

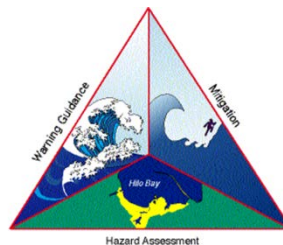
# Tsunami Education and Outreach Project Update

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**Christa Rabenold**

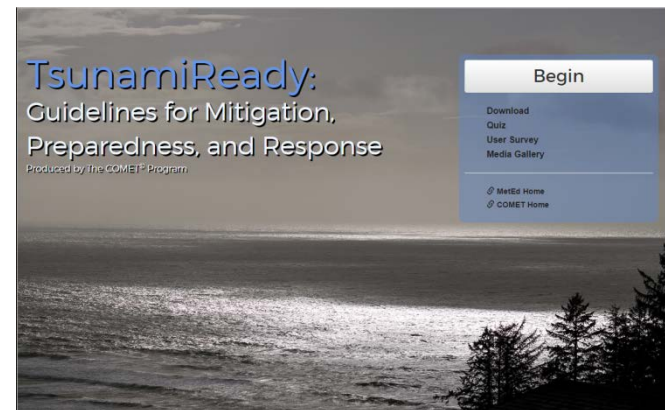
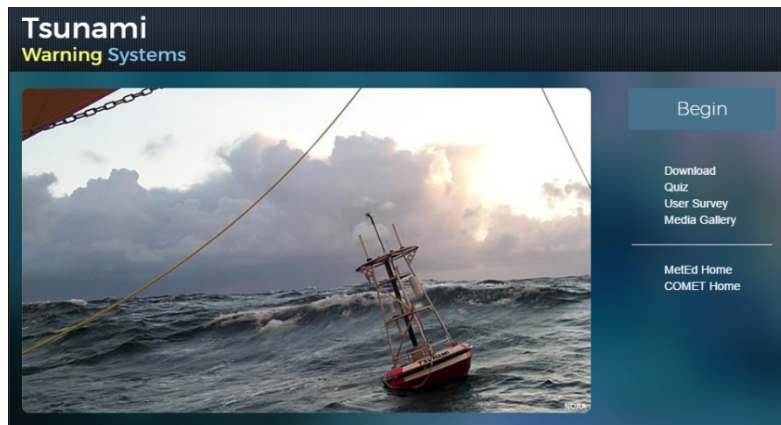
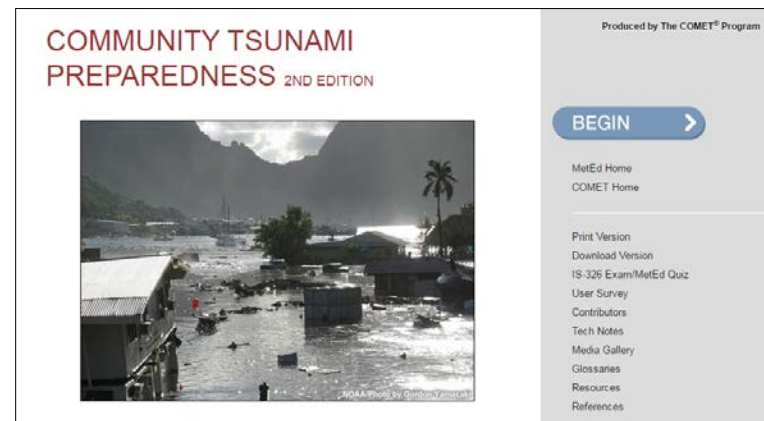
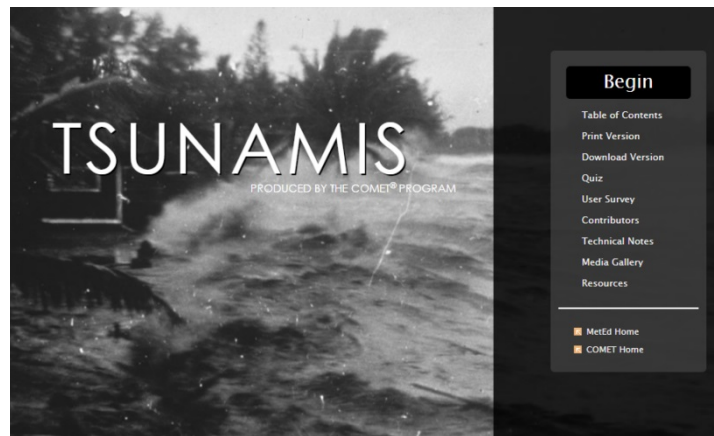
National Weather Service  
Tsunami Program  
(Syneren Technologies)

