



UNDERSTANDING EARTHQUAKE HAZARDS THROUGHOUT THE UNITED STATES

# Quaternary Fault and Fold Database for the Nation

**What are the faults in my area and where are they? When did they last have a large earthquake? Now you can find the answers to these questions online at <http://Qfaults.cr.usgs.gov/> through a user-friendly interface developed by the U.S. Geological Survey (USGS). This is the first nationwide compilation to provide up-to-date and comprehensive geologically based information on known or suspected active faults.**

(past 1.6 m.y.) because this period of geologic time is most relevant for studies of active earthquake faults.

Earthquakes occur when faults move beneath the Earth's surface. When the earthquake is large enough, movement will continue up to the surface and produce scarps, folds, or other geologic evidence of ground deformation. Although not all future earthquakes will occur on known faults, virtually all occur on preexisting faults. Thus, the faults included in this database have the most potential for future large earthquakes and provide a fairly accurate picture of earthquake hazards in the United States.

## Quaternary Faults

The Quaternary Fault and Fold Database includes information such as geologic setting, fault orientation, fault type, sense of movement, slip rate, recurrence (repeat) interval, and the time of the most recent surface-faulting event. Much of the information in the database is based on paleoseismology, which is the geologic study of prehistoric earthquakes. Paleoseismology combines geologic tools such as trenching with archeological-style analysis to determine the times and sizes of ancient earthquakes in the Quaternary Period. These studies extend the historic record of earthquakes and are extremely useful in assessing the potential hazard posed by the thousands of Quaternary faults in the United States.

## Interfaces

Three distinct but highly powerful interfaces can access the Quaternary Fault and Fold Database; each is tailored to different groups of users. There are two map interfaces. The U.S. Map interface (see below) is based on States or regions. Clicking on a State brings up the State map (Nevada is shown here), with all the 1°x 2° sheets for the State. Each sheet covers an area about 120 miles wide (E.-W.) and 60 miles high (N.-S.). Clicking one of the sheets brings up a shaded relief map of the area showing all the Quaternary faults. Each of these faults is numbered and linked to text descriptions in a table that is below the map. The static map images are small (typically 30 kb), so they load quickly using a standard dial-up modem.

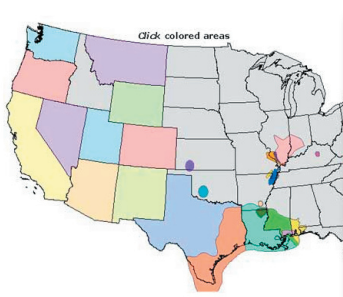
The second map interface is a dynamic one, which utilizes ArcInfo's Interactive Map Service (IMS). This map is linked to digital fault-and-fold files in a GIS (geographic information system). The interface loads a base map of the United States and a series of user-controlled layers, such as streams, roads, and towns, as well as the Quaternary faults and folds. Special tools allow users to zoom, pan, query, and link to the database (see next page). This powerful interface requires high-speed Internet access.

Users can also query the database. Queries can be simple, such as fault name, or as complicated as user-defined combinations of location, fault activity, and geologic characteristics.

## The Database

The USGS has released a new Quaternary Fault and Fold Database that summarizes geologic, geomorphic, and geographic information for about 2,000 Quaternary faults in the United States. This online database at <http://Qfaults.cr.usgs.gov/> contains information on faults and associated folds that are believed to be sources of earthquakes greater than magnitude 6 (M>6). The database is limited to structures with documented activity during the Quaternary

**Faults and Folds by State and Region**



Click colored areas

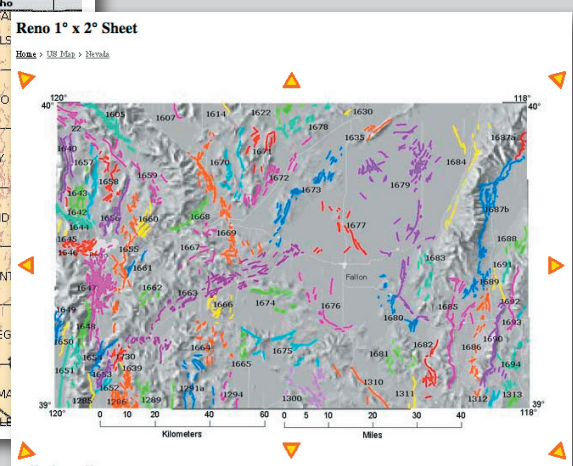
**Nevada**

|             |             |               |            |
|-------------|-------------|---------------|------------|
| ADRI        | Oregon      | JORDAN VALLEY | Idaho      |
| ALTURAS     | VYA         | MCDERMITT     | TWIN FALLS |
|             |             |               | WELLS      |
|             | LOVELOCK    | WINNEMUCCA    | ELKO       |
| CHICO       | RENO        | MILLETT       | ELY        |
|             | WALKER LAKE | TONOPAH       | LUND       |
| SAN JOSE    | MARIPOSA    | GOLDFIELD     | CALIENT    |
| MONTEREY    | FRESNO      | DEATH VALLEY  | LAS VEG    |
| BAKERSFIELD | TRONA       |               | PRINSM     |
|             |             |               | NEEDLE     |

**U.S. Map Interface**

This series of windows shows the graphical map interface for the U.S. faults. Each page is relatively small (30 kb) and loads quickly in a Web browser. Faults are organized in 1°x 2° map sheets by State or region.

