USGS
science for a changing world

EARTHQUAKE HAZARDS PROGRAM

ANSS-Advanced National Seismic System

Seismic monitoring is vital to meet the Nation's needs for timely and accurate information used in reducing the loss of life and property from earthquakes, tsunamis, and volcanic eruptions.

*An **Advanced National Seismic System** is needed to organize, modernize, standardize, and stabilize seismic monitoring in the United States.*

Most existing systems monitor either weak seismic motions or strong ground shaking, but not both. ***Modern seismographs can record both weak motions and strong motions on-scale with high accuracy.*** *By bringing this information in through a central computer with modern high-speed telecommunications, it becomes an important tool for emergency response.*

What is ANSS and how will we use it?

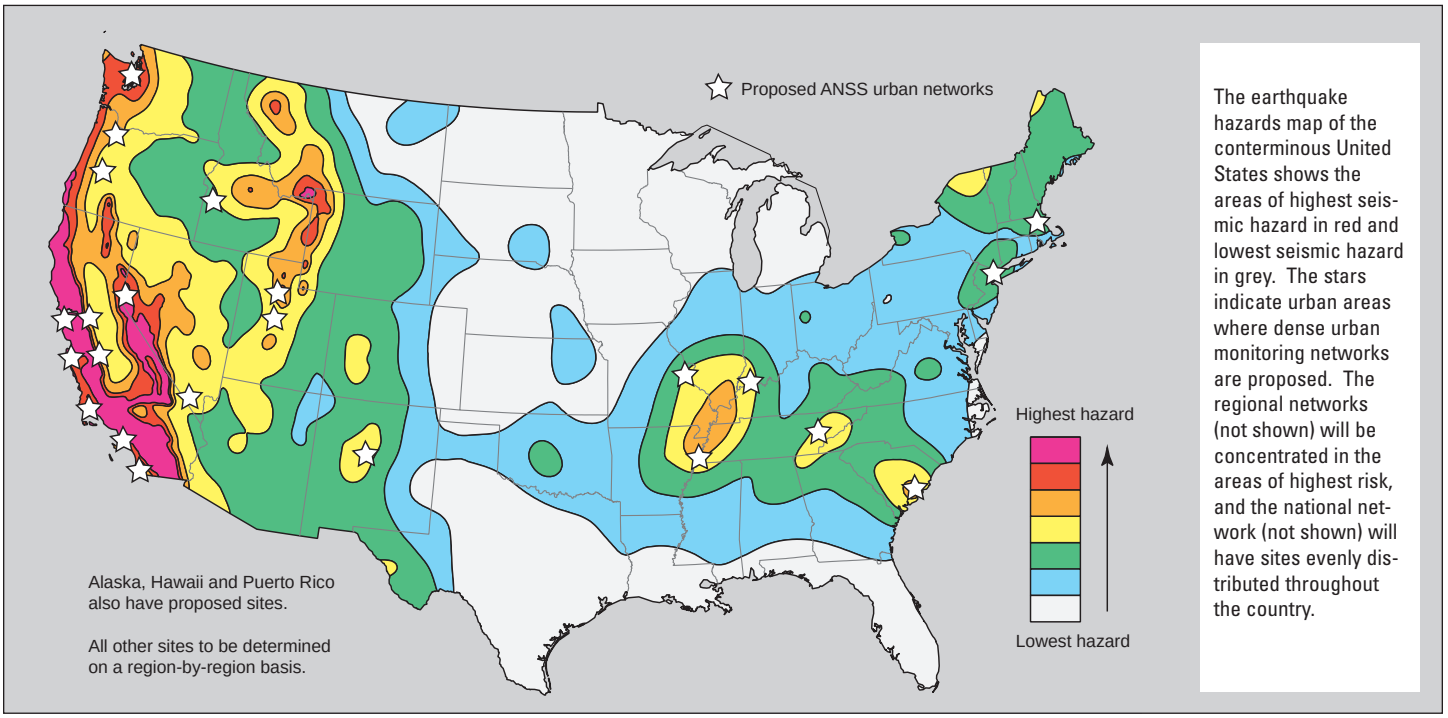
The Advanced National Seismic System Network will be a nationwide network of at least 7000 shaking measurement systems, both on the ground and in buildings, that will make it possible to:

- **Provide emergency response personnel with real-time earthquake information.**
- **Provide engineers with information about building and site response.**
- **Provide scientists with high-quality data to understand earthquake processes and solid earth structure and dynamics.**

How much will it cost?

$170 million for equipment

$47 million each year for operation and maintenance



The earthquake hazards map of the conterminous United States shows the areas of highest seismic hazard in red and lowest seismic hazard in grey. The stars indicate urban areas where dense urban monitoring networks are proposed. The regional networks (not shown) will be concentrated in the areas of highest risk, and the national network (not shown) will have sites evenly distributed throughout the country.