2016 NTHMP MES Summer Meeting




# 2014 Projects—Newly Completed

Coordinate updates of COMET tsunami modules



<http://nws.weather.gov/nthmp/tsunamicourses.html>

# 2014 Projects—Newly Completed



## National Tsunami Hazard Mitigation Program

[Home](#) [About the Program](#) [Partners](#) [Resources](#) [About Tsunamis](#)

### Tsunami Maps

In order to understand the potential for tsunami impacts on U.S. coastlines and help communities plan for the protection of life and property, NTHMP states and territories produce maps for their coastlines that identify tsunami inundation and evacuation areas. These maps are based largely on guidance produced collaboratively by members of the NTHMP to ensure consistent and accurate tsunami mapping of the Nation's coastline.

- **Tsunami inundation maps** show the coastal areas that may be flooded by tsunami waves. Based on tsunami inundation models, these maps are used to create evacuation maps and guide tsunami-related emergency response and land-use planning.
- **Tsunami evacuation maps** show the coastal areas from which people must be evacuated to avoid harm from tsunami waves. These maps may also include evacuation routes and assembly areas.

Click on the state/territory name to expand their section and see their links. Maps are not currently available online for states and territories not listed below. [U.S. East Coast tsunami inundation maps](#) are under development. New and updated maps will be posted once they are made available.

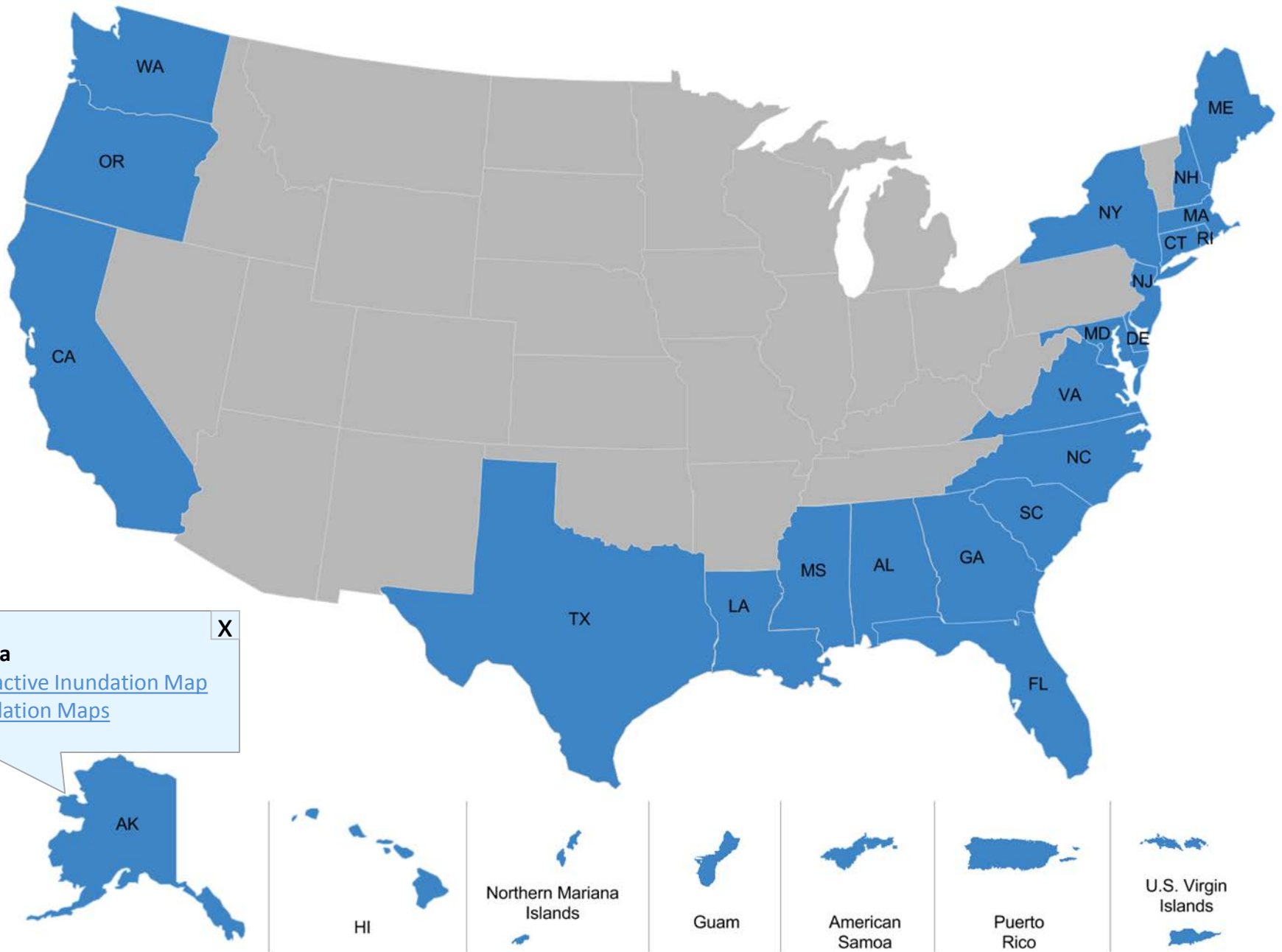
<a href="#">Alabama</a>	<a href="#">Alaska</a>	<a href="#">American Samoa</a>
<a href="#">California</a>	<a href="#">Florida</a>	<a href="#">Guam</a>
<a href="#">Hawaii</a>	<a href="#">Oregon</a>	<a href="#">Puerto Rico</a>
<a href="#">Texas</a>	<a href="#">U.S. Virgin Islands</a>	<a href="#">Washington</a>

