

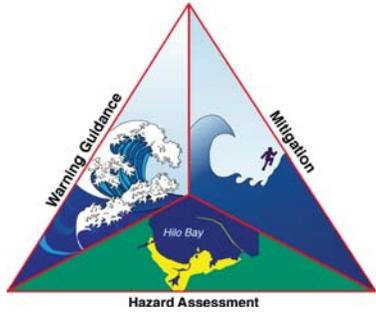


# Safer U.S. Shores

## *National Tsunami Hazard Mitigation Program Grant Investment Activities Report FY08–15*

November 2, 2015

Tsunami Program  
Analyze, Forecast, and Support Office  
NOAA/National Weather Service  
Silver Spring, Maryland



## NTHMP Grant Investment Activities FY08–FY15

As demonstrated by the 2004 Indian Ocean and 2011 Japan events, tsunamis can be devastating. In the United States, history and geologic evidence show that tsunamis are a significant threat. Today, there are over one million people living in identified tsunami hazard zones in the United States and its territories. In addition, millions vacation along U.S. coasts and are equally susceptible to tsunamis.

Since the beginning of the 20th century, 34 tsunami events have caused more than 500 deaths and over \$1.7 billion in damage to U.S. coastal states and territories. Recent studies indicate that a large U.S. tsunami could affect millions of people and cause tens of billions of dollars in damage. Tsunamis cannot be prevented, but their impacts on life, property, and the economy can be greatly reduced.

In 1995, recognizing the threat, the U.S. Congress directed the National Oceanic and Atmospheric Administration (NOAA) to form and lead a federal/state working group to develop a plan for reducing tsunami risk in the United States. This group formed what has become a model for federal/state partnerships—the National Tsunami Hazard Mitigation Program (NTHMP).

Since passage of the Tsunami Warning and Education Act in 2007 (P.L. 109-479, Title VIII), Congress has authorized and appropriated funds to NOAA’s National Weather Service for grants to states, territories, and universities that participate in the NTHMP (NTHMP state partners). From federal fiscal year 2008 through 2015, NOAA has invested or approved investments of \$36,494,540 for 17 NTHMP state partners that work to fulfill the NTHMP mission “to mitigate the impact of tsunamis through public education, community response planning, and accurate hazard assessment.”

This report summarizes the investments made by the NOAA Tsunami Program to mitigate the threat of tsunamis through NTHMP grants to state partners from FY08 through FY15.

### ***NTHMP=Collaboration***



#### **NTHMP Chair’s Message**

The NTHMP was established to enable coastal states and territories, federal agencies, and expert academic partners to work together to advance tsunami hazard preparedness and mitigation. Over time, the NTHMP has developed into a uniquely effective collaboration, where significant milestones are accomplished annually toward achieving the level of preparedness necessary to protect lives and mitigate property losses from one of the Earth’s most deadly coastal hazards.

I cannot overstate the collaborative success of the NTHMP. Prior to the NTHMP, tsunami preparedness and mitigation programs were uneven and challenging for emergency managers to sustain given the relatively low frequency occurrence of the hazard. Through the NTHMP, a consensus approach on issues such as risk assessment, evacuation planning, hazard communication, and public education has led to a markedly improved level of preparedness for the Nation.

States with strong foundational tsunami preparedness and mitigation programs have continued to advance their decision tools and plans through the partnerships with NOAA, the Federal Emergency Management Agency, the U.S. Geological Survey, and universities. Likewise, newer NTHMP state and territorial partners have leveraged model practices from others to make dramatic improvements in their public alerts, hazard education, and response planning efforts. NTHMP grants support this collaboration and have been an important enabling factor for partners to participate consistently and continuously.

Examples of NTHMP-related outcomes are featured in spotlights throughout this document. NTHMP grants have enabled the investments needed to underpin these improvements, and the result is cumulative and compounding progress toward a national vision of “minimal loss of life and property should a tsunami strike any U.S. state or possession, and resilient coastal communities that are prepared for tsunami hazards.”

**—Aimee Devaris**

Chair, National Tsunami Hazard Mitigation Program  
Director, National Weather Service Alaska Region

## NTHMP Background

The NTHMP is a partnership among NOAA, the Federal Emergency Management Agency, the U.S. Geological Survey, and 28 U.S. coastal states and territories. A Coordinating Committee, composed of representatives from NTHMP federal and state partners, and three subcommittees conduct its work. In conjunction with outside experts and other stakeholders, the three subcommittees develop guidance and set standards to ensure consistency among federal and state tsunami programs and integration with broader multihazard programs.

The Mapping and Modeling Subcommittee brings together expertise on modeling and mapping of tsunami hazards. It develops, standardizes, and improves tools that show how tsunamis could affect people and property. Examples of these tools, which are used for emergency and community planning, include tsunami inundation (flooding) and evacuation maps that show who and what is at risk.

