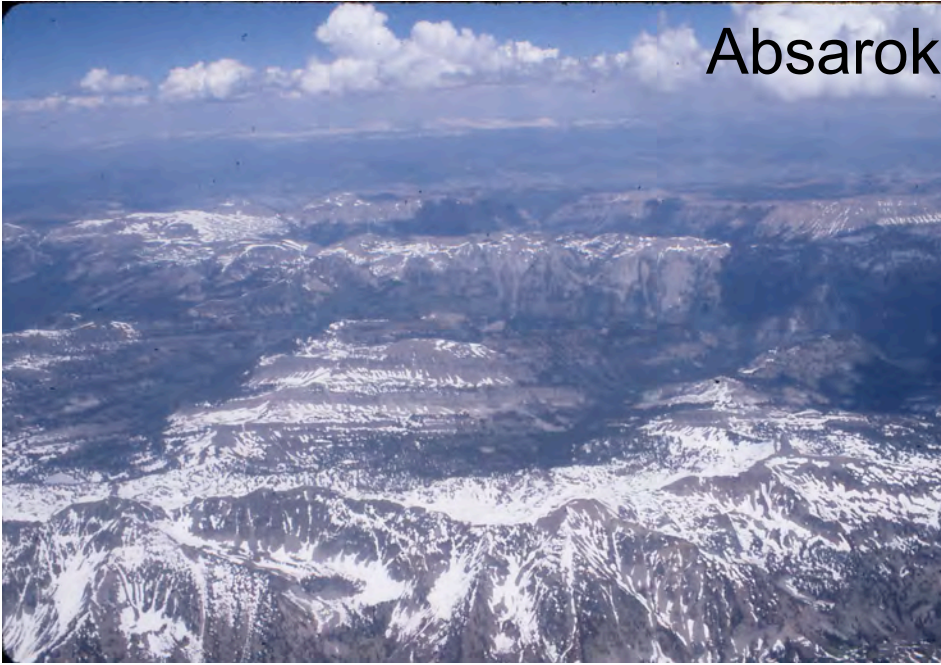
ISS005E18014



ISS015E06012

Some soon to be familiar Laramide uplifts
NB: hogbacks and strike valleys.

Absaroka Range Wyoming



Red Rocks Park, Colorado Springs, CO



Gunnison Uplift

Black Canyon
Gunnison River
Colorado



Eastern Uinta Uplift





Uinta Uplift famous outcrop

Waterpocket Fold, Utah



West Limb



East Limb



San Rafael Swell, Utah

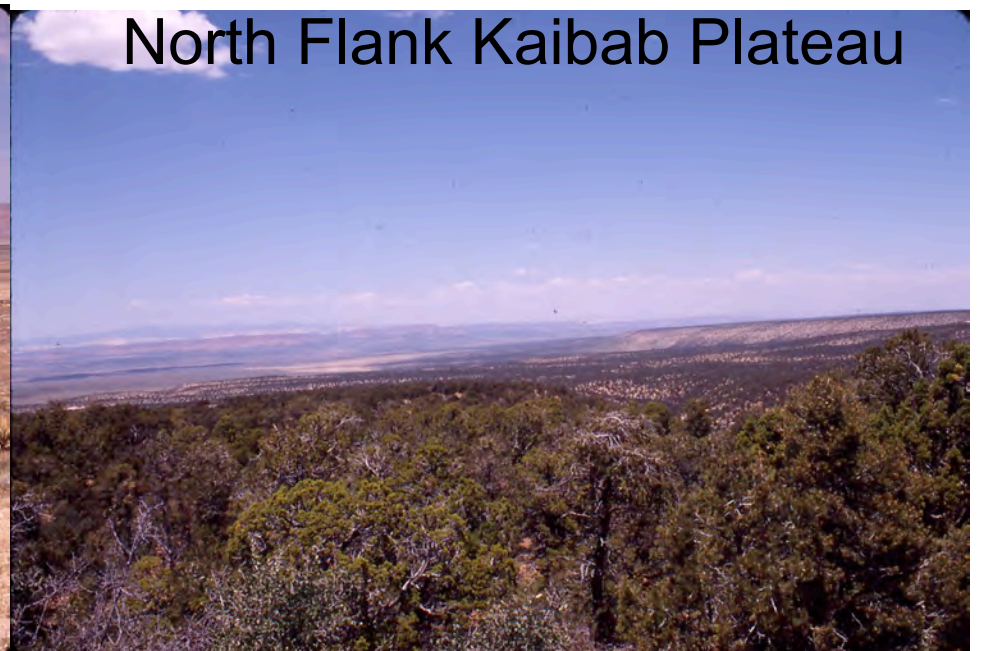
Grand Canyon from North Rim



Echo Cliffs, Arizona



North Flank Kaibab Plateau





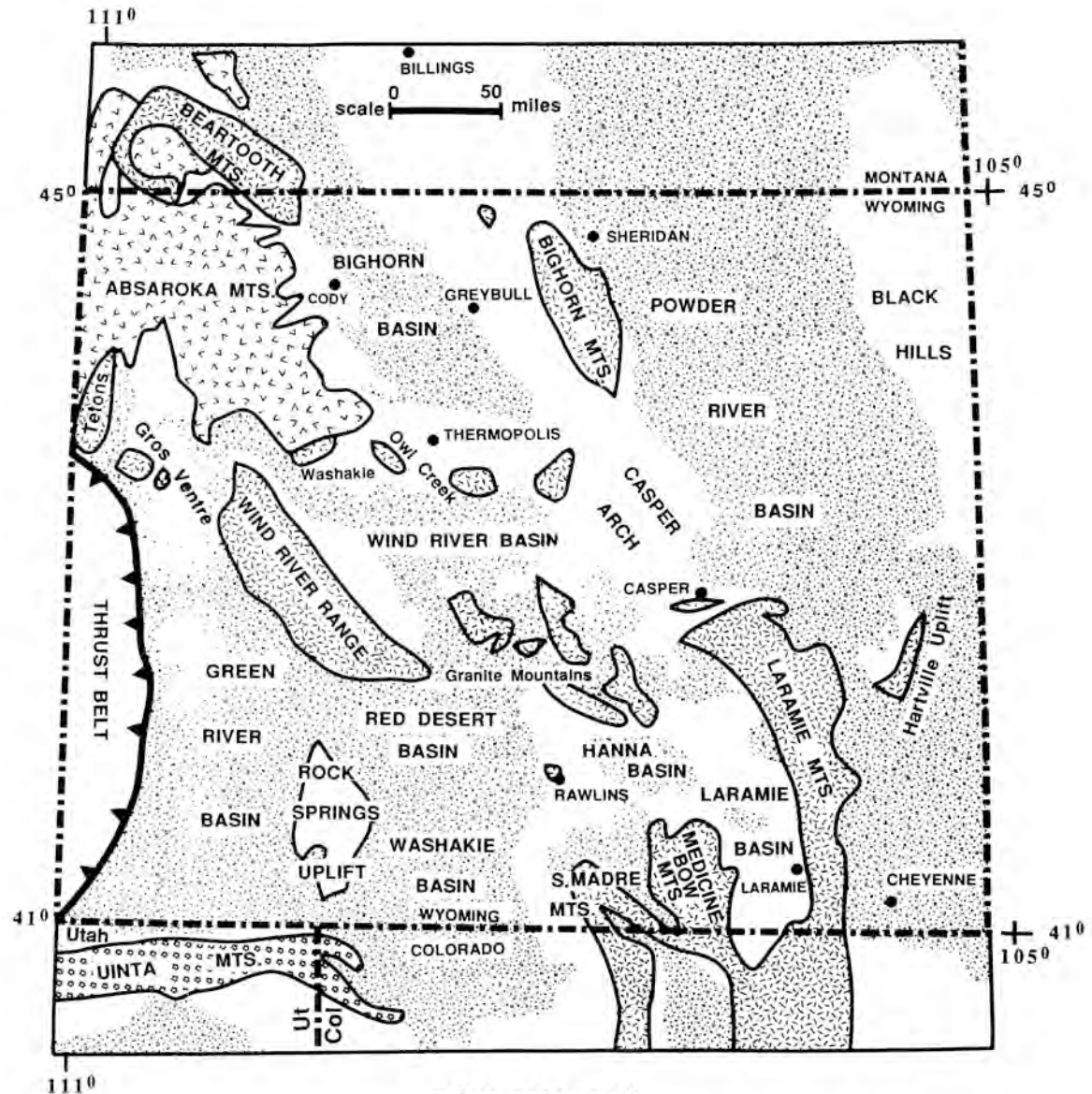
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Canon de Chelley and de Muerto, west flank Monument Uplift, AZ