Learn more about the [U.S. Tsunami Hazard](#).

Create online  
compilation of  
links to tsunami  
evacuation and  
inundation maps

<http://nws.weather.gov/nthmp/maps.html>

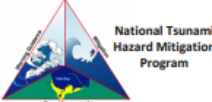
Click on a state or territory to access links to their tsunami maps.



# 2014 Projects—Newly Completed

Create a risk assessment summary/fact sheet to support national-level “know your risk” outreach

## U.S. Tsunami Hazard



**T**sunamis are infrequent high-impact events that have the potential to cause fatalities and damage on the coast. Since the beginning of the 19th century, tsunamis have caused more than 700 deaths and almost \$2 billion<sup>1</sup> in damage to U.S. coastal states and territories.

To better understand the U.S. tsunami hazard and prepare for the impacts of tsunamis on U.S. coasts, the National Tsunami Hazard Mitigation Program assessed the hazard for nine broad coastal regions. While a tsunami can strike any U.S. coast, the hazard level varies. Hazard levels reported here are qualitative and based largely on the historical record (through 2014), geological evidence, and location relative to tsunami sources, all of which provide clues to what might happen in the future.

The hazard is greatest for coastlines near subduction zones, which are particularly active seismic zones, where large earthquakes can produce damaging waves that threaten nearby and distant coasts. Dangerous subduction zones ring the Pacific Ocean and can also be found in the Caribbean Sea.

**Alaska: High to Very High**

Given its location near some of the most dangerous seismic zones in the world, a number of damaging tsunamis have affected the Pacific Coast of Alaska. Historic events include the tsunamis that devastated coastal communities in March 1964, which were produced by the largest recorded earthquake in U.S. history and associated underwater landslides. Due to Alaska's steep terrain, landslides and icefalls have also caused tsunamis in Alaska. The highest tsunami in recorded history occurred in 1958 when an earthquake-generated landslide produced a tsunami that cleared trees up to 525 meters (1,722 feet) above Lituya Bay. Volcanic activity has also caused tsunamis in Alaska as demonstrated by the Augustine Volcano in 1883.