The Mitigation and Education Subcommittee works to reduce tsunami impacts primarily through education and outreach that increase awareness and encourage preparedness. It also promotes and provides guidance on other risk reduction activities, such as evacuation planning and integration of tsunami risk into land-use policy and planning.

The Warning Coordination Subcommittee provides input to the operational U.S. tsunami warning system and advises on refinements to warning system messages, graphics, procedures, exercises, and dissemination systems to improve their effectiveness.

The most effective and efficient way to enable NTHMP state partners to develop and deliver the products and services described above for their jurisdictions—and to save lives, protect property, and inform public officials, residents, and visitors alike about the devastating impacts of tsunamis—is to provide funding through the NTHMP Grant Program.

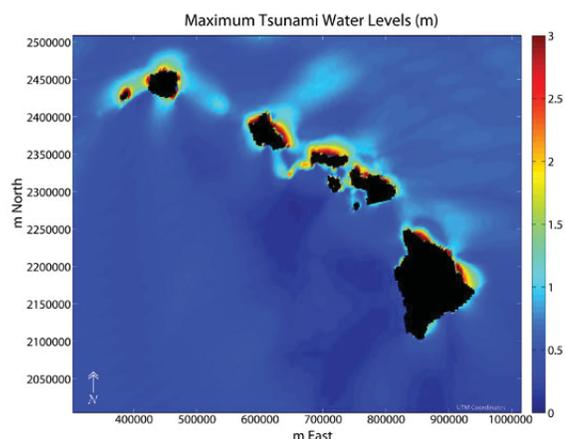
## Spotlight: Hawaii

In 1963, just before the destructive tsunami from Alaska in 1964, Hawaii became the first state to develop tsunami evacuation maps.

High-resolution LiDAR topography, which is a prerequisite for detailed inundation mapping, became available to Hawaii in 2007. With support from NTHMP grants, the Hawaii Emergency Management Agency contracted the University of Hawaii to update the tsunami inundation zones through two-dimensional modeling of five destructive historical tsunamis and calibration with the respective runup records. These updated evacuation maps became available in 2014.

The 2011 Japan earthquake and tsunami prompted the development of an extreme inundation scenario beyond what can be inferred from historical data. Oahu inundation maps for two extreme Aleutian events were completed in 2014 and adopted in 2015. Maps for the other counties are in development.

Offshore safety zones and in-harbor hazard maps of current speed, surge elevation, and drawdown are also in development. These products will inform response and mitigation plans for the maritime communities.



## NTHMP Grant Program

Since the passage of the Tsunami Warning and Education Act in 2007 (P.L. 109-479, Title VIII) and subsequent appropriations bills by Congress, funds have been made available in the budget of NOAA’s National Weather Service to provide grants to eligible NTHMP state partners to facilitate development and dissemination of new and more detailed and accurate products and services.<sup>1</sup>

NTHMP grants are non-competitive and do not have a matching requirement. They are administered for one-year terms with up to two years for full execution. Only states, territories, and universities that have representatives serving on the NTHMP Coordinating Committee are eligible for NTHMP grants.