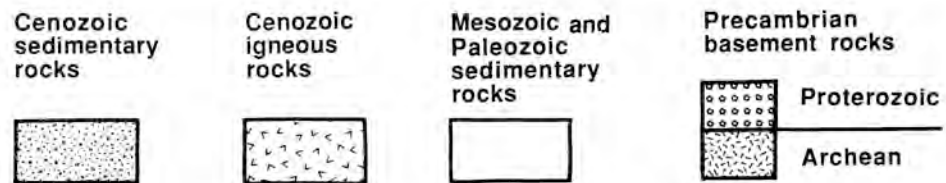


Front Range, Rocky Mountains, Denver, Colorado

Wyoming Laramide Features



EXPLANATION





North edge of the Pine Creek Thrust looking northwest along the front of the Bighorn Mountains. Valley of the Little Goose Creek in the middle distance.
Cc Louis Maher, University of Wisconsin



Sheep Mountain Anticline between Greybull and Lovell, WY. View to the southwest. Anticline plunges to the northwest. At the left is a northwest-plunging syncline. Note that Bighorn River has been superimposed across this structure. Photo by Louis Maher, University of Wisconsin

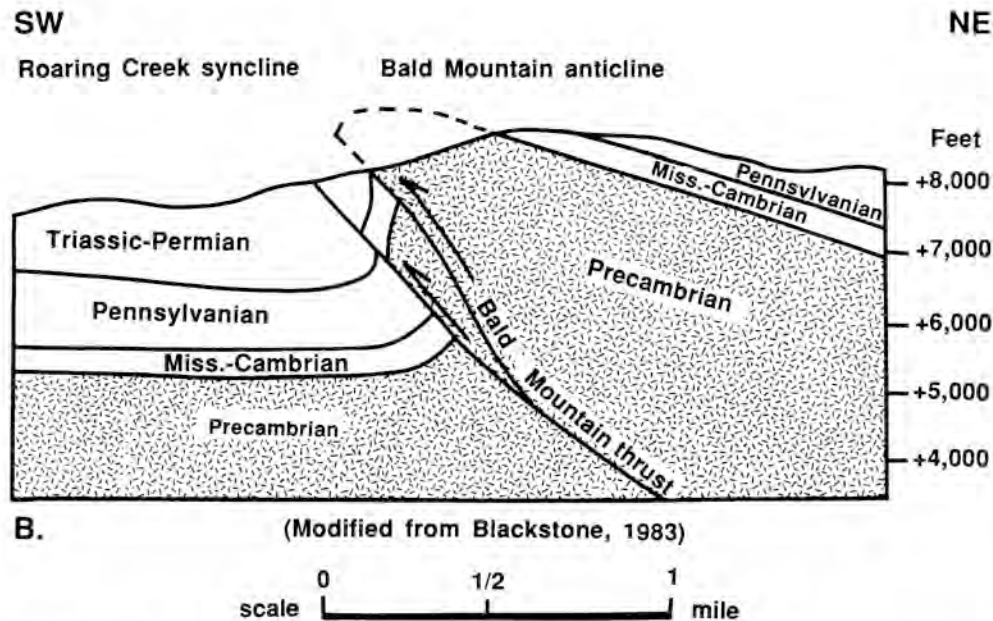
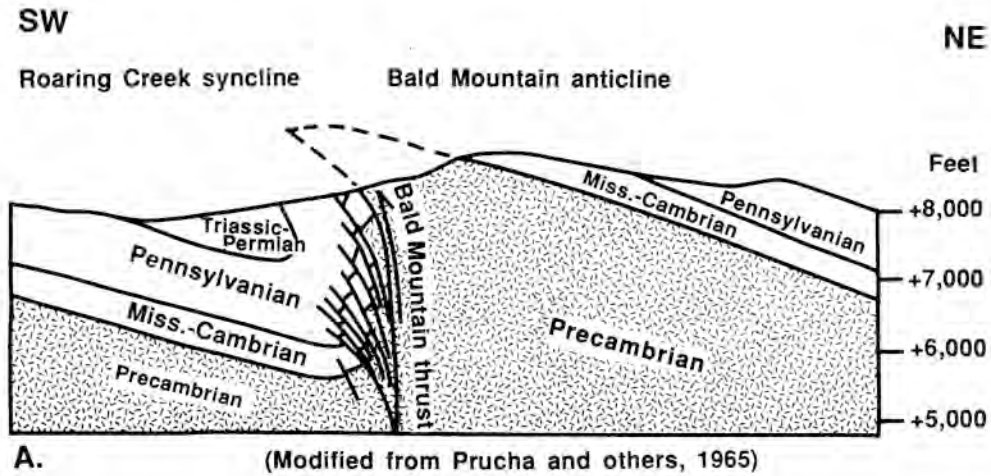
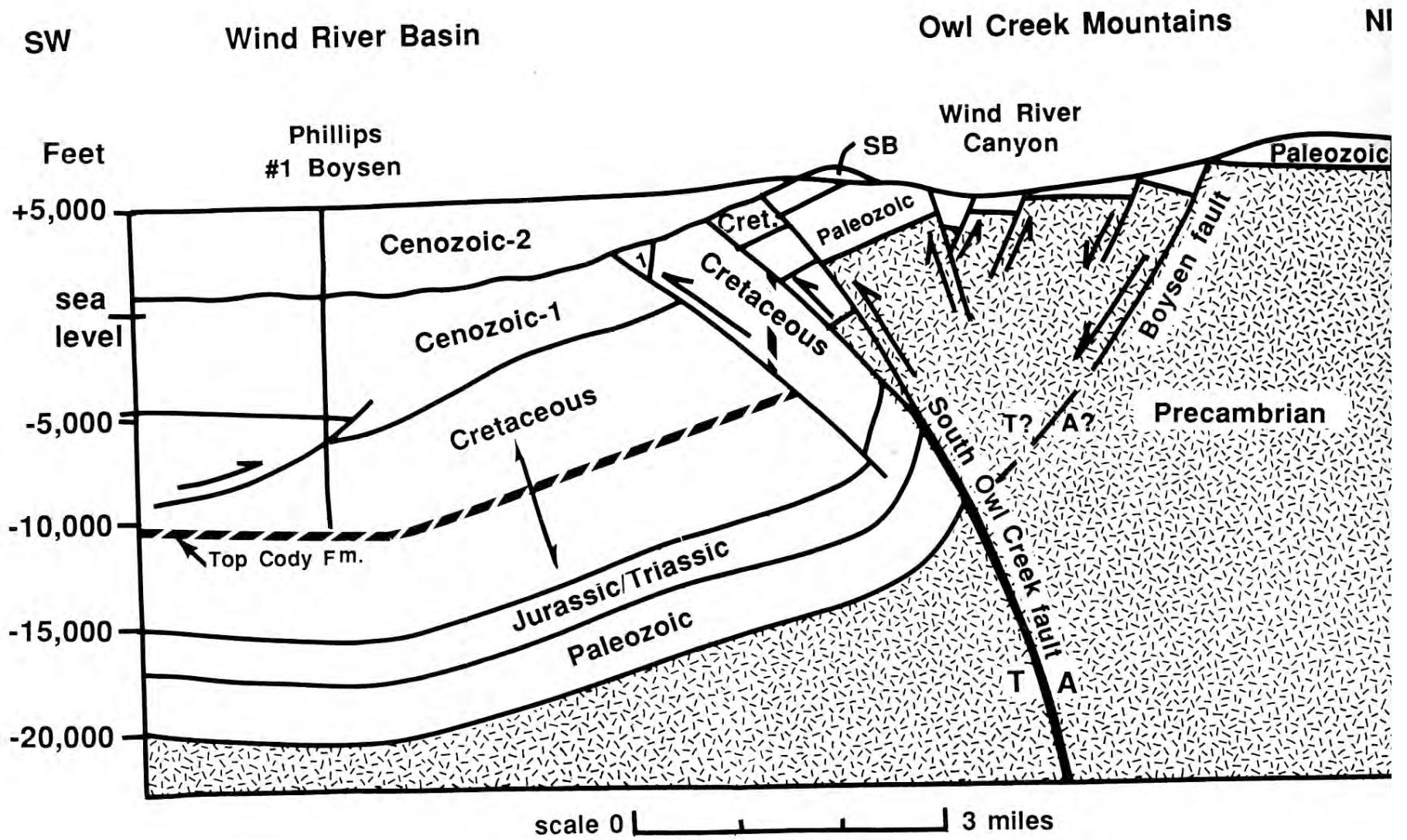