**Reported tsunamis:** Earliest: 1737 | Total events: 100 | Events with runups above one meter: 22 | Total damage: \$688 million<sup>1</sup> | Total deaths: 222

Approximately 95% of reported U.S. tsunami strikes were to Pacific states and territories.

**U.S. West Coast: High to Very High**

The West Coast states of Washington, Oregon, and California have experienced tsunamis from as far away as Alaska, South America, Japan, and Russia. The most damaging on record is the tsunami caused by the 1964 Great Alaska earthquake. More recently, harbors in the region were damaged by events in Japan (2011) and Chile (2010). Other tsunamis in the region were produced by local earthquakes and landslides (both underwater and from land). Locally, the greatest threat is from the Cascadia subduction zone, which stretches from northern California to southern Canada. Large Cascadia earthquakes occur every 500 years, on average. According to geological data in the Pacific Northwest, the last great Cascadia earthquake occurred in 1700. It produced a tsunami that crossed the Pacific Ocean and caused damage and deaths in Japan. The next Cascadia event will significantly impact the region and the nation.

**Reported tsunamis:** Earliest: 1812 | Total events: 94 | Events with runups above one meter: 17 | Total damage: \$241 million<sup>1</sup> | Total deaths: 25

**Alaska Arctic Coast: Very Low**

There are no tsunamis or significant earthquakes on record for the region, which is not seismically active and is not near a subduction zone.

**Hawaii: High to Very High**

Hawaii has a long history of damaging tsunamis. Its tsunami record includes events caused by earthquakes both near and far. Significant tsunamis were produced locally in 1868 and 1975, but the majority of Hawaii's destructive tsunamis were produced by distant subduction zone earthquakes. Notable distant tsunamis came from Chile (1837, 1877, 1960), Russia (1923, 1952), Alaska (1946, 1957), and Japan (2011). Underwater landslides also pose a threat, and volcanic activity was responsible for a tsunami in 1919.

**Reported tsunamis:** Earliest: 1812 | Total events: 134 | Events with runups above one meter: 30 | Total damage: \$622 million<sup>1</sup> | Total deaths: 293

**Tsunamis with runups over one meter (3.28 feet) are particularly dangerous to people and property, but smaller tsunamis also pose threats. (Runup is the maximum elevation of the tsunami flooding onshore.)**

<sup>1</sup>All dollar figures adjusted for inflation (2014)

## National Tsunami Hazard Mitigation Program

— Home — About the Program — Partners — Resources — About Tsunamis —


### U.S. Tsunami Hazard

[Download the U.S. Tsunami Hazard Summary Fact Sheet](#)

Tsunamis are infrequent high-impact events that have the potential to cause fatalities and damage on the coast. Since the beginning of the 19th century, tsunamis have caused more than 700 deaths and almost \$2 billion<sup>1</sup> in damage to U.S. coastal states and territories.

To better understand the U.S. tsunami hazard and prepare for the impacts of tsunamis on U.S. coasts, the National Tsunami Hazard Mitigation Program assessed the hazard for nine broad coastal regions. While a tsunami can strike any U.S. coast, the hazard level varies. Hazard levels reported here are qualitative and based largely on the historical record (through 2014), geological evidence, and location relative to tsunami sources, all of which provide clues to what might happen in the future.

The hazard is greatest for coastlines near subduction zones, which are particularly active seismic zones, where large earthquakes can produce damaging waves that threaten nearby and distant coasts. Dangerous subduction zones ring the Pacific Ocean and can also be found in the Caribbean Sea.



2009 tsunami damage in American Samoa

[U.S. West Coast | Alaska | Alaska Arctic Coast | Hawaii | American Samoa | Guam and Northern Mariana Islands | Puerto Rico and U.S. Virgin Islands | U.S. East Coast | U.S. Gulf Coast](#)

**U.S. West Coast: High to Very High**

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<http://nws.weather.gov/nthmp/ushazard.html>



# 2014 Projects—Ongoing

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- Provide national-level support for ~~2015 National~~ Tsunami Preparedness ~~Week~~ Campaigns
  - NTHMP Recognized Tsunami Preparedness Week for 2017?
    - CARIBE Wave – March 21 (3 scenarios: Costa Rica, Cuba, and Northern Lesser Antilles)
    - “It was moved to pursue the week starting on the fourth Monday in March as the National Tsunami Awareness Week. The motion was seconded. The pursuit of this week as the National Tsunami Awareness Week was approved by the CC.”
      - November 2008 annual meeting notes
- Support development of the TsunamiZone as vehicle for tsunami preparedness ~~week~~—activities *and information*