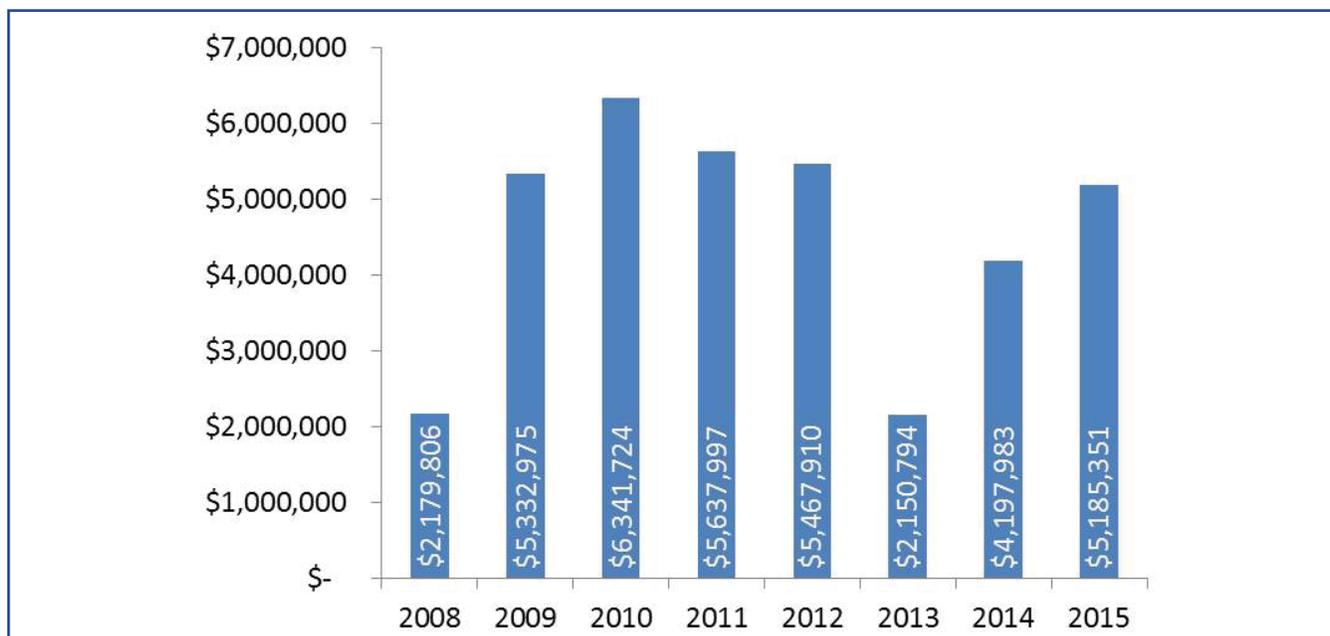


A federal grant review panel reviews grant applications during each annual application round. The panel considers how well the proposed projects meet high priority capabilities identified in the NTHMP Strategic Plan, if the technical and scientific approaches are sound and reasonable, consistency with NTHMP Grant Guidance, past performance, demonstrated need, and reasonableness of financial request through independent evaluation of cost estimates.

The NTHMP federal grant review panel recommends tasks within grant applications for funding to the NTHMP chair. In turn, the chair reviews those recommendations and provides a final recommendation to National Weather Service management for approval of the grants.

NTHMP grants for each federal fiscal year they have been available total \$36,494,540.

**NTHMP Grant Investments FY08–FY15 by Fiscal Year**



<sup>1</sup> The National Weather Service also provides administrative support and travel funding for the NTHMP outside of the NTHMP Grant Program.

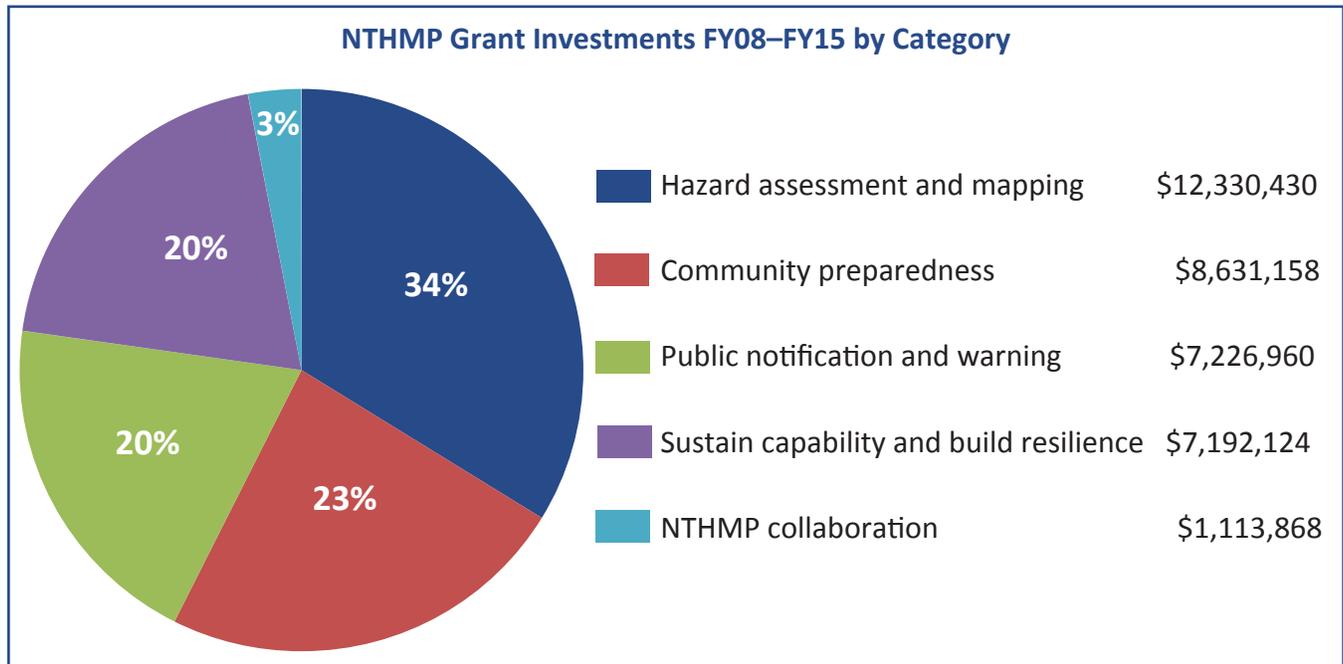
NTHMP grants comprise four primary funding categories and one supporting funding category:

Primary funding categories:

- Hazard assessment and mapping
- Community preparedness
- Public notification and warning
- Sustain tsunami capability and build resilience

Supporting funding category:

- NTHMP collaboration



### ***Spotlight: Alaska***

The University of Alaska Fairbanks Geophysical Institute has developed detailed inundation maps for 66 percent of the at-risk population along Alaska’s tsunami-threatened coast and is developing a web-based repository for the maps. Inundation maps are used to develop evacuation maps.

