USGS Science Helps Build Safer Communities

Tsunami Hazards—A National Threat

This map shows seven earthquake-generated tsunami events in the United States from the years 900 to 1964. The earthquakes that caused these tsunamis are: Prince William Sound, Alaska, 1964, magnitude 9.2; Chile, 1960, magnitude 9.5; Alaska, 1946, magnitude 7.3; Puerto Rico/Mona Rift, 1918, magnitude 7.3 to 7.5; Virgin Islands, 1867, magnitude undetermined; Cascadia, 1700, magnitude 9; and Puget Sound, 900, magnitude 7.5. Map not to scale.

Sources: National Geophysical Data Center, NOAA, USGS

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<th>Tsunami Impacts</th>
<th>USGS Science Priorities</th>
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<td>The 2004 Indian Ocean tsunami reached heights of 65 to 100 feet in Sumatra, caused more than 200,000 deaths from Indonesia to East Africa, and registered on tide gauges throughout the world.</td>
<td>Identify and quantify tsunami sources, such as earthquake faults, volcanoes, and landslides</td>
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<td>The 1964 Alaska tsunami led to 110 deaths, some as far away as Crescent City, Calif.</td>
<td>Assess tsunami sources and hazards and model tsunami generation</td>
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<td>In 1918, an earthquake and tsunami killed 118 people in Puerto Rico. Several such events have struck this region in historic times</td>
<td>Improve understanding of how tsunamis are generated and incorporate this information into probabilities of tsunami hazards in different areas</td>
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<td>A tsunami that originated along the Washington, Oregon, and California coasts in 1700 overran Native American fishing camps and caused damage in Japan.</td>
<td>Assess tsunami inundation hazards by interpreting tsunamis</td>
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A Real Risk for the United States

In December 2004, when a tsunami killed more than 200,000 people in 11 countries around the Indian Ocean, the United States was reminded of its own tsunami risks.

In fact, devastating tsunamis have struck North America before and are sure to strike again.

Especially vulnerable are the five Pacific States—Hawaii, Alaska, Washington, Oregon, and California—and the U.S. Caribbean islands.

In the wake of the Indian Ocean disaster, the United States is redoubling its efforts to assess the Nation’s tsunami hazards, provide tsunami education, and improve its system for tsunami warning.

The U.S. Geological Survey (USGS) is helping to meet these needs, in partnership with the National Oceanic and Atmospheric Administration (NOAA) and with coastal States and counties.

Crescent City, Calif., is heavily damaged following a tsunami generated in Alaska on March 28, 1964. (University of California-EERC photo)
**Tsunami Warnings**

In 2005, the President’s tsunami-warn-
ing initiative directed $37.5 million to
the USGS and NOAA to improve the
Nation’s domestic tsunami detection and
warning system.

As part of that commitment, the USGS
has received $13.5 million to strengthen
its ability to detect global earthquakes
both through 24-7 analysis of earthquake
events and through improvements in
the Global Seismographic Network, a
partnership with the National Science
Foundation (NSF) and the Incorporated
Research Institutions for Seismology.

These changes are enabling the USGS
to provide NOAA’s tsunami-warning
centers with faster, more accurate esti-
mates of earthquake location and size.

**Domestic Tsunami Hazards**

The USGS assesses tsunami hazards
in the United States by investigating past
tsunamis, identifying potential tsunami
sources, mapping tsunami-prone coasts,
and creating simulations of tsunami
inundation. Emergency managers use
this information in hazard planning and
mitigation.

The USGS played major roles in docu-
menting the tsunamis generated by the
magnitude 9.2 Alaska earthquake in 1964
and in discovering previously unknown
tsunami hazards in Washington, Oregon,
and California. These findings were a key
impetus for the National Tsunami Hazard
Mitigation Program.

**International Efforts**

The USGS has teamed up with
NOAA, the U.S. Agency for International
Development, and other Federal agencies
and scientific organizations to provide
scientific information and support of
relief efforts around the Indian Ocean.

This work builds on a rapid response
in early 2005, when USGS geologists
investigated tsunami effects in Sri Lanka,
Indonesia, and the Republic of Maldives,
and provided field training to scientists
from Indonesia and India.

These activities are coordinated
through the Intergovernmental Oceano-
graphic Commission, a branch of the
United Nations Educational, Scientific,
and Cultural Organization. The USGS is
particularly active in working groups that
address seismic monitoring and hazard
assessment.

The United States is also a member of
the Group on Earth Observations. This
group is committed to the development of
a worldwide, all-hazards warning system
as part of the integrated Global Earth
Observation System of Systems.

Through such efforts at home and
abroad, the USGS helps the public,
policymakers, and emergency manag-
ers make informed decisions on how to
reduce losses from future tsunamis.

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**Tsunami Facts**

- Tsunamis are triggered by earthquakes, volcanic eruptions, submarine land-
slides, and by onshore landslides in which large volumes of debris fall into the
water. All of these triggers can occur in the United States.

- If a tsunami-causing disturbance occurs close to the coastline, a resulting tsunami
can reach coastal communities within minutes.

- Although many people think of a tsunami as a single, breaking wave, it typically
consists of multiple waves that rush ashore like a fast-rising tide with power-
ful currents. Tsunamis can travel much farther inland than normal waves.

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**For More Information**

USGS tsunami research

- [http://woodshole.er.usgs.gov/project-
pages/caribbean/](http://woodshole.er.usgs.gov/project-pages/caribbean/) —USGS research
into tsunami hazards in the Caribbean