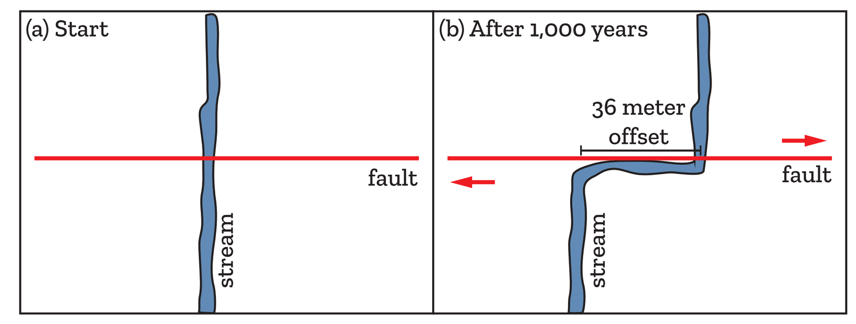
Faulting in California

A fault is a fracture in the earth's crust where the rock masses on either side have shifted relative to each other. Most faulting occurs at the boundaries of the earth's huge crustal plates, which are in slow but constant motion. Though plate motion is constant, faults get stuck, building up strain until they break and release the strain as an earthquake. This map shows the locations and activity of significant faults in California, categorized by the rate they move and can produce earthquakes. The maximum size of an earthquake is related to the length of the fault.

There are thousands of recognized faults in California, hundreds of which have been given formal names, but only a very small number of these pose significant hazards. The potential for a fault to produce earthquakes is directly related to its rate of movement. The rate of movement on faults is called the slip rate. Faults that have high slip rates are more likely to be the source of future earthquakes. Faults with lower slip rates have correspondingly longer times between earthquakes.

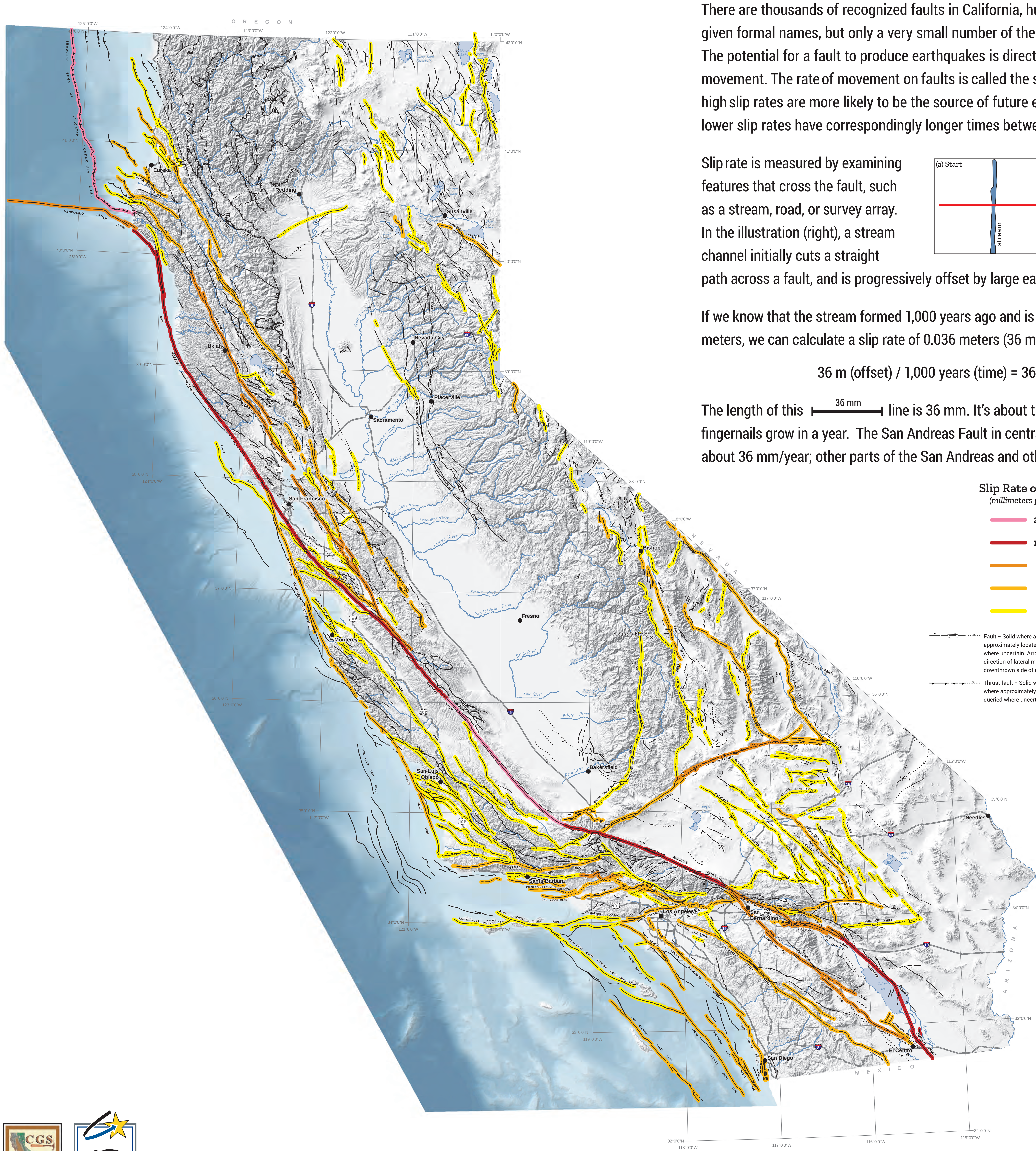


Slip rate is measured by examining features that cross the fault, such as a stream, road, or survey array. In the illustration (right), a stream channel initially cuts a straight path across a fault, and is progressively offset by large earthquakes or fault creep.

If we know that the stream formed 1,000 years ago and is offset by the fault by 36 meters, we can calculate a slip rate of 0.036 meters (36 millimeters) per year.

36 m (offset) / 1,000 years (time) = 36 mm/year.

The length of this ⊢—36 mm—⊣ line is 36 mm. It's about the amount that a person's fingernails grow in a year. The San Andreas Fault in central California has a slip rate of about 36 mm/year; other parts of the San Andreas and other faults move more slowly.



Slip Rate of Faults

(millimeters per year)

- 26–36
- 16–25
- 6–15
- 2– 5
- 0– 1

Fault – Solid where accurately located; dashed where approximately located; dotted where concealed; queried where uncertain. Arrows along fault indicate relative direction of lateral movement; ball and bar indicates downthrown side of normal fault.

Thrust fault – Solid where accurately located; dashed where approximately located; dotted where concealed; queried where uncertain. Teeth on upper plate.

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Base Map Sources: U.S. Geological Survey, California Department of Fish and Wildlife, California Department of Transportation