

FAULT ACTIVITY MAP OF CALIFORNIA AND ADJACENT AREAS

With Locations and Ages of Recent Volcanic Eruptions

1994

Most of the fault data shown on this map were compiled from 1989 to 1992. A preliminary version was released in 1992.
Additional data were added and revisions made in 1993 and 1994; this map supersedes the 1992 version.
This compilation was completed before the preliminary Earthquake Fault Zones Maps of 1994 were completed so there may be minor differences.

COMPILATION AND INTERPRETATION BY

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WITH ASSISTANCE FROM
GEORGE J. SAUCEDO

This map is a revision of the 1975 FAULT MAP OF CALIFORNIA. It has been extensively updated with new information in many areas and many new features have been added. The fault classification color code has been expanded to distinguish Holocene and late Quaternary faults as well as late Cenozoic faults of the Foothills fault system and the northern Sierra Nevada. Recently discovered features such as offshore paleosubduction zones and structural discontinuities are shown and zones of aligned seismicity in California have been added. Faults in the adjacent states of Nevada, Oregon and northern Baja California are also shown because of their potential impact on the seismicity of California.

The topographic base map is a reduction of the 1:500,000-scale map published by the U. S. Geological Survey, 1982, 1927 North American Datum. Lambert conformal conic projection is based on standard parallels 33° and 45°

BULLETIN 201, "An Explanatory Text to Accompany the Fault and Geologic Maps of California," published separately, contains detailed source index maps and references to all the published and unpublished reports and information used in compiling the 1975 FAULT MAP OF CALIFORNIA. Appendices accompanying this 1994 map contain the additional information that has been incorporated in this new map.

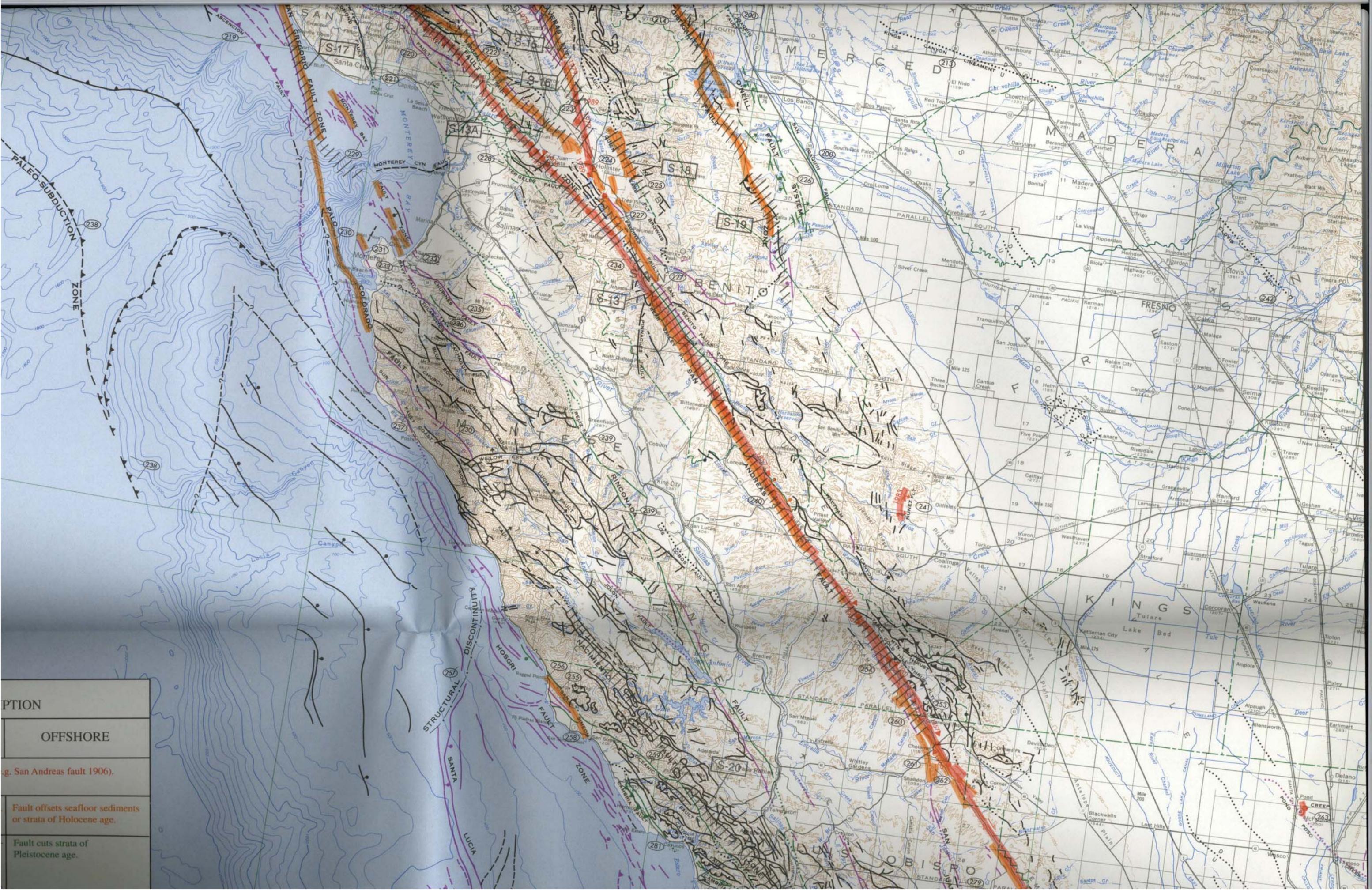
This compilation has benefited from the comments and new data provided by the geologists of the U.S. Geological Survey, the Division of Mines and Geology and by several professors and consulting geologists. To all these contributors, the author is most grateful.