A top priority of emergency management is providing tsunami warning equipment and training to remote communities. Warning sirens have been installed in over 20 cities, and over 90 NOAA Weather Radios have been distributed among numerous communities.

Tsunami operations workshops offered by Alaska’s Division of Homeland Security and Emergency Management bring community leaders and responders together to discuss earthquake and tsunami science, preparedness, warning reception and dissemination, evacuation and recovery procedures, and tabletop exercises. These workshops have contributed to effective evacuations following actual tsunami warnings in several remote communities.



## Hazard Assessment and Mapping



In order to understand the potential for tsunami impacts on U.S. coastlines, assessments have been done by NOAA and NTHMP partner states to define the coastal tsunami hazard, project populations and property at risk, and develop easily understood maps that identify tsunami inundation

hazard areas and evacuation routes. These maps form the basis for emergency response and evacuation plans for all coastal communities.

NTHMP state partners also review NOAA-developed high-definition digital elevation models that inform them more precisely about projected tsunami generation, propagation, and inundation.

### NTHMP Grant Investments for FY08–FY15: Hazard Assessment and Mapping

NTHMP Partner	Total	# of Maps/ % of Coast Mapped	Population in Tsunami Zone
Alaska	\$3,024,886	28/66%	103,800
American Samoa	\$125,763	4/100%	24,000
California	\$1,875,506	200/100%	267,000
CNMI	\$133,666	7/50%	17,000
East Coast	\$1,297,528	39/55%	
Gulf Coast	\$414,449	10/20%	
Guam	\$195,000	5/100%	15,000
Hawaii	\$1,482,391	103/100%	240,000
Maine	\$38,093	1/20%	
Oregon	\$2,196,998	177/100%	33,000
Puerto Rico	\$483,560	47/100%	252,700
U.S. Virgin Islands	\$234,338	3/60%	15,000
Washington	\$828,252	40/30%	43,000
<b>Total</b>	<b>\$12,330,430</b>	<b>664 maps</b>	<b>~1,010,500</b>

## Spotlight: Guam

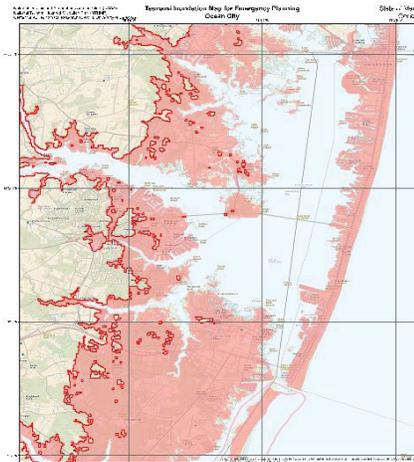
The acquisition of high-resolution LiDAR topography and risk and inundation models developed at NOAA's Pacific Marine Environmental Laboratory have allowed Guam to develop high-quality inundation and evacuation maps and determine tsunami risk for the island. The Guam Tsunami Program determines the risks and the extent of coastal inundation due to tsunamis, maps the most effective evacuation routes, and conveys this information to residents and visitors in the most effective manner.

Since 2013, the Guam Tsunami Program has had inundation and evacuation maps for 100 percent of the island's vulnerable areas. Recently, new land uses, improved evacuation strategies, and re-siting of sirens has necessitated the redesign of some evacuation maps.



## Special Feature: Tsunami Risk Research U.S. Atlantic and Gulf Coast State Shorelines

The University of Delaware, University of Rhode Island, and Texas A&M University at Galveston are working to determine the potential for damaging tsunami effects along the U.S. East and Gulf Coast shorelines. When available, this information will be shared with state and local officials to include in emergency management response, mitigation, and hazard plans.



