

2009 and 2010: Banner Years for the National Tsunami Hazard Mitigation Program

After the Indian Ocean tsunami of December 2004 killed approximately 230,000 people, the world became increasingly aware of the dangers of tsunamis. What are our nation's leaders doing to protect our coasts? The [National Tsunami Hazard Mitigation Program \(NTHMP\)](#) wants you to know.

The NTHMP is a federal/state partnership between the National Oceanic and Atmospheric Administration (NOAA), the [United States Geological Survey \(USGS\)](#), the [Federal Emergency Management Agency \(FEMA\)](#), and 29 U.S. Coastal States, Territories, and Commonwealths aimed at improving tsunami mitigation throughout the country. NTHMP Chairperson Vickie Nadolski of the National Weather Service summarized recent NTHMP accomplishments: "The NTHMP is committed to ensuring our nation's coasts are as well-prepared as possible for the inevitable tsunami which will impact our shores. We prepare with a three-fold defense. First, we define regions of the coast which are susceptible to tsunami flooding with an inundation mapping program. Second, we work to prepare coastal populations and emergency management agencies by promoting public education and community tsunami response plans. Third, we coordinate with the NOAA tsunami warning system and ensure official warnings are disseminated to people at risk." The last two years were busy years for the Program.

The inundation mapping program provides the basic information necessary to plan evacuation routes as well as essential information to community managers and builders. During the last two years, the NTHMP created second generation maps for all populated California coastal communities, the islands of Oahu and Hawaii, and various communities in Alaska, Oregon, Washington, and American Samoa. The program also completed its first inundation mapping effort in the Gulf of Mexico, initiated a mapping project for the U.S. east coast, and initiated development of second generation maps for Puerto Rico coastal communities.

NTHMP education and community planning efforts touched almost every coastal region of the country. Efforts included hundreds of outreach events throughout the country, distribution of hundreds of thousands of copies of tsunami educational material, development of media toolkits for both national and local media, training for the tourist industry, purchase and installation of tsunami evacuation signage in threatened communities, development of new evacuation maps for dozens of communities, support for states and territories to convene state and local level tsunami response workgroups, and new efforts to develop vertical evacuation facilities in areas where evacuation is not feasible. Thanks to efforts by NTHMP members, 36 communities attained National Weather Service [TsunamiReady](#) status in 2009 and 2010.

NTHMP warning response efforts and coordination with the NOAA tsunami warning system has improved the nation's capability to respond to official warnings. The February 2010 Chilean tsunami response exemplified coordination between the NOAA system and response agencies as Hawaiian beaches were evacuated prior to tsunami arrival and other regions along the U.S. Pacific took action for their level of threat. The ability to respond properly has been enhanced by NTHMP actions such as the recent institution of annual national tsunami exercises, support for local exercises, installation and maintenance of sirens and loudspeakers, development of new warning dissemination techniques such as over-flights, provision of NOAA All-Hazard Weather

Radios to ensure communities receive warnings, end-to-end tests of the tsunami notification system, and development of a plan to evaluate warning response.

These are just a few of the things the NTHMP program accomplished in 2009 and 2010 to protect our nation's coastline from nature's tsunami fury. Additional Accomplishments are listed below:

Inundation Mapping
<ul style="list-style-type: none"> • Coordination and Validation Efforts: <ul style="list-style-type: none"> ✓ The Mapping and Modeling Subcommittee (MMS) developed a process for validating all model software used to generate NTHMP-funded inundation maps to be carried out in 2011 ✓ MMS verified that all NTHMP-funded model codes are expected to be available, freely on-line or by request ✓ MMS developed inundation mapping guidelines ✓ MMS developed guidelines for mapping inundation in non-modeled / low hazard areas ✓ MMS developed a prioritized national list of communities for NTHMP-funded inundation mapping and Digital Elevation Model (DEM) development ✓ MMS led by California developed a common, updatable database of scientifically valid sources ✓ MMS developed a set of best-practices for coastal bathymetric/topographic digital elevation models • Inundation Map Development: <ul style="list-style-type: none"> ✓ Distant source inundation computed for Neah Bay and Port Angeles, WA ✓ Lake Washington tsunami inundation mapping underway ✓ Seward and Whittier, Alaska inundation maps completed ✓ First inundation map in the Gulf of Mexico developed for Port Aransas, TX ✓ New and updated maps produced for 130 California communities ✓ Hawaii has completed updated inundation maps for Oahu and Hawaii islands ✓ American Samoa has developed first-generation inundation maps for the island ✓ Bandon, Oregon tsunami inundation map is in review ✓ Tsunami inundation modeling for the southern Oregon coast completed ✓ U.S. east coast inundation modeling project initiated • Other Items: <ul style="list-style-type: none"> ✓ Tsunami source study completed for the Gulf of Mexico ✓ Bathymetric/elevation grids developed for 7 communities with 6 DEMs in development and 3 previously developed NOAA DEMs being reformatted for use ✓ Tsunami source and deposit databases in development with California as lead ✓ Oregon developed a Cascadia source characterization for the southern Cascadia subduction zone and compiled geologic information for comparison with inundation maps ✓ Puerto Rico has integrated new bathymetric and elevation data sets into its modeling capability
Outreach Activities
<ul style="list-style-type: none"> • National Efforts: <ul style="list-style-type: none"> ✓ NTHMP inventory of outreach materials compiled and posted to web site ✓ First national Tsunami Awareness Week declared in 2010