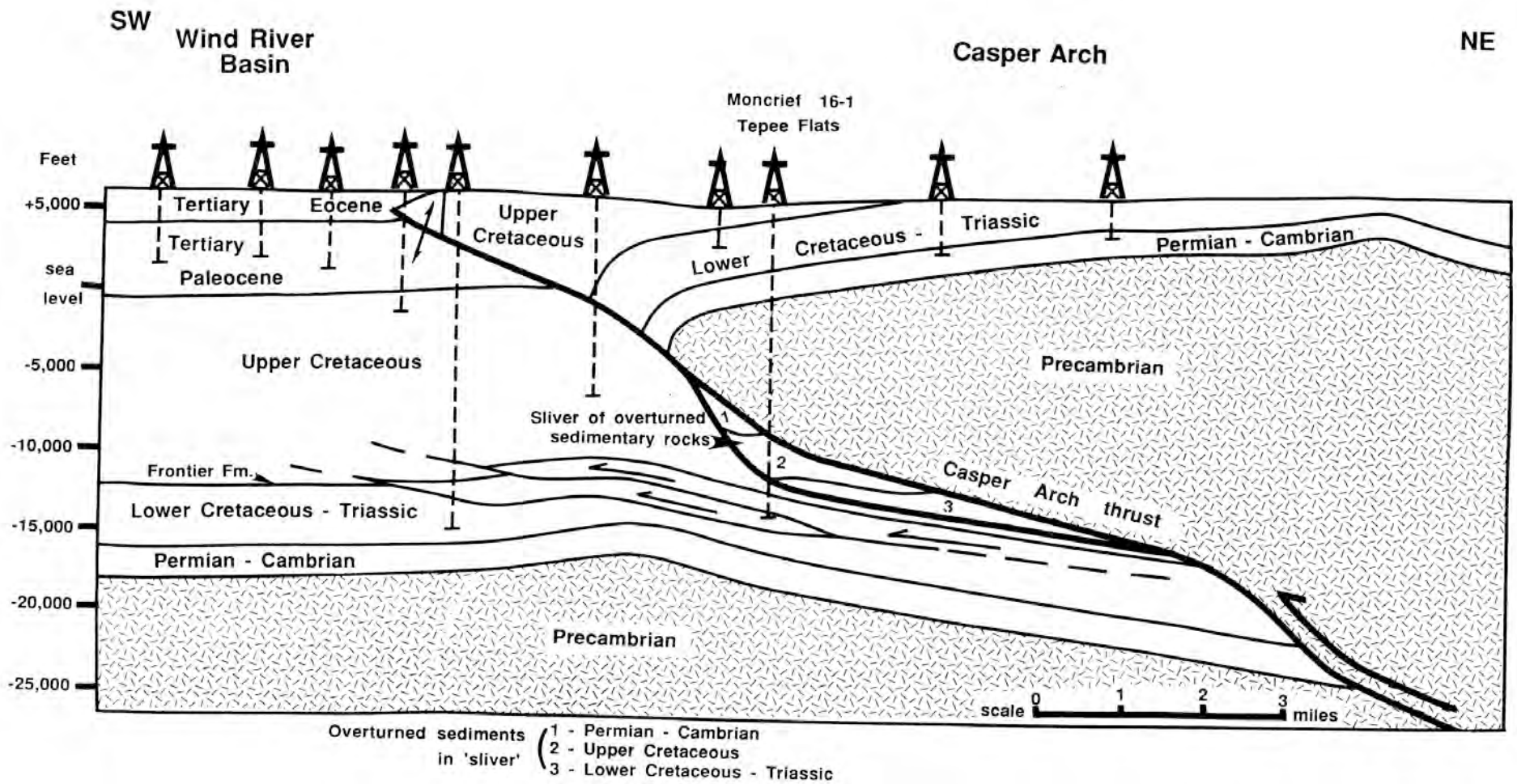
Figure 30. A. The nonshortening interpretation of Bald Mountain anticline (modified from Prucha and others, 1965) shows an upthrust system with multiple splay faults which are not present at the surface, even though the fault is exposed up-plunge. B. The crustal shortening interpretation (modified from Blackstone, 1983) displays a style encountered frequently across the foreland. A moderately dipping reverse dual fault system has vertical to overturned rocks between the two fault planes.

