



Highlights of [GAO-06-519](#), a report to congressional committees and Senator Dianne Feinstein

## Why GAO Did This Study

The 2004 Indian Ocean tsunami raised questions about U.S. preparedness for such an event. The National Oceanic and Atmospheric Administration (NOAA) leads U.S. detection and warning efforts and partners with federal and state agencies in the National Tsunami Hazard Mitigation Program (NTHMP) to reduce tsunami risks. In 2005, Congress appropriated \$17.24 million in supplemental funding to enhance these efforts.

This report (1) identifies U.S. coastal areas facing the greatest tsunami hazard and the extent to which potential impacts have been assessed, (2) discusses the effectiveness of the existing federal tsunami warning system, (3) describes efforts to mitigate the potential impacts of tsunamis on coastal communities, and (4) assesses NOAA's efforts to develop long-range plans for federal tsunami programs.

## What GAO Recommends

GAO recommends, among other things, that NOAA take steps to develop software for tsunami loss estimation, conduct periodic end-to-end warning system tests, increase high-risk community participation in its tsunami preparedness program and prepare risk-based strategic plans for its efforts.

NOAA reviewed a draft of this report and generally agreed with the findings and recommendations.

[www.gao.gov/cgi-bin/getrpt?GAO-06-519](http://www.gao.gov/cgi-bin/getrpt?GAO-06-519).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Anu Mittal at (202) 512-3841 or [mittala@gao.gov](mailto:mittala@gao.gov).

# U.S. TSUNAMI PREPAREDNESS

## Federal and State Partners Collaborate to Help Communities Reduce Potential Impacts, but Significant Challenges Remain

### What GAO Found

NOAA has determined that the Pacific coast states of Alaska, California, Hawaii, Oregon and Washington, as well as Puerto Rico and the U.S. Virgin Islands in the Caribbean Sea, face the greatest tsunami hazard. The east and Gulf coasts are relatively low-hazard areas. While high-hazard areas have been identified, limited information exists on the likely impacts of a tsunami in those areas. Some coastal areas lack inundation maps showing the potential extent of tsunami flooding in communities, and others have maps that may be unreliable. State assessments of likely tsunami impacts on people and infrastructure have been limited, in part, due to a lack of tsunami loss estimation software, as exists for floods and other hazards. Although federal warning centers quickly detect potential tsunamis and issue warnings, false alarms and warning system limitations hamper their effectiveness. Some state and local emergency managers have raised concerns about false alarms—the 16 warnings issued since 1982 were not followed by destructive tsunamis on U.S. shores—potentially causing citizens to ignore future warnings. Furthermore, limitations in the Emergency Alert System and NOAA Weather Radio All Hazards may impede timely warnings to communities. For example, signal coverage for these two systems is insufficient to transmit warnings to some coastal areas and failure to properly activate them has resulted in warnings being delayed or not transmitted to some locations. NOAA has begun addressing false alarms but, according to agency officials, lacking the states' permission elsewhere, has only conducted "live" end-to-end testing of the warning systems in Alaska to identify problems.

The at-risk communities GAO visited have mitigated potential tsunami impacts through planning, warning system improvements, public education, and infrastructure protection, but the level of implementation varies considerably by location. Most of the states and some communities GAO visited have basic mitigation plans identifying tsunami hazards. While all of these locations have multiple warning mechanisms in place, disruptions to key infrastructure such as telephone lines may hamper timely warnings. Furthermore, key educational efforts, such as distributing evacuation maps and developing school curricula have not been consistently implemented. In addition, few states and communities protect critical infrastructure from tsunamis through land-use and building design restrictions. Emergency managers attributed variability in their efforts to the need to focus on more frequent hazards like wildfires and to funding limitations. Furthermore, few communities participate in NOAA's preparedness program, according to NOAA officials, because they perceive the threat of a tsunami to be low. The nationwide expansion of NOAA's tsunami-related activities and NTHMP is under way; however, the future direction of these efforts is uncertain because they lack long-range strategic plans. NOAA has yet to identify long-range goals, establish risk-based priorities, and define performance measures to assess whether its tsunami-related efforts are achieving the desired results.