**Reno 1° x 2° Sheet**



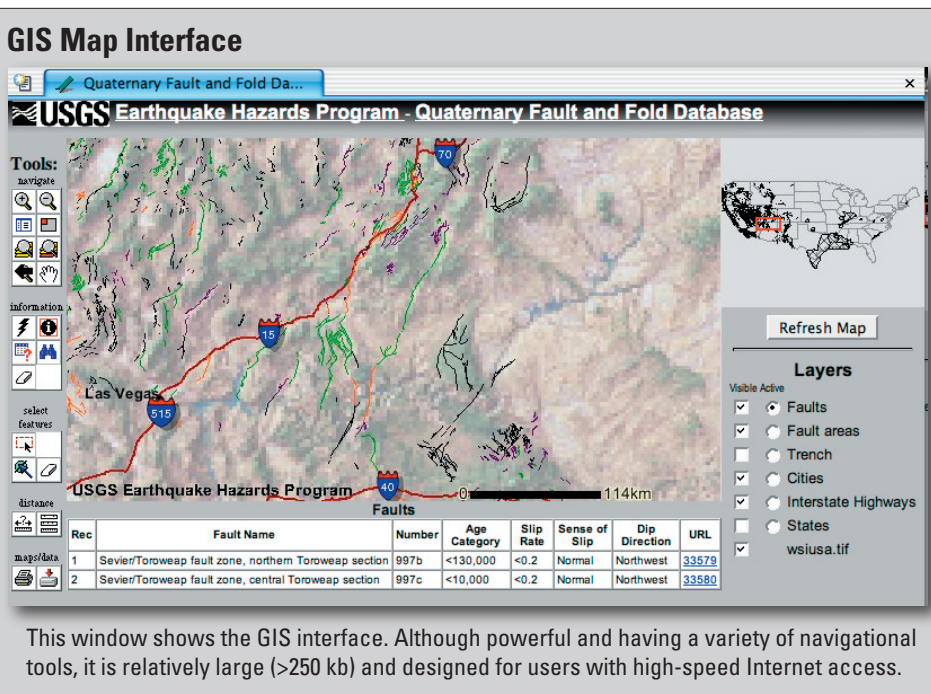
Number Name

## Purpose and Uses

The database is designed to fulfill the needs of a broad group of users, ranging from the science community to the general public. Scientific and technical professionals engaged in seismological and paleoseismological research will find this Web site a powerful tool. The Web site facilitates making comparisons of spatial and temporal patterns of faulting at local, regional, and national scales and provides critical input for modeling plate motion and regional strain distribution. In addition, paleoseismologists and earthquake geologists will be able to identify where trenching studies have been conducted and review summaries of the results of those studies. Other geological specialists, such as hydrologists, can use it to address issues of ground-water availability and hydrothermal potential.

The seismic-hazard-assessment community will benefit from public access to all data available on potential earthquake sources in one location. The database will allow these users to identify faults that have likely produced strong ground motion in the geologically recent past and that may contribute to future seismic hazards. The database will continue to be the primary source for USGS seismic-hazards information on faults and fault-related folds in the United States, providing geologic information on the probable sources of past, current, and future earthquakes.

Other potential users include the earthquake-engineering community, the insurance industry, and companies managing large infrastructures, such as pipelines or power-transmission networks. In addition, local and State planners can use the database to locate potential earthquake sources on maps. Similarly, emergency-response officials can



**GIS Map Interface**

Quaternary Fault and Fold Database

**USGS Earthquake Hazards Program - Quaternary Fault and Fold Database**

Tools: navigate, information, select features, distances, maps/data

| Rec | Fault Name  | Number | Age Category | Slip Rate | Sense of Slip | Dip Direction | URL                   |
|-----|---|--------|--------------|-----------|---------------|---------------|-----------------------|
| 1   | Sevier/Toroweap fault zone, northern Toroweap section | 997b   | <130,000     | <0.2      | Normal        | Northwest     | <a href="#">33579</a> |
| 2   | Sevier/Toroweap fault zone, central Toroweap section  | 997c   | <10,000      | <0.2      | Normal        | Northwest     | <a href="#">33580</a> |

Layers: Visible Active, Faults, Fault areas, Trench, Cities, Interstate Highways, States, wsiusa.tif

This window shows the GIS interface. Although powerful and having a variety of navigational tools, it is relatively large (>250 kb) and designed for users with high-speed Internet access.

use the database to plan earthquake drills and to identify and fortify critical infrastructure near active faults.