*Draft inundation map for Ocean City, Maryland*

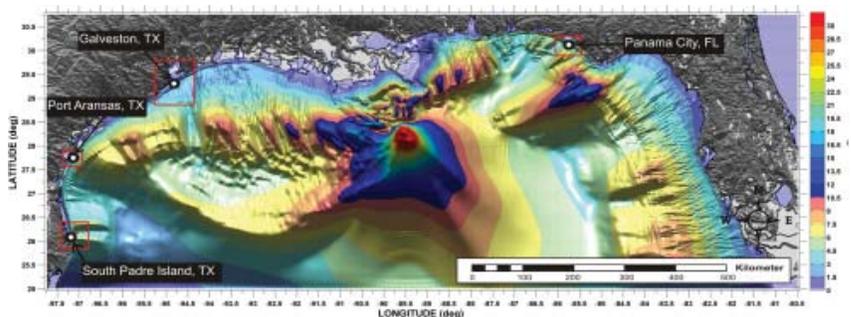
The U.S. East Coast is a region with an uncertain history of tsunami activity, but the geological record includes evidence of tsunami inundation from distant sources and landslide events along the continental shelf margin. For these events, warning times would be only one to two hours, at best. Researchers from the University of Delaware and the University of Rhode Island have been conducting inundation studies for populous East Coast areas from Florida to New England and are developing first generation inundation maps.

Since FY08, NTHMP grants have provided support to Texas A&M University at Galveston (TAMUG) to identify the tsunami hazard in the Gulf of Mexico and mitigate its impact. TAMUG efforts include determining tsunami inundation depths, extents, and current speeds based on submarine landslides as the triggering mechanism. Based on evidence of ancient massive landslides and continued

emptying of sediments into the Gulf of Mexico, mainly from the Mississippi River, an underwater landslide in the Gulf is considered a potential hazard, although the recurrence of such an event is quite low.

TAMUG has developed tsunami source characterization using a novel probabilistic approach, increasing the number of potential tsunami scenarios to cover the entire northern Gulf basin. Approximately 20 percent of the Gulf coastline has been mapped, and updates are provided constantly through publications and reports available online. Studies have proven that massive landslides have the potential to cause severe flooding in coastal communities comparable to severe storm surge inundation.

Current efforts also include assisting the maritime community by including maritime products in tsunami inundation map projects. In addition, the Gulf and East Coast researchers are working together to develop procedures for providing inundation hazard estimates for areas without detailed inundation studies or bathymetric data.



*Model output showing maximum tsunami wave amplitude generated by a submarine landslide in the Gulf of Mexico*

**The University of Delaware and Texas A&M University at Galveston have been awarded \$1,297,528 and \$414,449, respectively, in NTHMP grants between FY08 to FY15 for tsunami risk research for the U.S. East and Gulf Coasts.**

## Community Preparedness

Coastal communities of NTHMP partner states face threats from local tsunami sources where those at risk may have only minutes to evacuate. In the event of a local tsunami, there may not be enough time for established tsunami warning notification systems to communicate the tsunami risk to the public before the first wave arrives. Sources that produce tsunamis from a distant



*Communities host tsunami walks to encourage practicing evacuation routes.*

location are also a major threat to U.S. coastlines, harbors, and marine interests.

Because of these threats, improving the tsunami preparedness of coastal communities is a priority for NTHMP partner states. Preparedness activities help ensure the safety of coastal residents

and visitors and reduce the potential for loss of life in future tsunamis.

Activities in this NTHMP grant funding category include:

- Developing tsunami outreach materials, such as maps, brochures, posters, videos, kiosks, and exhibits;
- Promoting and conducting tsunami education and outreach through community presentations, workshops, exercises, and drills; attending and supporting community events where information about tsunamis is shared; and educating public officials about tsunami threats to help them protect the welfare of residents and visitors;
- Purchasing and installing tsunami hazard signs and providing guidance on sign placement;
- Supporting pedestrian evacuation analysis to study how long it would take someone to travel on foot out of a tsunami zone; and
- Communicating community needs to federal tsunami and earthquake hazard mitigation programs.



## Spotlight: Oregon

The vision of the Oregon Tsunami Program is a coastal resident and visitor population that is fully prepared for, and resilient to, Cascadia tsunamis that will strike within 15-20 minutes after a local subduction zone earthquake.

Potential tsunami inundation areas have been mapped for the entire 370 mile-long Oregon coast. And, recommended evacuation zones have been made widely available through printed materials, websites, and smartphone applications.

A long-term outreach and education program continues. Each year, Oregon Emergency Management teams up with local Red Cross representatives and delivers numerous presentations and community meetings in Oregon coastal communities to promote instinctive response and motivate communities to take mitigation actions such as hardening evacuation routes and creating tsunami refuges.



**NTHMP Grant Investments for FY08–FY15:  
Community Preparedness**

NTHMP Partner	Total*	Original Products
Alaska	\$240,836	16
American Samoa	\$234,896	23
California	\$2,513,425	37
CNMI	\$63,180	
East Coast	\$152,410	3
Guam	\$515,746	13
Hawaii	\$857,462	15
Maine	\$3,588	1
Oregon	\$1,716,099	41
Puerto Rico	\$1,247,670	49
U.S. Virgin Islands	\$239,883	3
Washington	\$845,963	20
<b>Total</b>	<b>\$8,631,158</b>	<b>~221</b>

\* Includes all preparedness products and services

**Spotlight:  
American Samoa**

American Samoa is the southernmost territory of the United States. It can be affected by tsunamis originating as far away as Chile, Japan, and Alaska and as close as eastern Australia’s Tonga Trench.