- ✓ Development of a national Tsunami Education Plan underway
- ✓ NTHMP web-based repository for all NTHMP-produced material under development
- ✓ Development of an Emergency Managers Tsunami Education Module with COMET nears completion
- Media Toolkits:
 - ✓ The Mitigation and Education Subcommittee (MES) created a National Media Guidebook with an associated web site under development
 - ✓ Washington updated its media toolkit
 - ✓ Oregon created a media toolkit.
 - ✓ Alaska, Puerto Rico, and California each have a media guidebook in development
- Tsunami Preparedness Meetings:
 - ✓ Puerto Rico conducted nearly 200 educational events reaching over 13,000 people
 - ✓ Hawaii conducted School Readiness Conferences, Tsunami Awareness Conferences, and outreach events at more than 20 schools, as well as supporting PRiMo tsunami workshops
 - ✓ Oregon conducted over 20 public outreach events along its coast
 - ✓ USVI conducted tsunami preparedness meetings on its two main islands
 - ✓ California conducted 8 tsunami planning workshops
 - ✓ Washington held meetings in more than 10 coastal communities
 - ✓ Alaska conducted meetings in 4 remote communities
 - ✓ Multiple meetings were held throughout American Samoa
 - ✓ The West Coast/Alaska Tsunami Warning Center (WCATWC) and International Tsunami Information Center (ITIC) conducted tsunami warning system workshops in eight locations on the east coast
- Outreach Material Distribution:
 - ✓ NTHMP supported development of an audio-visual Science-on-a-Sphere tsunami educational presentation
 - ✓ Washington distributed over 90,000 DVDs, flyers, etc. to residents in at-risk areas
 - ✓ Alaska has a children's book in development and reprinted 1000 copies of the *Ocean Fury* tsunami DVD
 - ✓ California developed two educational videos and distributed over 7500 copies of a children's preparedness video as well as 2500 copies of an adult tsunami video.
 - ✓ California developed a tsunami education Poster and Note for classroom education and distributed 4000 copies to teachers
 - ✓ California printed and distributed 300,000 copies of an earthquake and tsunami pamphlet
 - ✓ CNMI developed and distributed children's coloring books with a tsunami theme
 - ✓ Hawaii has printed many CDs, booklets, and pamphlets for public education purposes
 - ✓ Maryland included tsunami information in their all hazards brochure
 - ✓ Oregon supported development of a tsunami preparedness video with USGS
 - ✓ Puerto Rico published and distributed DVDs of its new preparedness video, tsunami educational CDs, children's booklets, and brochures
 - ✓ American Samoa created an informational brochure in English and Samoan
 - ✓ Guam has produced a "tsunami-wheel" which describes evacuation routes and safe areas
 - ✓ NOAA/ITIC/NTHMP developed, printed, and distributed posters of global tsunami sources and impacts (also significant earthquakes and volcanic eruptions)
- Tourist-Related Activities:
 - ✓ Washington distributed specialized materials for rooms in all hotels in inundation