Users of this map should be aware that active faults and earthquakes are the subject of continuing research and that refinements of the interpretations given here are sure to come within a few years. Therefore, this map should be considered a provisional inventory of faults in California. A digital version of this map is expected to be available from the Division of Mines and Geology in January, 1995.



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| <p>PTION</p> |
| <p>OFFSHORE</p> |
| <p>(e.g. San Andreas fault 1906).</p> |
| <p>Fault offsets seafloor sediments or strata of Holocene age.</p> |
| <p>Fault cuts strata of Pleistocene age.</p> |

| Geologic Time Scale | | Years Before Present (Approx.) | Fault Symbol | Recency of Movement | DESCRIPTION | |
|---------------------|------------------|--------------------------------|--------------|---|---|---|
| | | | | | ON LAND | OFFSHORE |
| Quaternary | Late Quaternary | Historic | | | Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep. | |
| | | Holocene | | | Displacement during Holocene time. | Fault offsets seafloor sediments or strata of Holocene age. |
| | Early Quaternary | Pleistocene | | | Faults showing evidence of displacement during late Quaternary time. | Fault cuts strata of Pleistocene age. |
| | | | | | Undivided Quaternary faults – most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. | Fault cuts strata of Quaternary age. |
| Pre-Quaternary | | | | Late Cenozoic faults within the Sierra Nevada, including parts of, but not restricted to, the Foothills fault system. These faults may have been active in Quaternary time. | Fault cuts strata of Pliocene or older age. | |
| | | 1,600,000 | | | | |
| | | 4.5 billion (Age of earth) | | | | |
| | | | | | Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive. | Fault cuts strata of Pliocene or older age. |
| | | | | | Pre-Quaternary faults not shown in Nevada and Oregon. | |

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

FAULT CLASSIFICATION COLOR CODE (Indicating Recency of Movement)



Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage – slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.

Pink band added to emphasize location of historic fault displacement.

SPECIAL NOTATIONS

A triangle to the right or left of the date indicates termination point of observed surface displacement.



Date bracketed by triangles indicates local fault break.

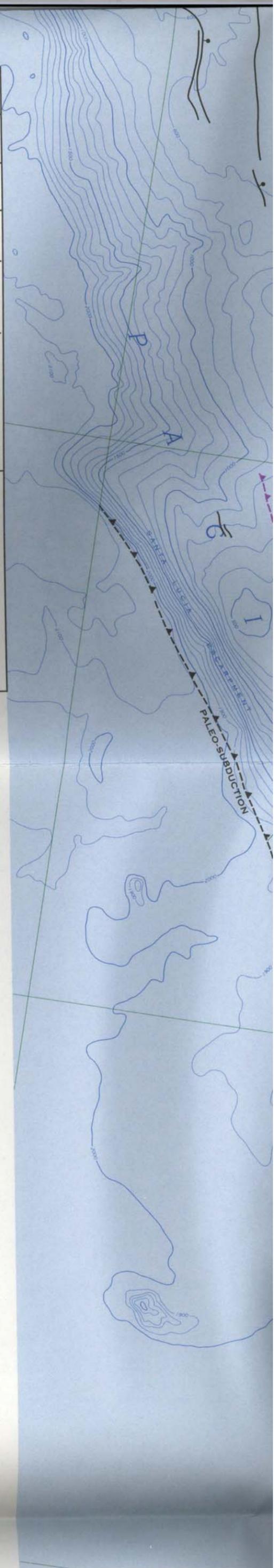
No triangle by date indicates an intermediate point along fault break. 1906

Dot on fault indicates location where fault creep slippage has been observed and recorded.



Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points). 1969

Holocene fault displacement (during past 10,000 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting. Pale orange band added to emphasize



| | | |
|----|-------------------------------|---|
| Pr | 4.5 billion (Age of earth) | Pre-Quaternary faults not shown in Nevada and Oregon. |
|----|-------------------------------|---|

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

FAULT CLASSIFICATION COLOR CODE (Indicating Recency of Movement)



Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage – slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.

Pink band  added to emphasize location of historic fault displacement.