U.S. Department of the Interior
U.S. Geological Survey

USGS Fact Sheet 075-00
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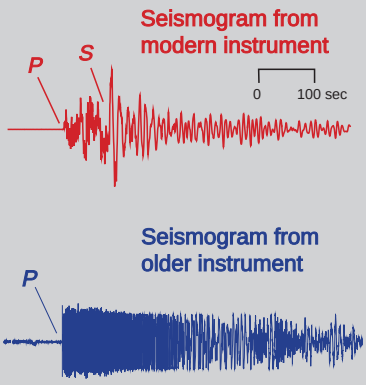
Old Versus New Instrument



The digital instrument (top) records the earthquake on-scale. The analog instrument (bottom) loses all amplitude information necessary to determine magnitude and phases later than the first arrival.

How do we build ANSS?

- **Modernize and expand the infrastructure for monitoring earthquakes and volcanoes.**
- **Implement common, integrated seismic systems across the entire nation that are networked together.**
- **Develop interagency and public-private collaboration for monitoring earthquakes and shaking of buildings.**
- **Facilitate and promote the use of real-time information through training and public education.**

Infrastructure Requirements

Urban networks — 6000 new instruments concentrated in high-risk urban areas to monitor strong ground shaking and the response of buildings and other structures.

Regional networks — 1000 new instruments to replace obsolete seismographs in networks now monitoring the most active seismic regions.

National network — 44 new instruments to achieve a uniform minimum threshold of earthquake monitoring across the entire nation.

Network operations — modernize national and regional operations centers for routine monitoring and emergency response functions.

Data centers — upgrade facilities for archiving and distributing large volumes of data.

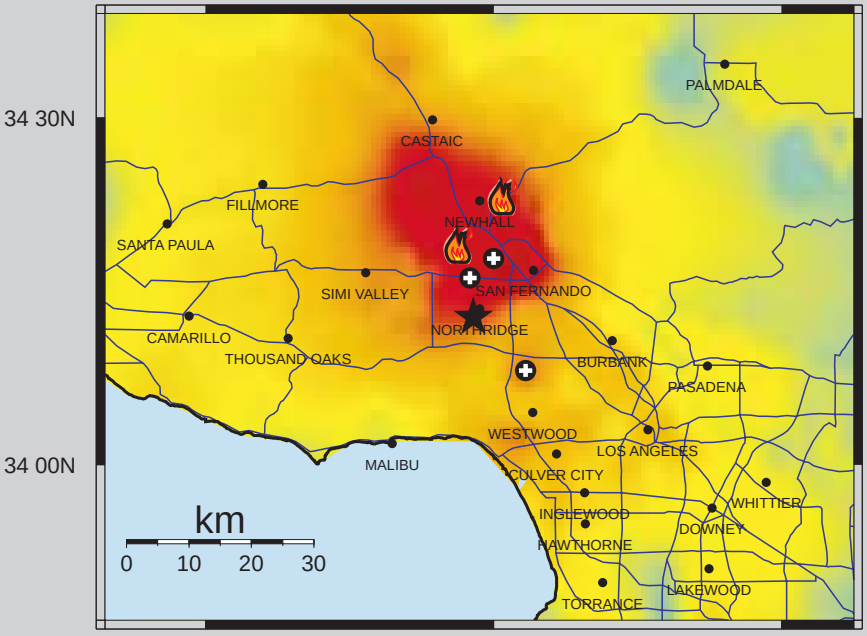
Portable seismograph arrays — two arrays of 25 stations each for supplementing permanent networks in special studies of aftershocks and earthquake hazards.

Partnerships

The USGS has the assigned Federal responsibility to "monitor seismic activity" in the United States. Because the need for seismic information spans the interest of many public and private organizations, a true National Seismic System offers unprecedented opportunities for mutually advantageous partnerships.

TriNet ShakeMap: Instrumental Intensity Map

JAN 17 1994 (M6.7) Northridge Earthquake



EPICENTER MAJOR FIRES SEARCH & RESCUE OPERATIONS

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL. (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

ANSS will make a map like this possible in all the most active seismic regions. The ShakeMap for the Northridge, CA earthquake shows that the greatest shaking and the most damage occurred to the north of the epicenter and in other isolated areas. The earthquake location and magnitude alone does not give that information. This capability was developed after the Northridge earthquake; however, had this been available right after the earthquake, it could have been immediately used to guide emergency response teams to areas that potentially had the greatest need. Modern seismic stations and communications can now provide a map like this 4 minutes after an earthquake.

For further information:

See U.S. Geological Survey Circular 1188, An Assessment of Seismic Monitoring in the United States: Requirement for an Advanced National Seismic System, 1999,
or
greenwood.cr.usgs.gov/pubs/circulars/c1188

Written by:
Harley Benz, John Filson, Walter Arabasz, Lind Gee and Lisa Wald

Graphic design by:
Lisa Wald

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