- zones
 - ✓ Washington conducted training sessions for hotel staff in three regions
 - ✓ Hawaii has provided visitor information to auto-rental companies and airlines
 - ✓ Puerto Rico developed information cards for placement in tourist racks
- Inundation map focus group meetings
 - ✓ New inundation maps reviewed by and delivered to Seward, Alaska
 - ✓ New inundation maps reviewed with customers throughout Washington
 - ✓ New inundation maps reviewed by focus groups in 14 California counties
 - ✓ New inundation maps reviewed by focus groups in Oahu and Hawaii islands
- Other Items:
 - ✓ Washington introduced a train-the-trainer program to expedite outreach programs
 - ✓ Oregon contracted with several community organizer positions in coastal communities to develop local tsunami champions
 - ✓ Alaska continues to maintain the Quake Cottage for use in public tsunami and earthquake education
 - ✓ California declared Tsunami Awareness Week and developed a week long public education campaign
 - ✓ Puerto Rico has purchased and uses a “Tsunami-on-Wheels” vehicle for use in outreach events

Evacuation Signage and Maps

- Signage:
 - ✓ Alaska provided signs to Whittier, Sitka, Unalaska, and Lowell Point
 - ✓ California placed signs in Del Norte and Ventura Counties and purchased over 1000 signs for use throughout the state
 - ✓ CNMI has purchased and installed 100 signs
 - ✓ Hawaii has installed signs throughout the island of Hawaii
 - ✓ Washington replaced lost and stolen signs as needed throughout state
 - ✓ Oregon procured and installed 326 tsunami evacuation signs for use in four coastal communities and developed new signs for one community that features its new inundation map
 - ✓ Puerto Rico installed tsunami signage in 9 communities
- Evacuation Maps:
 - ✓ MES developed consistent requirements for NTHMP-produced evacuation maps and is finalizing evacuation map guidelines
 - ✓ MES is developing a web-based application to display all tsunami evacuation maps
 - ✓ Evacuation maps were reprinted for several communities in Washington; all threatened communities in Washington have maps available
 - ✓ New evacuation maps were developed for Valdez, Kodiak, Yakutat, and Sitka, Alaska
 - ✓ Hawaii completed new evacuation maps for Oahu
 - ✓ Oregon developed a web interface for easy access to its evacuation maps, which are available for 22 coastal communities
 - ✓ Puerto Rico developed evacuation maps and vulnerability analyses for seven communities
 - ✓ California developed guidance for local communities to evaluate secondary hazards that may inhibit safe tsunami evacuation after local earthquake, and completed a pilot analysis in Ventura County
 - ✓ California began development of offshore safety zones and guidance for pre-tsunami maritime evacuation

Warning Dissemination Systems

- Sirens and Loudspeakers:
 - ✓ Washington installed 9 AHAB systems and provided O&M on its AHAB network
 - ✓ Alaska installed sirens in Akutan, Sitka, Yakutat, Cordova, Whittier, Sand Point, King Cove, and Cold Bay
 - ✓ Oregon installed a visual warning signal in one coastal community
 - ✓ Puerto Rico upgraded its AHAB system in one community
 - ✓ Guam provided vehicle mounted sirens to mayors of villages in low-lying regions

Local Warning Reception Systems

- NOAA Weather Radio:
 - ✓ Washington provided for free several hundred radios in conjunction with outreach events along its coast
 - ✓ Alaska provided radios to several communities in southeast Alaska
 - ✓ Puerto Rico distributed 40 radios to key responders
- Emergency Manager's Weather Information Network (EMWIN):
 - ✓ Puerto Rico installed EMWIN systems in four communities

Tsunami Curriculum

- Alaska Tsunami Education Program (ATEP):
 - ✓ NTHMP members supported development of the ATEP K-12 tsunami curriculum
 - ✓ Through ATEP, teachers throughout coastal communities in Alaska were briefed on tsunami hazard and the new curriculum to use in their classrooms
- California developed two tsunami lesson plans and an educational website tied to California Science Standards for K-12
- NTHMP MES is developing a National Tsunami Education Plan to provide recommendations to create tsunami education curriculums for K-12

Response Exercises

- National Exercises:
 - ✓ The Warning Coordination Subcommittee (WCS) instituted annual, national tsunami exercises in both the Atlantic and Pacific basins
 - ✓ National exercises conducted along with associated training in both 2009 and 2010
- State-led Exercises:
 - ✓ Washington conducted the first FEMA tsunami Integrated Emergency Management Course along the west coast which included table top exercises
 - ✓ California conducted tabletop exercises in several counties and functional exercises in the northern three counties
 - ✓ Alaska conducted table top exercises in conjunction with emergency management tsunami training workshops
 - ✓ Hawaii held semi-annual state-wide response exercises
 - ✓ Oregon participated in a state-wide response exercise
 - ✓ Puerto Rico turned the national exercise into a functional exercise for municipalities and schools and supported drills in four communities
- MES is providing guidance on how to include voluntary evacuation practices in community-based education programs, and shares these practices throughout the NTHMP