SPECIAL NOTATIONS

A triangle to the right or left of the date indicates termination point of observed surface displacement.

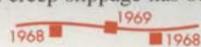


Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along fault break. 

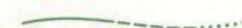
Dot on fault indicates location where fault creep slippage has been observed and recorded.



Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points). 



Holocene fault displacement (during past 10,000 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting. Pale orange band  added to emphasize location of Holocene fault displacement.



Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.



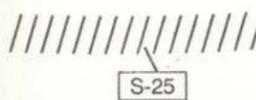
Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.



Late Cenozoic faults within the Sierra Nevada including, but not restricted to, the Foothills fault system. Faults show stratigraphic and/or geomorphic evidence for displacement of late Miocene and Pliocene deposits. By analogy, late Cenozoic faults in this system that have been investigated in detail may have been active in Quaternary time. (Data from PG&E, 1993).



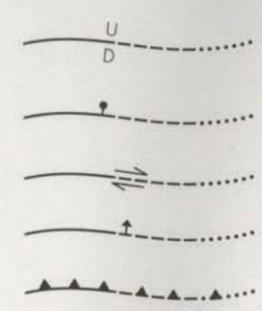
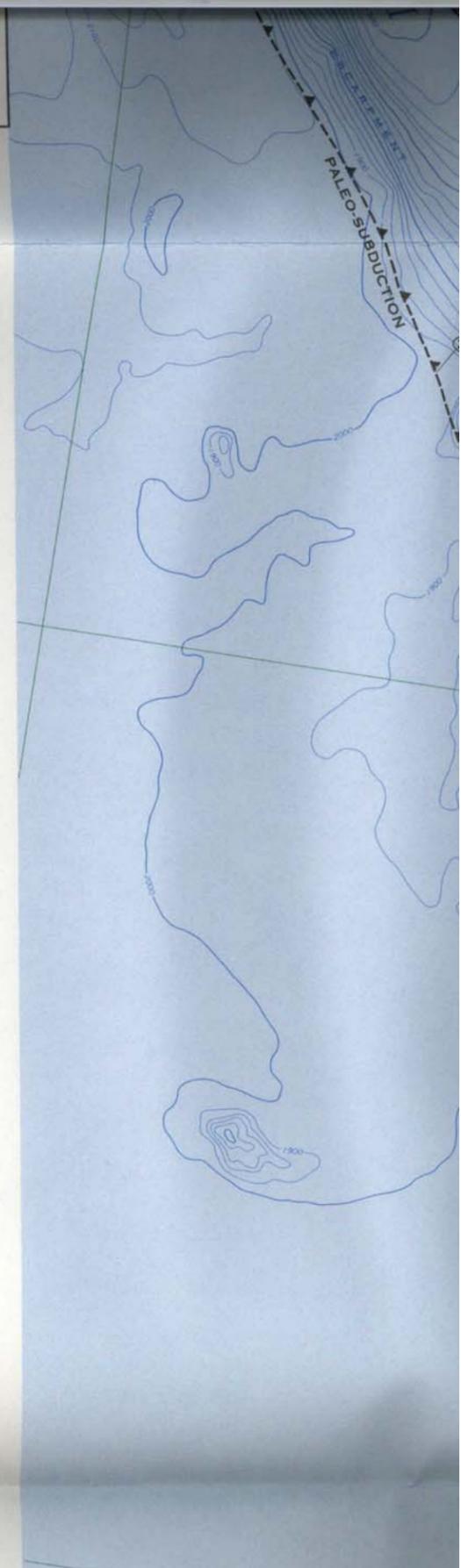
Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.



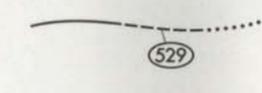
Fault segment associated with a significant linear trend of accurately located earthquake epicenters (magnitude 0.2 or greater). Generally aligned along strike slip faults having Quaternary displacement, but not necessarily with historic surface rupture. Lack of seismic activity along any fault is no indication that the fault may not be active in the future (e.g. San Andreas fault north of San Francisco). Epicenter data are derived from closely spaced seismic stations and include either continuing microseismicity or aftershocks associated with relatively large earthquakes.

Aligned seismicity on fault segments are referenced in Appendices C and E.

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U = Uplifted side (relative to D)
D = Downthrown side (relative to U)
Bar and ball on downthrown side
Arrows along fault indicate direction of movement
Arrow on fault indicates direction of movement
Low angle fault (barbs on steep side) may have been subsequent fault regardless of steepness



Numbers refer to annotation of fault name, age of fault movement, or location where a fault has been shown on the State Geologist's delimitation map.

* Cinder cone and other types of volcanoes. A few are historic.

21 8 Number in box or circle refers to California Geologic Map (Box refers to California, Circle refers to Nevada)

(1786 A.D.) = Date of historic eruption

(9,500 B.P.) = Eruption of volcanic ash

★ (0.5 m.y.) = Age of volcanic ash