

Understanding Earthquake Hazards Across the United States



Monitoring Earthquakes Across the United States

Those who plan for and respond to earthquake disasters, and those who study earthquakes, require timely notification of earthquake occurrences and information to mitigate losses. Earthquake events throughout the United States are currently monitored by sophisticated systems that provide the notification and information needed by decision makers before and during times of crisis. The national and regional earthquake monitoring systems for the United States have evolved into one of the world's finest emergency-management and research tools.

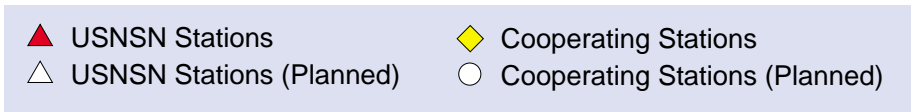
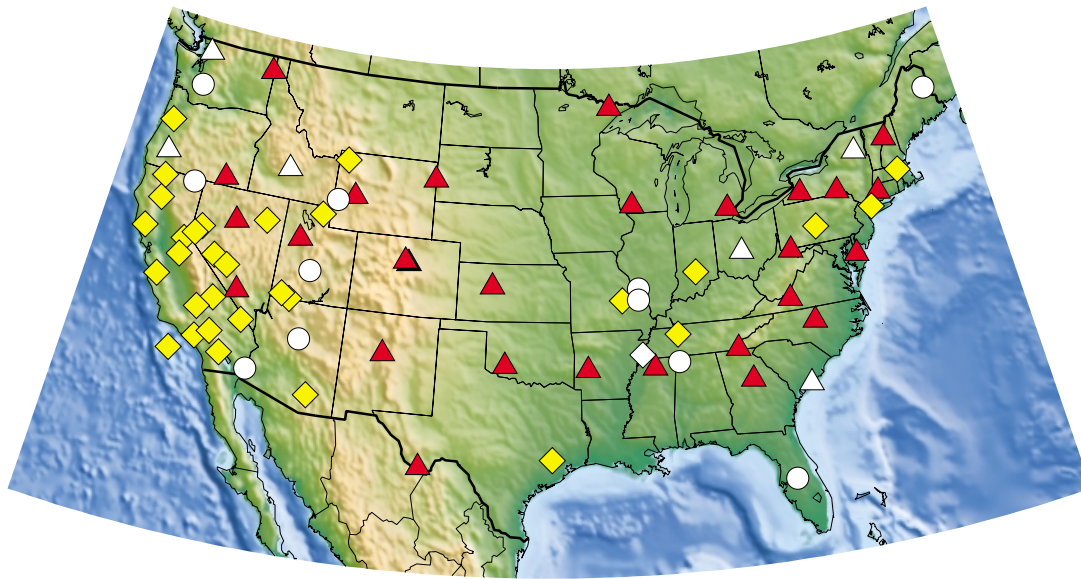


Earthquake data from the U.S. National Seismograph Network and other stations feed into USGS computers, located in Golden, Colo., via satellite transmissions and through the Internet.

More than 2,500 seismograph stations monitor earthquakes throughout the conterminous United States, Alaska, and Hawaii. The stations are grouped into regional networks operated by local institutions. The U.S. Geological Survey (USGS) supports many of these regional networks and operates its own nationwide network. The regional seismograph networks (RSN's) provide information about earthquakes to the USGS National Earthquake Information Center (NEIC) in Colorado, which serves as a national point of contact for distributing earthquake

information. The United States National Seismograph Network (USNSN), operated by the USGS, provides uniform coverage of the whole Nation and integrates data from the regional networks. The NEIC rapidly reports earthquakes to Federal, State, and local emergency managers, public utilities, the media, and the public. The RSN's fulfill a similar role within their regions. The cooperation and coordination of the RSN's and the USNSN is organized through the Council of the National Seismic System (CNSS), of which the USGS is the steward.

USNSN Stations



Each USNSN station consists of a system of sophisticated seismometers, data-acquisition system, and satellite telecommunications equipment. USNSN stations provide high-quality, real-time information on earthquake occurrences directly to the USGS National Earthquake Information Center (NEIC) in Colorado and to cooperators throughout the network.