# Preparedness Campaigns

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- Puerto Rico - March 13-19
- U.S. Virgin Islands - March 13-19
- California - March 20 - 26
- NTHMP - March 27-April 2
- Alaska - March 27-April 2
- Guam - March 27-April 2
- *Maine - March 27-April 2*
- *New Hampshire - March 27-April 2*
- Hawaii - Month of April
- American Samoa - September 24-30
- Oregon - Month of October/part of ShakeOut
- Washington - Month of October/part of ShakeOut

# 2014 Projects—Underway/Next

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- Coordinate updates for tsunami pages on NWS JetStream Online Weather School
- Develop evacuation modeling guidance (???)
- Create materials that describe how FEMA's Community Rating System can enhance tsunami mitigation and support efforts to achieve TsunamiReady recognition
- Update NTHMP Media Guide
- Develop resource to help commemorate tsunamis as a way to further tsunami awareness and preparedness



# 2011 Projects—Underway


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- Lead in development of consistent tsunami messaging through consensus process
- Revise “Local Tsunami Education and Outreach Plan” (and rename “Disaster Preparedness Education and Outreach” Guide)

- Provide content for NWS Tsunami Safety website
- Create expanded NOAA Tsunami Program fact sheet
- Provide direction and content for Tsunami.gov non-operational web pages
- Coordinate updates of COMET tsunami modules
- Coordinate updates for tsunami pages on NWS JetStream Online Weather School
- Create NTHMP fact sheet
- Develop evacuation modeling guidance
- Create hazard assessment summary/fact sheet to support national-level “know your hazard” outreach
- Provide national-level support for Tsunami Preparedness Campaigns
- Support development of the TsunamiZone as vehicle for tsunami preparedness activities and information
- Update Tsunami Awareness and Safety fact sheet
- Create online compilation of links to tsunami evacuation and inundation maps
- Create materials that describe how FEMA’s Community Rating System can enhance tsunami mitigation and support efforts to achieve TsunamiReady recognition
- Update NTHMP Media Guide
- Update Compendium of Tsunami Education Resources and create independent web page
- Create meteotsunami awareness fact sheet
- Develop resource to help commemorate tsunamis as a way to further tsunami awareness and preparedness

# Bonus Slide 1:

## Partner Web Resources



### National Tsunami Hazard Mitigation Program

[Home](#) [About the Program](#) [Partners](#) [Resources](#) [About Tsunamis](#)

#### Partner Web Resources

[National Tsunami Hazard Mitigation Program Library collection](#) (part of the Washington Geology Library catalog)

Table of Contents	Linked Resources
<b>Education and Outreach</b> <ul style="list-style-type: none"><li>Alaska</li><li>California</li><li>East Coast</li><li>FEMA</li><li>Guam</li><li>Gulf Coast</li><li>Hawaii</li><li>ITIC</li><li>NOAA</li><li>NTHMP</li><li>Oregon</li><li>Puerto Rico</li><li>USGS</li><li>U.S. Virgin Islands</li><li>Washington</li></ul> <a href="#">Guidance, Plans, and Policy</a> <a href="#">Maps</a> <a href="#">Media Resources</a> <a href="#">Research and Reports</a> <a href="#">Tsunami Events</a>	<b>Education and Outreach: Alaska</b> <ul style="list-style-type: none"><li>Alaska Governor Tsunami Public Service Announcement (video)</li><li>Alaska Tsunami Education Program</li><li>Are you Prepared for the Next Big Earthquake in Alaska? (2004)</li><li>Seismic Network and Tsunami Information (fact sheets)<ul style="list-style-type: none"><li>Earthquake Characteristics and Finite Fault Processes: Diagnostics for Tsunamigenic Potential</li><li>Seismic Networks in Alaska</li><li>Short-period vs. Broad-band Seismograph Stations in Alaska</li><li>Tsunami Inundation Mapping for Alaska Communities</li></ul></li><li>What is a Tsunami? Large Poster   Small Poster</li><li>Tsunami Animations<ul style="list-style-type: none"><li>Generation of Tsunami by a Subduction Zone Earthquake</li><li>Propagation of Tsunami in Deep Ocean</li><li>Tsunami Waves Inundating a Coastal Town</li><li>Underwater Slide Generating a Tsunami Wave</li></ul></li></ul> <b>Education and Outreach: California</b> <ul style="list-style-type: none"><li>California Tsunami Hazards, Preparedness, Education, &amp; Resources</li><li>Earthquake, Tsunami &amp; Volcano Programs</li><li>FAQ About Tsunamis</li></ul>