The majority of the population in American Samoa lives in coastal communities and is vulnerable to tsunamis. A tsunami that originated from an earthquake in the Tonga Trench on September 29, 2009, still lingers in the minds of the people.

NTHMP grant funds have helped thousands of the territory’s coastal residents prepare for tsunamis. Just weeks before the 2009 tsunami, community outreach sessions were delivered in villages, government offices, churches, and schools. This raised awareness about what to do before, during, and after a tsunami or another natural disaster. As a result of these outreach efforts, many lives were saved.



*Examples of tsunami outreach materials produced with NTHMP grant funding*

## ***Special Feature: Tsunami Vertical Evacuation Project Safe Haven***

In 2008, a Federal Emergency Management Agency (FEMA) report ranked Washington State's risk of economic loss from a devastating earthquake as second nationally behind California. Coastal Washington faces the threat of tsunamis from massive earthquakes originating from as far away as Alaska, Japan, and Chile as well as local offshore earthquakes. The death toll from a large local tsunami could rival recent events, such as the one that killed more than 18,000 people in Japan in 2011.

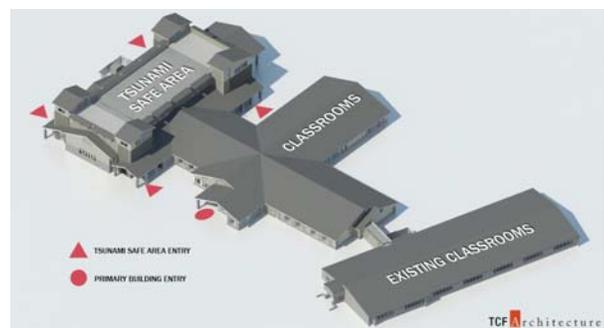
Traditional over-land evacuation routes to high ground require residents to walk more than an average of 30+ minutes to safety.

However, tsunami warnings may leave residents as few as 15 minutes to get to natural high ground. Given the speed with which tsunamis can reach land and the likelihood that roads will be impassable by car, Washington's coastal residents need other options.

To help overcome challenges like this and mitigate the risk, Washington's Emergency Management Division (EMD) provides technical assistance to its coastal cities, counties, and tribes. After witnessing the devastation of other Pacific earthquakes, EMD launched Project Safe Haven to increase the resilience of coastal communities to large-scale tsunamis. This community-based project is a collaborative effort among EMD, FEMA, University of Washington, NOAA's National Weather Service, the U. S. Geological Survey, Washington Department of Natural Resources, and local and tribal communities.



*Architectural rendering of the Nation's first tsunami vertical evacuation refuge*



*Site plan for the new school building*

The goal of the project is to help local communities construct tsunami refuges, artificial high ground in the form of vertical evacuation structures that coastal residents can reach before a tsunami strikes. The proposed structures include berms, towers, and raised platforms constructed in city centers and populated areas and use the *Guidelines for Design of Structures for Vertical Evacuation from Tsunamis* (FEMA P646) developed jointly by NOAA and FEMA.

Construction began on the first Project Safe Haven structure, the Ocosta Elementary School in Westport, Washington, in 2014. The school board approved renovations that include a tsunami evacuation refuge with capacity for approximately 1,000 people. The new structure, which will be able to withstand 9.0+ magnitude earthquakes and 30-foot waves, will provide residents and visitors a safe place to go to in the event of a tsunami without having to travel considerable distance to natural high ground. Funding for construction of the building was authorized by the local community through a local bond measure. This will be the first tsunami vertical evacuation structure in the United States.

**The Washington Tsunami Program used \$320,000 from NTHMP grants to support conceptual design, preliminary engineering, and cost estimations for Project Safe Haven.**

## Public Notification and Warning

An important factor in keeping people informed and safe from the threat of a tsunami is to ensure multiple, redundant systems are in place to notify the public about tsunami alerts.

Investments for public notification and warning systems include:

- Purchasing, installing, and maintaining outdoor warning siren systems along populated coastlines and harbors;
- Enhancing and upgrading notification system infrastructure, including communications linkages through satellites and other means;
- Installing National Weather Service Emergency Management Weather Information Network (EMWIN) systems;
- Purchasing and distributing NOAA Weather Radios; and
- Translating alerts into foreign languages for local Emergency Alert Systems.