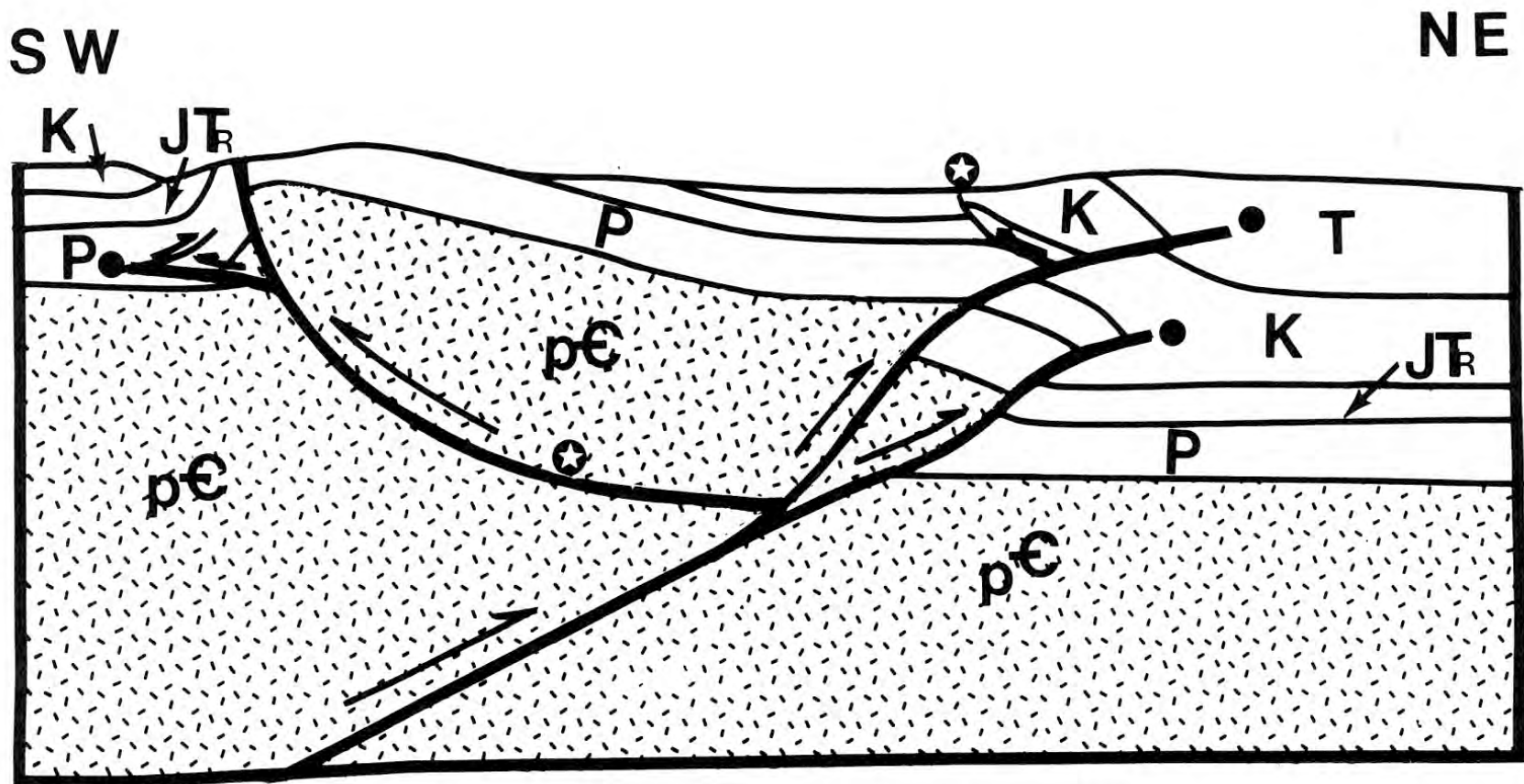


EXPLANATION




Cenozoic-2 - Eocene
 Cenozoic-1 - Paleocene
 SB - 'slide block' of Paleozoic

FAULT MOTION
 A - away from the viewer
 T - towards the viewer



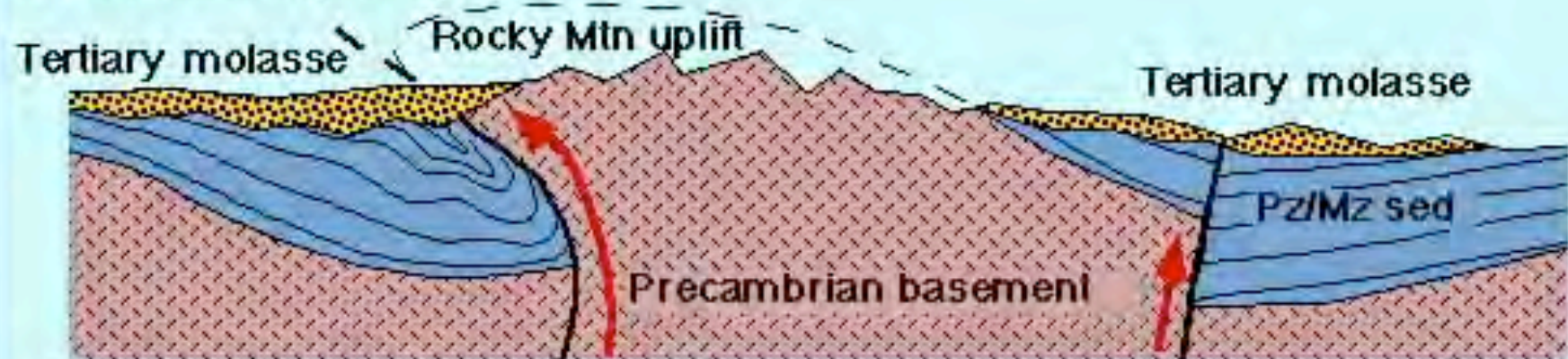


EXPLANATION

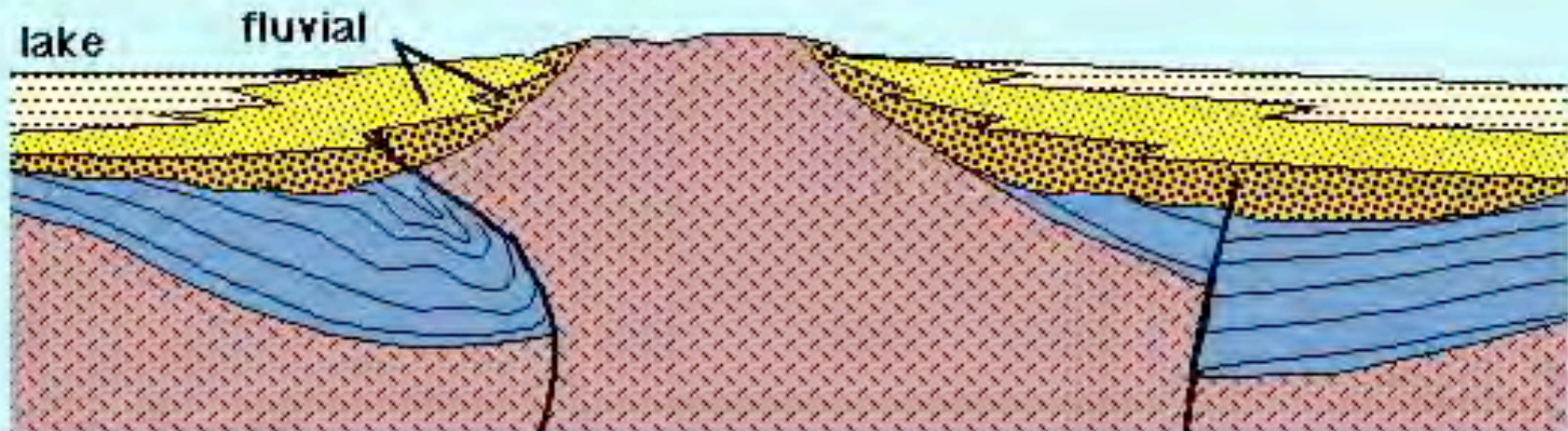
- | | |
|-------------------------------------|--|
| T - Tertiary rocks |  - Precambrian basement |
| K - Cretaceous rocks |  - backthrusts |
| JR - Jurassic-Triassic rocks |  - 'blind' thrusts |