Communication Tests

- Emergency Alert System (EAS) Tests:
 - ✓ California conducted live code EAS tests in northern California including a broad public education campaign and activation of some local alerting systems
 - ✓ Alaska conducted annual state-wide live code EAS tests
 - ✓ Puerto Rico conducted its first-ever live code tsunami test in 2010
 - ✓ Washington conducted annual EAS tests; the 2010 test included state-wide AHAB activation
 - ✓ West coast EAS and NWR communications tests were conducted annually
- Monthly communication tests were conducted between TWCs and primary respondents with a greater than 90% response rate

Support of State-level Tsunami Response Workgroups

- State/Local Tsunami Workgroup Activities:
 - ✓ Washington held 6 State/Local tsunami workgroup meetings
 - ✓ California convened the California Tsunami Steering Committee 3 times
 - ✓ Hawaii convened the Tsunami Mitigation Group twice
 - ✓ Alaska conducted two Tsunami Planning Conferences for Emergency Managers
 - ✓ Puerto Rico held a Tsunami Summit for emergency managers from all 44 coastal municipalities and convened its TsunamiReady Interdisciplinary Working Group several times

Mitigation Efforts

- National Activities:
 - ✓ MES developed and executed a national community tsunami preparedness survey in order collect baseline community preparedness data
 - ✓ MES is integrating tsunami building standards into the International Building Code
 - ✓ 36 communities attained TsunamiReady status in 2009/10
 - ✓ MES completed review of the updated TsunamiReady guidelines
 - ✓ MES is supporting a NOAA-funded social science review of the TsunamiReady program
 - ✓ MES is creating a web-based database of all actions taken by TsunamiReady communities as part of the NTHMP repository under development
- Tsunami Response Plans:
 - ✓ California supported development of new response plans in several communities
 - ✓ California instituted a program to provide tsunami planning support for State Parks
 - ✓ Puerto Rico provided support to three communities in development of tsunami response plans
 - ✓ Maine is developing a state-wide tsunami operations plan with evacuation routes
 - ✓ Guam conducted several planning meetings for officials to promote tsunami plan development
- Vertical Evacuation Activities:
 - ✓ MES supported development of the Tsunami Vertical Evacuation User's Guide
 - ✓ Washington held two vertical evacuation planning workshops in highly threatened communities
 - ✓ Washington has identified through community-based planning sessions with leaders in 6 communities potential sites for vertical 20 evacuation structures in Pacific County.
 - ✓ California held a planning workshop in several counties to introduce the FEMA P-646
 - ✓ Guidelines

- ✓ Puerto Rico has translated the FEMA P-646 document to Spanish
- Social Science Studies of Community Preparedness:
 - ✓ Washington completed studies in 2 communities
 - ✓ California completed an assessment of the Crescent City public education program through pre and post-project reviews
 - ✓ Puerto Rico completed an assessment of educational effectiveness in one community
- Other Activities:
 - ✓ Land-use planning and tsunami hazard study completed in California with tsunami hazard maps for land-use planners under development
 - ✓ Washington developed agreements with landowners to utilize private land for evacuation

Post-Event Response Evaluation

- NTHMP Post-Event Activities:
 - ✓ WCS developed post-event warning/advisory effectiveness questionnaires for emergency managers and the public
 - ✓ NTHMP developed an implementation plan for the questionnaires
 - ✓ NTHMP also developed a plan for NTHMP involvement in post-event physical surveys

NTHMP Programmatic Accomplishments

- Overall NTHMP Programmatic Activities:
 - ✓ The NTHMP-funded TsuAlert publication led by Washington continues to be published bi-monthly
 - ✓ The NTHMP Strategic Plan was updated with Measures and Milestones for all Outcomes
 - ✓ The NTHMP Rules of Procedure was updated with a new governance model
 - ✓ The Rules of Procedure outline a new grant approval and review procedure which ensures independent decisions regarding partner grant funding
 - ✓ The NTHMP Subcommittee structure strengthened with resources to complete program-wide milestones