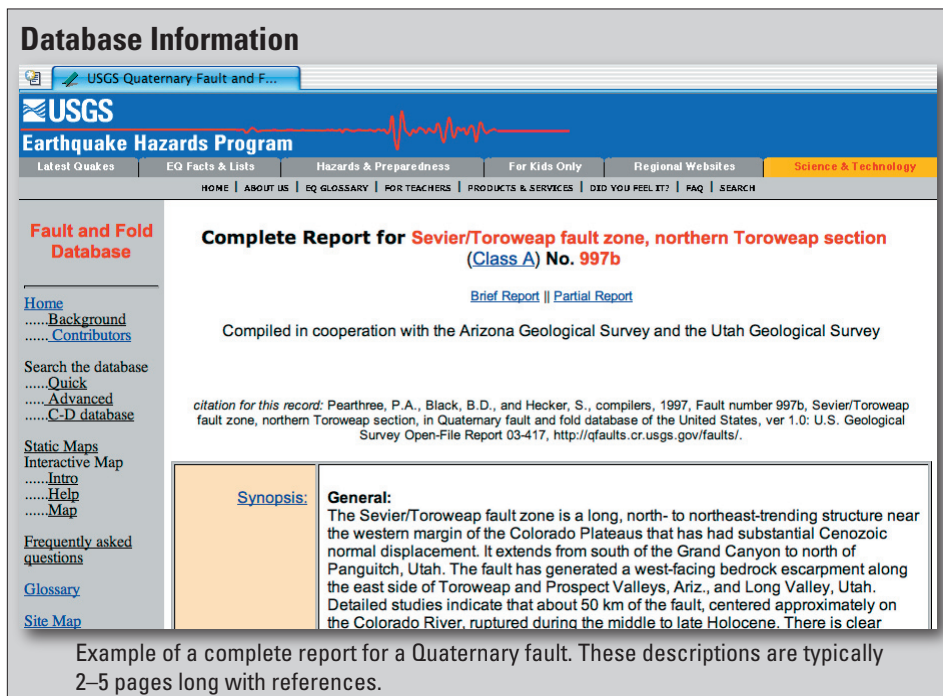
Finally, the general public is becoming increasingly aware of potential hazards in their environment. The USGS as well as State geological surveys frequently are called upon to respond to questions regarding the location of hazardous faults that may impact the lives of the population at large. Now individuals can find the answers to their questions directly in a user-friendly online interface.

## Acknowledgments

Ten years in the making, this massive collection of data, which is estimated to contain about 10,000 pages of content on

about 2,000 faults and folds (see below), was accomplished with the cooperation and assistance of State geological surveys as well as individuals in the academic and private sectors (see Web site for a complete list). Future additions to the database will include information for Alaska and Hawaii, as well as updates to information in the lower 48 States.

The work of the USGS and its cooperators in developing this database is only one part of the ongoing USGS efforts to protect lives and property from future earthquakes throughout the United States.



**Database Information**

USGS Earthquake Hazards Program

Complete Report for **Sevier/Toroweap fault zone, northern Toroweap section (Class A) No. 997b**

Brief Report || Partial Report

Compiled in cooperation with the Arizona Geological Survey and the Utah Geological Survey

citation for this record: Pearthree, P.A., Black, B.D., and Hecker, S., compilers, 1997, Fault number 997b, Sevier/Toroweap fault zone, northern Toroweap section, in Quaternary fault and fold database of the United States, ver 1.0: U.S. Geological Survey Open-File Report 03-417, <http://qfaults.cr.usgs.gov/faults/>.

**Synopsis:**

**General:**  
The Sevier/Toroweap fault zone is a long, north- to northeast-trending structure near the western margin of the Colorado Plateaus that has had substantial Cenozoic normal displacement. It extends from south of the Grand Canyon to north of Panguitch, Utah. The fault has generated a west-facing bedrock escarpment along the east side of Toroweap and Prospect Valleys, Ariz., and Long Valley, Utah. Detailed studies indicate that about 50 km of the fault, centered approximately on the Colorado River, ruptured during the middle to late Holocene. There is clear

Example of a complete report for a Quaternary fault. These descriptions are typically 2–5 pages long with references.

### For More Information Contact:

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Quaternary Fault & Fold Database is at:  
<http://qfaults.cr.usgs.gov/>

Earthquake Hazards Program  
<http://earthquake.usgs.gov/>

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