| P - Paleozoic rocks | |

Brown 1993 after
Erslev 1990

Laramide Style Uplifts



1. Paleocene - Eocene

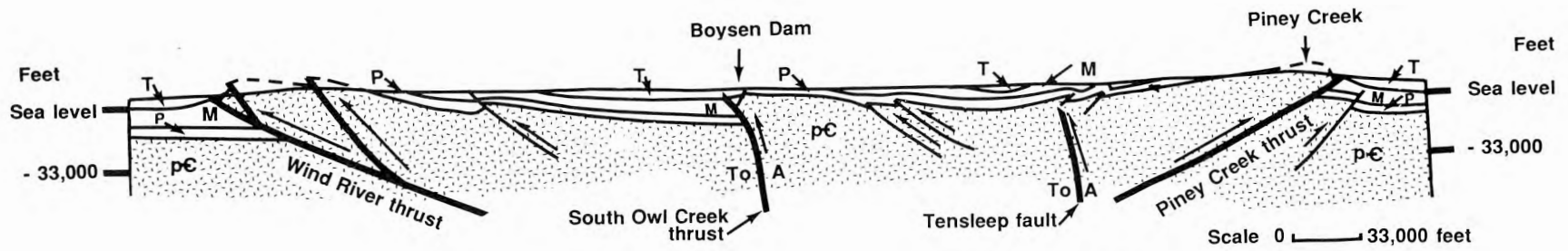


2. Late Eocene

<http://jan.ucc.nau.edu/%7ercb7/Laramide.jpg>

B B'
WYOMING FORELAND
 SW $\xrightarrow{-N40^{\circ}E}$ NE

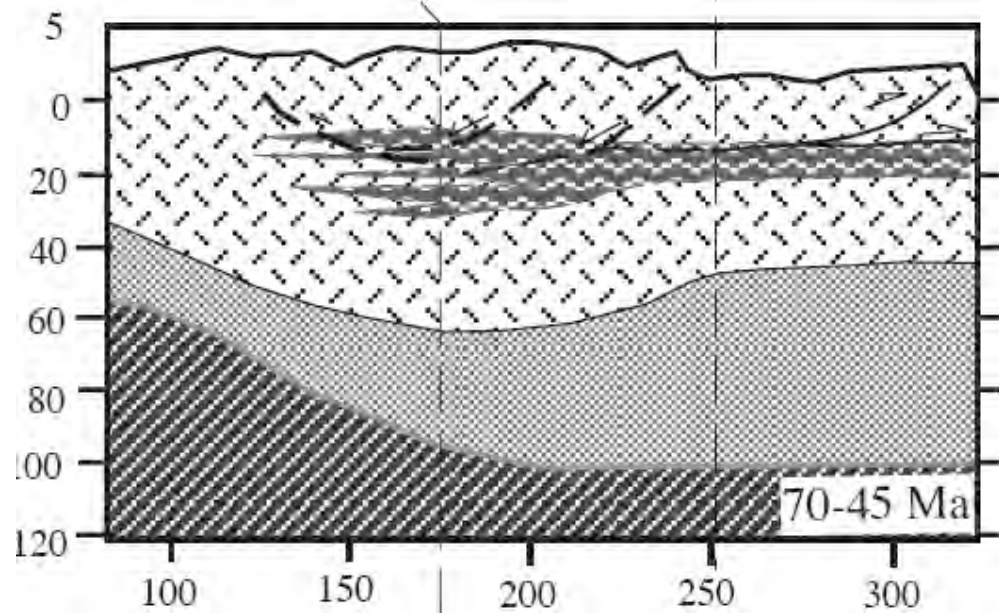
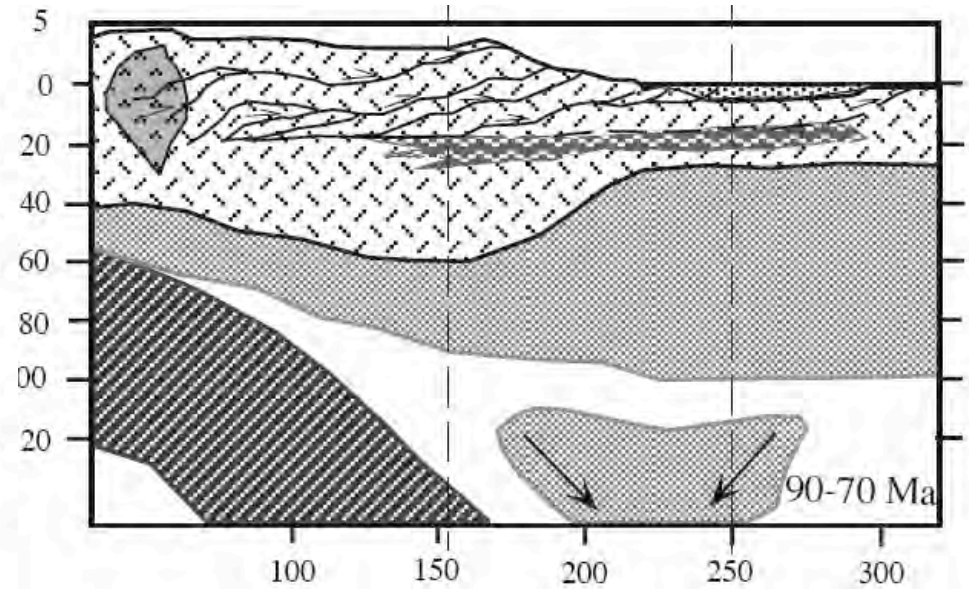
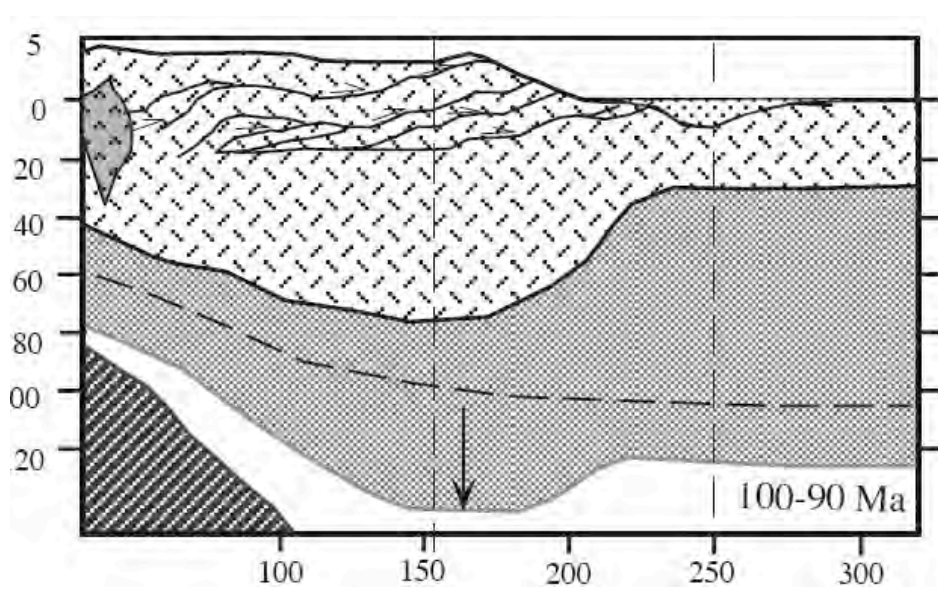
Green River Basin Wind River Range Wind River Basin Owl Creek uplift Bighorn Basin Bighorn Mountains Powder River Basin