### NTHMP Grant Investments for FY08–FY15: Public Notification and Warning

NTHMP Partner	Total
Alaska	\$1,040,779
American Samoa	\$1,270,236
California	\$456,049
CNMI	\$94,864
East Coast	\$40,000
Guam	\$143,000
Hawaii	\$237,630
Maine	\$16,706
Oregon	\$89,680
Puerto Rico	\$1,243,005
U.S. Virgin Islands	\$853,056
Washington	\$1,741,955
<b>Total</b>	<b>\$7,226,960</b>

## Spotlight: Washington

Washington continues to install tsunami warning sirens throughout the state and upgrade them as technology improves and cost-saving efficiencies are identified. The major at-risk populations of a tsunami have been covered. The four Pacific Ocean coastal counties and six coastal tribal reservations are safer because of this investment.

The state and local agencies have expanded the siren deployment to include coastal communities along the Strait of Juan de Fuca.

The sirens, which are All Hazard Alert Broadcast Sirens, are tested monthly with the Westminster Chimes and a verbal test message. Evacuation plans are practiced once a year, at least, in conjunction with the Great Washington ShakeOut. During these drills, the sirens play the actual warning wail followed by a verbal warning message.



## Sustain Tsunami Capability and Build Resilience

A community that is informed about and prepared for a tsunami will be better positioned to recover if one strikes. A quick recovery can reduce adverse impacts on human health, the environment, and the economy.

“Resilience is our ability to prevent a short-term hazard event from turning into a long-term community-wide disaster.”<sup>2</sup> It is linked to the strengths and capacities of individuals, families, businesses, schools, hospitals, and other parts of the community. More people are moving to tsunami-prone coastlines every year. This means more people in harm’s way. Coastal homes, businesses, and infrastructure are also at great risk of tsunami damage.



The NTHMP supports efforts to sustain and build resilience. These resilience investments include:

- Conducting drills and exercises among local and state officials to test response plans and improve recovery capabilities;
- Training local and state officials, emergency managers, law enforcement and fire department personnel, maritime and public works authorities, and volunteers on the nature of the tsunami threat and community plans to respond to tsunamis;
- Hiring staff in NTHMP partner state offices to manage projects that contribute to NTHMP efforts associated with mapping and modeling, mitigation and education, and warning coordination; and
- Supporting the National Weather Service’s TsunamiReady recognition program.

<sup>2</sup> NOAA: National Ocean Service. Retrieved from website May 13, 2015. <http://oceanservice.noaa.gov/facts/resilience.html>

## **Spotlight:** **U.S. Virgin Islands**

Since 1842, more than 2,500 people have lost their lives to tsunamis in the Caribbean. In recent years, there has been an explosive population growth and influx of tourists along the Caribbean coasts. This growth has increased the number of people in the region who are vulnerable to tsunamis, especially on the U.S. Virgin Islands.

Installation of tsunami warning sirens throughout the U.S. Virgin Islands has been progressing incrementally since 2011. Sirens have been installed on St. Thomas, St. Croix, and St. John. Over time, additional sirens have been (and will be) purchased and installed to fill gaps and provide warning to popular tourist regions as well as residential areas and harbors.

With mega-sized cruise ships visiting regularly, and hundreds of thousands of visitors on beaches year-round, working outdoor siren systems are essential for warning people and saving lives.



**NTHMP Grant Investments for FY08–FY15:  
Sustain Capability and Build Resilience**

NTHMP Partner	Total*	TsunamiReady Communities**
Alaska	\$177,666	13
American Samoa†	\$430,589	2
California†	\$1,109,934	46
CNMI	\$86,036	3
East Coast	\$31,440	19
Guam	\$149,400	3
Hawaii†	\$778,394	11
Maine	\$55,954	1
Oregon†	\$282,563	24
Puerto Rico†	\$2,620,495	44
U.S. Virgin Islands†	\$126,108	3
Washington†	\$1,343,545	17
<b>Total</b>	<b>\$7,192,124</b>	<b>186</b>

\* Many states/territories absorb the cost of some staff time as a part of employees’ regular duties. The value of that staff time is considered in-kind support to the NTHMP. Data on the value of in-kind support are not available, so only grant-supported staff time is reported here.

\*\* As of June 23, 2015

† States/territories that employ grant-funded full- or part-time staff



**Spotlight: California**

NTHMP grant funding for the California Tsunami Program has enabled a tremendous amount of tsunami planning, preparedness, and hazard mitigation among California’s coastal communities.

The program leads and delivers training, education, outreach, preparedness, planning, and exercises in working toward building disaster-resilient communities with well-informed populations. In doing so, it has become recognized as a model of collaboration with partners at all levels of government.



The state program has been able to leverage lessons learned and apply them toward real-world response planning and exercising. In addition, it continues to identify and address new mitigation and recovery needs.

For example, the 2010 Chile and 2011 Japan tsunamis caused significant damage to harbors in California. Since these events, the state has taken action to study and plan for impacts within harbors, expanding their efforts beyond the open coastlines.