The USNSN determines the location and magnitude of significant earthquakes anywhere in the United States within minutes, while the RSN's provide this information for earthquakes in their regions within seconds. Together, the RSN's and the USNSN provide (1) comprehensive, reliable, and cost-effective earthquake monitoring of the Nation, (2) highly accurate recordings of even the largest earthquakes, and (3) high-resolution mapping of faults in seismically active areas. In the aftermath of a major earthquake, the USGS/NEIC and the RSN's rapidly provide earthquake information, including detailed interpretations to assist disaster-response activities. The USGS/NEIC uses the USNSN to assist other Federal agencies in tsunami warnings, overseeing nuclear powerplant safety during earthquakes, and discriminating nuclear blasts from earthquakes under nuclear- test-ban agreements.

SEISMIC MONITORING

- Real-time hazards information for emergency management and the general public
- General information for public officials, utilities, the engineering community, and the media
- Earthquake catalog for earthquake hazards assessments
- Seismic waveform archive for applied and basic research

National Component (USNSN)

- National real-time advisories within minutes
- Uniform earthquake monitoring of the Nation
- Precise recordings of medium to large earthquakes

Regional Component (RSN's)

- Regional real-time advisories within seconds
- Detailed monitoring of earthquake-prone areas
- Precision mapping of faults
- Local expertise on earthquake hazards to increase public awareness and safety

For the Nation, seismic monitoring offers a wide variety of benefits focused on minimizing loss of life and property that result from earthquakes, and understanding earthquake phenomena for earthquake-hazards planning.

Distributing Uniform Earthquake Information Nationwide

The USGS and the RSN's are currently developing agreements on common methods, format, and procedures for reporting earthquake information. This ongoing program effectively integrates the USNSN and the RSN's into a single National Seismic System. Part of this effort includes acquiring and developing new software to connect all seismograph networks across the Nation. Earthquake data from any network then will be immediately available to all networks nationwide. For example, a requester in New York will be able to obtain immediate information on an earthquake in Oregon from a local RSN in New York, rather than trying to communicate with a more distant RSN.



Advanced seismic sensors (inset) are installed at USNSN sites to measure Earth movements.

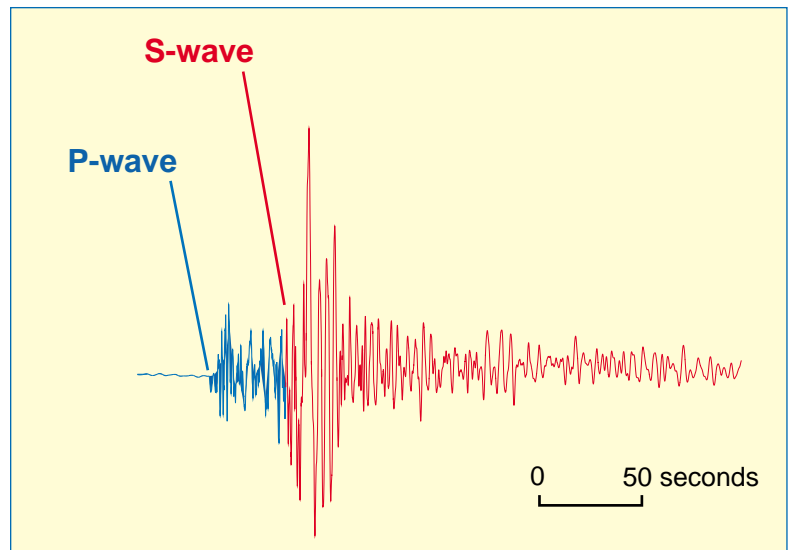
Activities of the seismograph networks nationwide are coordinated by the Council of the National Seismic System (CNSS), which fosters development and cooperation for improved regional and national earthquake reporting. Details about the CNSS and its member seismograph networks may be viewed on the World Wide Web (WWW) at the following Uniform Resource Locator (URL):

<http://www.cnss.org/>

Current earthquake activity is posted directly to the WWW as earthquakes occur. Locations of important earthquakes nationwide are reviewed by analysts and listed on the WWW within about an hour. In other areas, notably central California, earthquake locations automatically appear on the WWW in about a minute. Examples, which include a variety of earthquake parameters, and maps of epicenters, can be viewed on the WWW at the following URL's:

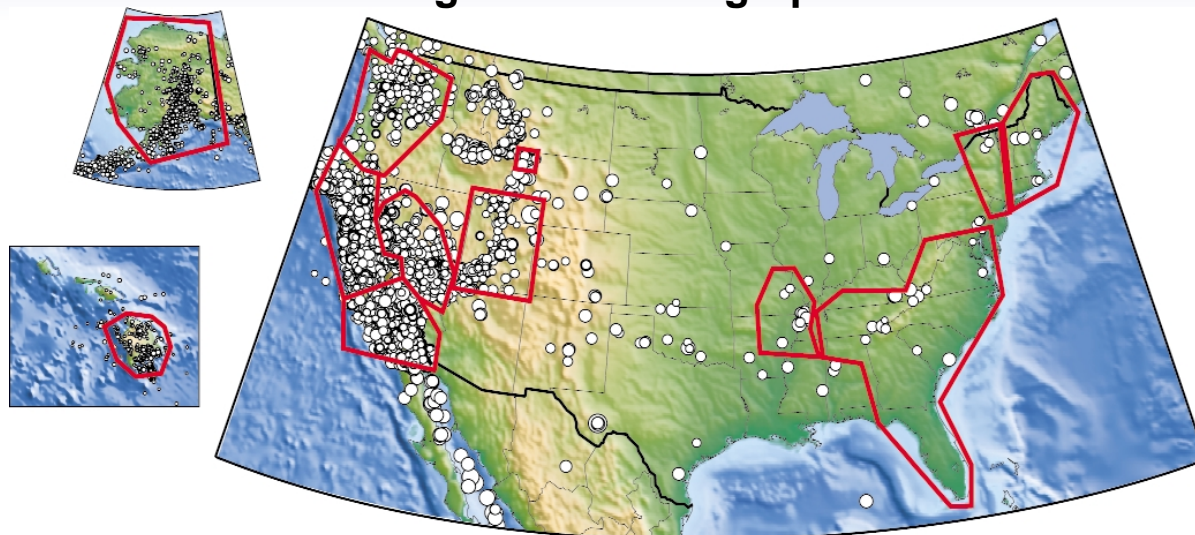
<http://quake.wr.usgs.gov/recenteqs>

<http://wwwneic.cr.usgs.gov/>



This seismogram of a magnitude 5.0 aftershock of the 1994 Northridge, California, earthquake was recorded at a USNSN station in Tonopah, Nevada. The P-wave (traveling rapidly through the Earth) was recorded first; the S-wave (traveling more slowly through the Earth) was recorded about 40 seconds later and produced significantly stronger ground vibrations. Seismograms from many stations that record the same event allow scientists to determine such factors as the time, location, type of faulting, and energy release of an earthquake.

Regional Seismograph Networks



The USGS supports the regional seismograph networks (RSN's) that monitor the areas of the United States outlined in red. Other RSN's are self-supporting. The Council of the National Seismic System (CNSS) coordinates activities of the RSN's and the United States National Seismograph Network (USNSN). White circles indicate magnitude 2.0 and greater earthquakes recorded between July 1995 and August 1996.

Cooperating Organizations

The USGS and its cooperators have been steadily developing this vast, interconnected monitoring and communications system for many years. Continually using technological advances to improve the system and interpret the information it produces, USGS earth scientists are serving primary needs for the Nation's approach and response to earthquake hazards.

Boston College, Weston, Mass.
California Institute of Technology, Pasadena
Delaware Geological Survey
Incorporated Research Institutions for Seismology
Lamont-Doherty Earth Observatory of Columbia University
Lawrence Livermore National Laboratory
Pacific Tsunami Warning Center, Ewa Beach, Hawaii
Saint Louis University, Saint Louis, Mo.
University of Alaska, Fairbanks
University of California, San Diego
University of California, Berkeley
University of Memphis
University of Nevada, Reno
University of North Carolina at Chapel Hill
University of South Carolina

University of Utah Seismograph Stations, Salt Lake City
University of Washington, Seattle
U.S. Advanced Research Projects Agency
U.S. National Park Service, Yellowstone National Park
U.S. Nuclear Regulatory Commission
U.S. Air Force Technical Applications Center, Patrick Air Force Base, Florida
U.S. Bureau of Reclamation
U.S. Department of Energy, Sandia National Laboratories
Virginia Polytechnic Institute and State University Seismological Observatory, Blacksburg
West Coast/Alaska Tsunami Warning Center, Palmer, Alaska
Wyoming Geological Survey, Laramie

By

Raymond P. Buland, Harley M. Benz, and William M. Brown III

Graphic design by

Eleanor M. Omdahl and Margo L. Johnson

For more information contact:

U.S. Geological Survey
National Earthquake Information Center
(303) 273-8500
Mailing address:
Federal Center, Box 25046, MS 967
Denver, CO 80225-0046 USA
<http://wwwneic.cr.usgs.gov/>