TOTAL CRUSTAL SHORTENING
28 miles
 (13%)

A - motion is away from viewer
 To - motion is toward viewer

T - Tertiary
 M - Mesozoic
 P - Paleozoic
 pC - Precambrian



Laramide Orogeny

Mcquarrie and Chase 2000

But wait: there's more . . .

Another
idea
from
California . . .

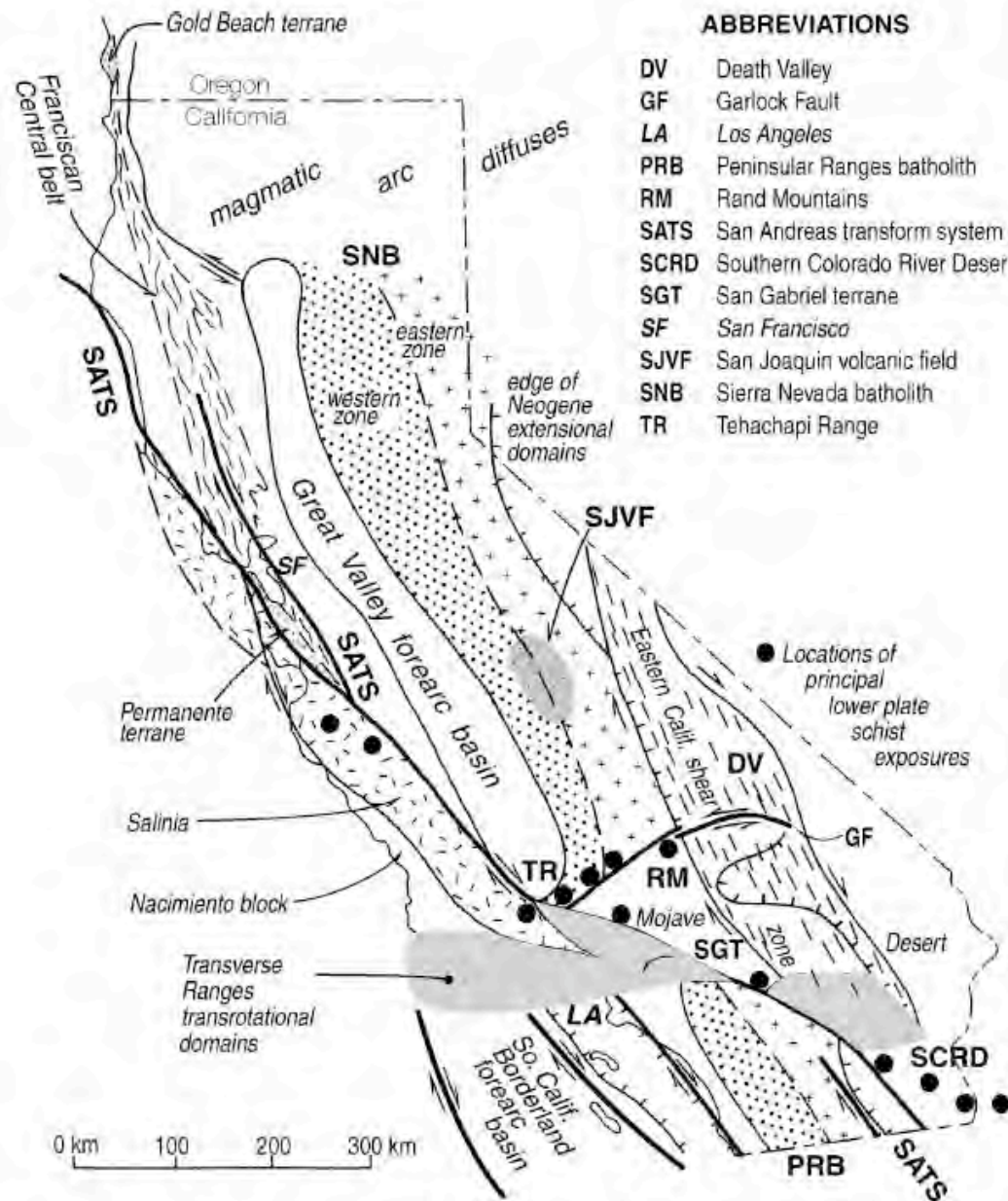
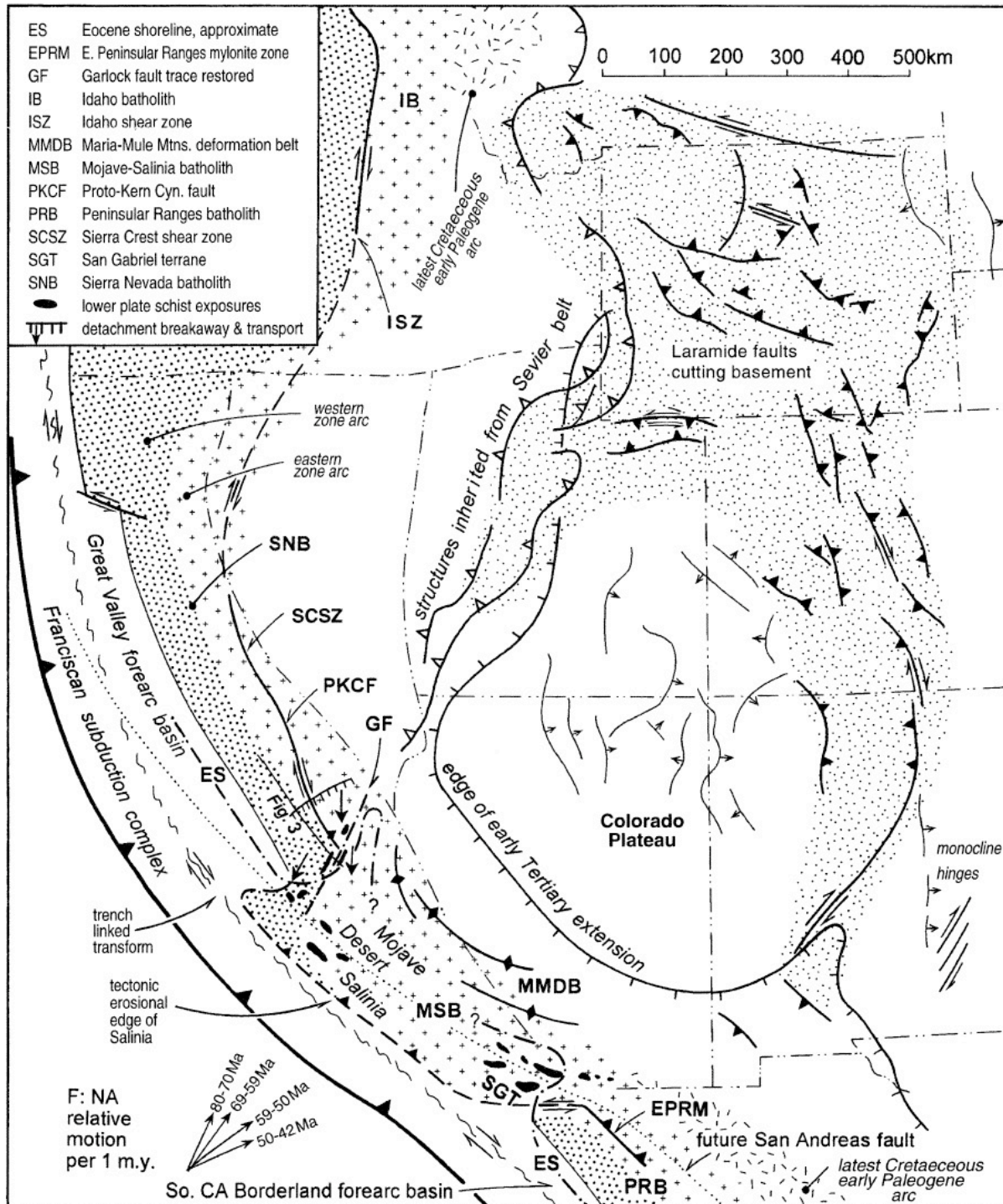
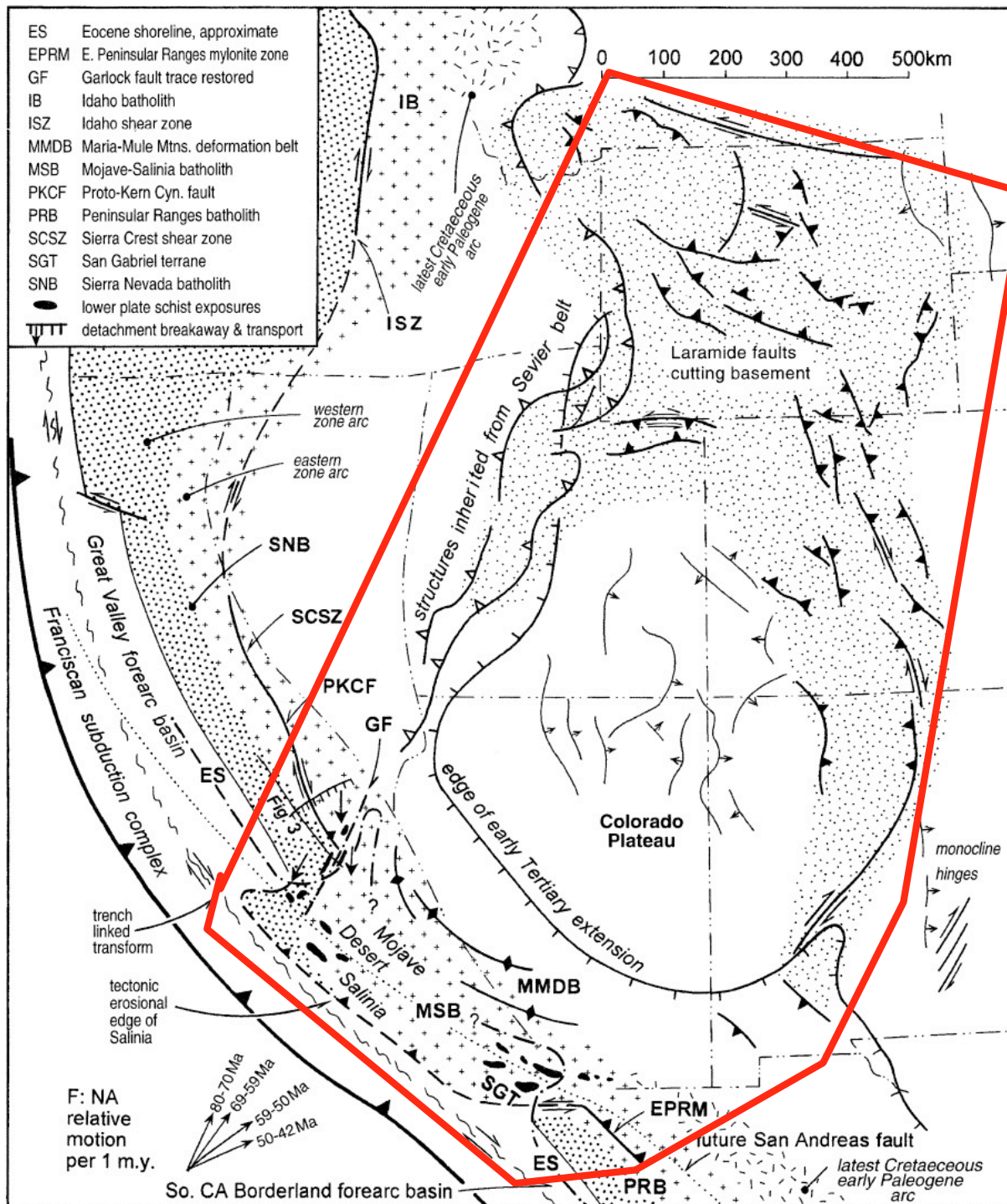
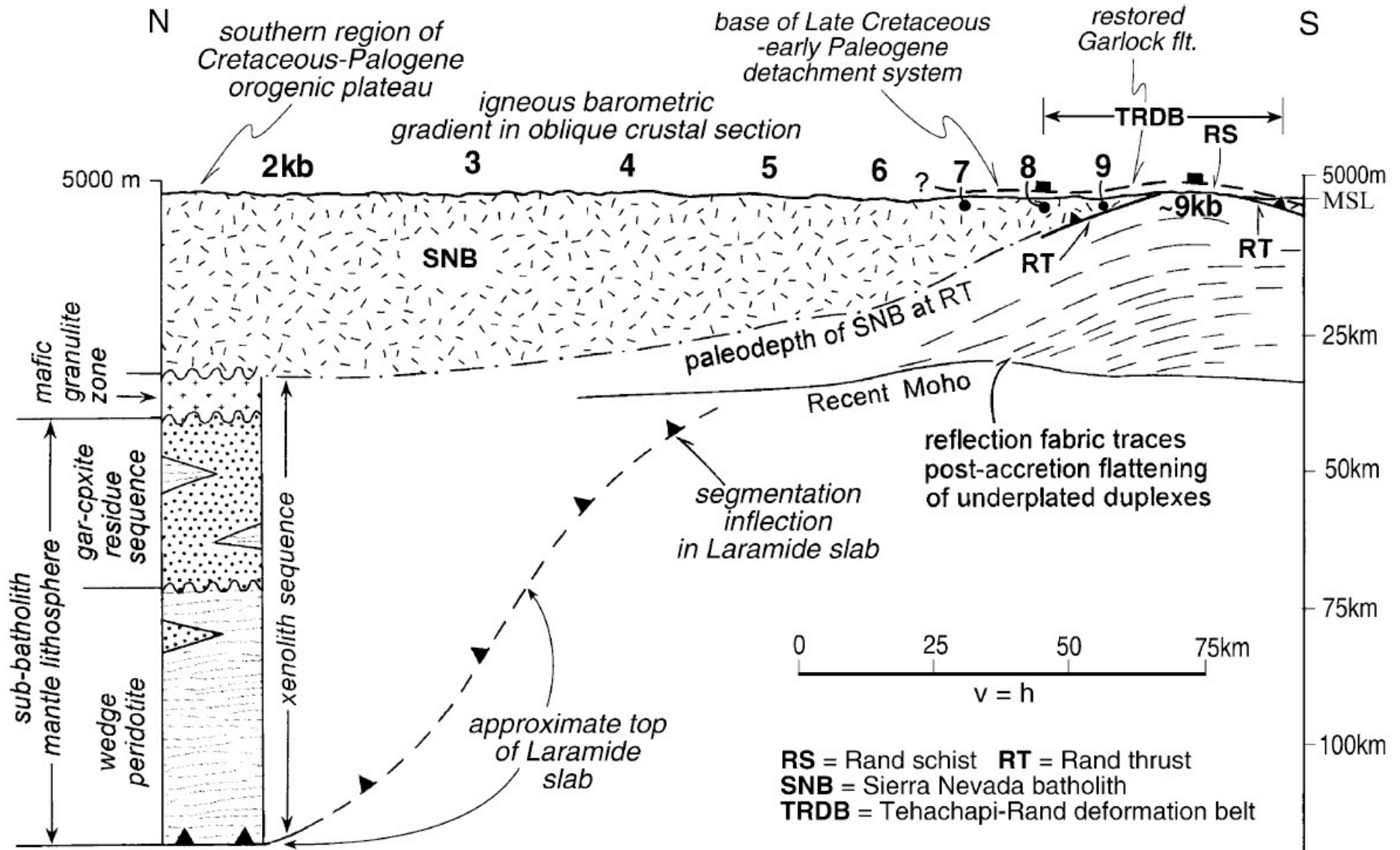