## Special Feature: *TsunamiReady Recognition in Puerto Rico and U.S. Virgin Islands Builds a Culture of Preparedness*



TsunamiReady is a voluntary community recognition program that promotes tsunami hazard preparedness as an active collaboration among federal, state/territorial and local emergency management agencies, community leaders, and the public. The main goal of the program is to improve public safety before, during, and after tsunami emergencies. The program promotes criteria for a standard level of preparedness (guidelines) for tsunamis and works with communities to help them meet the criteria and ultimately become recognized as TsunamiReady by the National Weather Service.

Forty-six (46) of Puerto Rico’s 78 municipalities and all four populated U.S. Virgin Islands are threatened by tsunamis. Puerto Rico and the U.S. Virgin Islands are surrounded by offshore active faults on all sides. Seismic events in 1867 and 1918 generated tsunamis and caused extensive damage to local infrastructure and loss of life.

Puerto Rico has a population of about 3.7 million and a higher population density along shorelines than any U.S. state or territory. Much of the populations of Puerto Rico and the U.S. Virgin Islands are concentrated in low-lying coastal areas, and both host a large number of tourists every year.

NTHMP investments in Puerto Rico and the U.S. Virgin Islands have been used to enhance these islands’ disaster resilience and improve tsunami preparedness. Residents and visitors are provided the tools and information they need to be able to apply the principles of TsunamiReady in order to know what to do and how to respond when the next tsunami strikes.



TsunamiReady Communities in the Caribbean

**Legend:** ● TsunamiReady Communities ● TsunamiReady and StormReady Communities

## NTHMP Collaboration



The NTHMP is a model of a successful collaboration among Federal Government agencies, states, territories, and universities working toward achieving a common vision of “minimal loss of life and property should a tsunami strike any U.S. state

or possession, and resilient coastal communities that are prepared for tsunami hazards.” A great deal of the NTHMP’s success is due to the professionals who devote their talent, time, and expertise through the NTHMP’s Coordinating Committee and its three subcommittees.

NTHMP grant support for collaboration funds:

- Staff time to participate in NTHMP meetings,
- Technical workshops, and
- Production of the bimonthly NTHMP newsletter *TsuInfo Alert*.



## NTHMP Grant Investments for FY08–FY15: NTHMP Collaboration

NTHMP Partner	Total*
Alaska	\$106,111
American Samoa	\$29,078
California	\$288,140
East Coast	\$94,726
Guam	\$5,650
Hawaii	\$63,656
Oregon	\$47,316
Puerto Rico	\$57,461
Washington	\$421,730
<b>Total</b>	<b>\$1,113,868</b>

\* Does not include grant-funded full- or part-time staff, which is included in the “Sustain Capability and Build Resilience” section

## Spotlight: Commonwealth of Northern Mariana Islands

The Commonwealth of Northern Mariana Islands (CNMI) consists of 15 islands in the northwestern Pacific Ocean. Its three most populated islands are Saipan, Tinian, and Rota.

The CNMI participates as a partner in the NTHMP. Tsunami mitigation and preparedness work has included:

- Developing and posting tsunami evacuation and hazard signage on the islands of Saipan, Tinian, and Rota;
- Conducting proactive public education and outreach;
- Enabling mobile warning tsunami siren systems;
- Training local responders through educational workshops, which reached 95 percent of the territory’s first responders; and
- Achieving TsunamiReady recognition for Saipan, Tinian, and Rota.



## Looking to the Future

NTHMP federal and state partners are committed to the vision of the NTHMP, which is consistent with the vision of the NOAA Tsunami Program: “for the United States to become a tsunami-resilient Nation by minimizing the loss of life and disruption to our economically vital coastal communities from tsunamis.” With the grant support provided to date, NTHMP partners have provided coastal communities scientific-based tsunami hazard assessments, emergency response products, and public education support that has and will continue to save lives during tsunamis along U.S. coasts.

The Nation’s ability to respond to a tsunami has come a long way since 1995. Much of this progress is because of the NTHMP and its partners, both individually and collectively. Today, thanks in part to the work of the NTHMP, U.S. coastal communities are better prepared for a tsunami. Ultimately, the effectiveness of the NTHMP requires a long-term, sustained effort at all levels of government that is responsive to changes in tsunami science and technology, emergency management, risk communication, and society in general, as well as lessons from future tsunamis.

Tsunamis are a national problem. They cannot be prevented, and their impacts can be catastrophic. The ultimate goal of the NTHMP is to improve life safety and increase community resiliency to future tsunamis. With this goal in mind, the work of NTHMP partners will greatly reduce the impact of tsunamis on their coastal communities, residents, businesses, and visitors, as well as the impact on the economy of the United States.

To learn more about the National Tsunami Hazard Mitigation Program, visit the website at <http://nws.weather.gov/nthmp/index.html>.