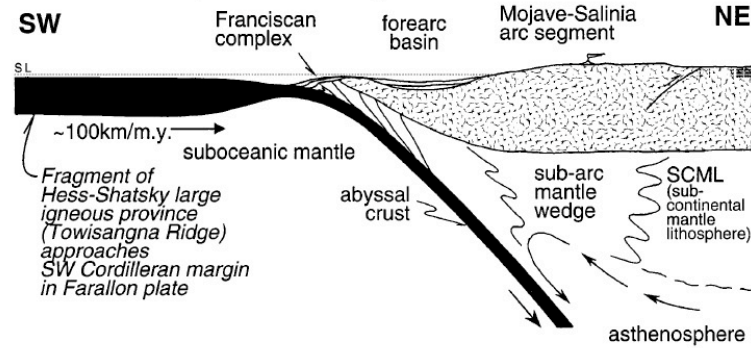
Figure 2. Map of California region showing in generalized form a number of key tectonic and geographic features that are referred to in text. The San Andreas transform system, Transverse Ranges transrotational deformation, Neogene extension, and the eastern California shear zone constitute main superposed deformations that were restored in the California region for the construction of the Figure 1 palinspastic base.



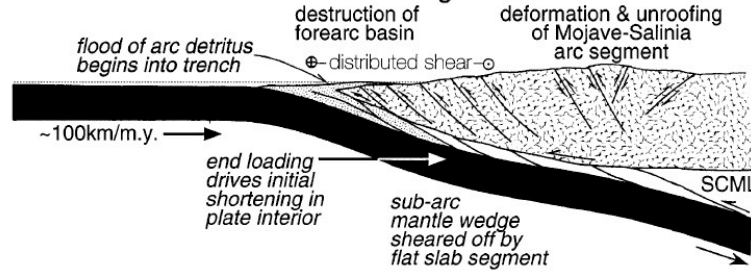




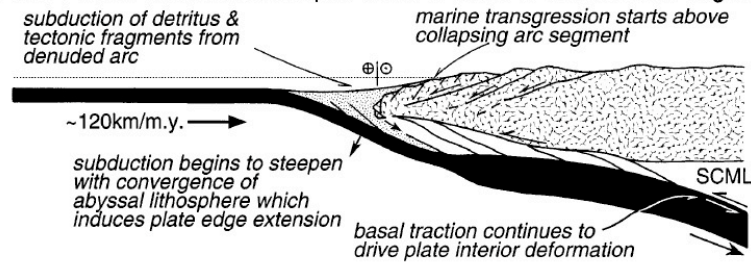
A. 90-85 Ma: Just prior to slab segmentation



B. ca.80 Ma: Laramide shallow slab segment subduction



C. ca.70 Ma: Extensional collapse starts in wake of shallow slab segment



D. ca.60 Ma: Plate edge orogen collapsed above steepened slab