[http://nws.weather.gov/nthmp/NTHMP\\_Web\\_Resources.html](http://nws.weather.gov/nthmp/NTHMP_Web_Resources.html)

Ongoing: Review and send updates (additions, deletions, changes) to:

[christa.rabenold@noaa.gov](mailto:christa.rabenold@noaa.gov)

# Thank You for Your Time!

Christa Rabenold

301-427-9343

[christa.rabenold@noaa.gov](mailto:christa.rabenold@noaa.gov)

<http://nws.weather.gov/nthmp/documents/2014edplan.pdf>



# NWS Safety Campaigns



**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

Weather Safety | Ambassadors | Education | News & Events | About

## Spring Has Sprung! Get Ready for Some of America's Wildest Weather!

#SpringSafety



Photo by Brad Gedard

Tornadoes, lightning, floods, rip currents and early season heat - spring is three months of danger that can imperil the unprepared. It roars in like a lion, rampaging across the United States throughout March, April and May. And there's one hazard that can strike the coasts at any time: tsunamis.

Spring hazards include:

- Severe Weather/Tornadoes
- Floods
- Lightning
- Tsunamis
- Rip Currents/Beach Hazards
- Heat

Nobody knows the hazards of this dynamic season more than NOAA's National Weather Service (NWS). We ask that you get weather-ready for spring with just a few simple steps:

- 1. Know Your Risk**

Check [weather.gov](http://weather.gov) every morning. It is a simple action that will ensure that you're ready for the day's weather. Don't leave home without knowing the forecast.

**Outreach Toolkit**

Be a Force of Nature! Help us get the word out about staying safe. The content below is free to share on the web, social media and elsewhere.

**Articles**

- Forecasting Severe Weather
- Surveying Storm Damage

**Social Media Plans**

- Spring Break
- Severe Weather/Tornadoes
- Floods
- Lightning
- Tsunamis
- Historic Tsunamis
- Rip Currents/Beach Hazards
- Heat

Spring: March, April, May



**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

Weather Safety | Ambassadors | Education | News & Events | About

## Stay Safe This Summer!

#SummerSafety



Photo by Amanda Hill

Summer means vacation, outdoor activities, and fun in the sun! It's a time when families hit the road to visit national parks or distant relatives. The warm months and long days mean that there is plenty of time for baseball games and barbecues. The sultry temperatures practically invite you to take a dip in the pool or ocean.

But don't let the sunny days and warm nights fool you. Summer also holds significant weather and water hazards. Heat waves can be lengthy and deadly. Lightning deaths are at their peak during the summer. Beach hazards such as rip currents can catch the unprepared. And, it's the start of hurricane season.

This summer, the [National Weather Service \(NWS\)](http://www.weather.gov) wants you to be prepared for the following weather and water hazards:

- Floods
- Severe Weather
- Rip Currents/Beach Hazards
- Drought
- Air Quality
- Hurricanes
- Wildfire
- Heat
- Lightning
- Tsunamis

**Outreach Toolkit**

Be a Force of Nature! Help us get the word out about staying safe. The content below is free to share on the web, social media and elsewhere.

**Articles**

- Hurricane Hunters
- Lightning and Golf

**Social Media Plans**

- Floods
- Severe Weather
- Rip Currents/Beach Hazards
- Drought
- Air Quality
- Hurricanes
- Wildfire
- Heat
- Lightning
- Tsunamis

Summer: June, July, August

<http://www.weather.gov/safetycampaign>





# NWS Safety Campaigns

## Understand U.S. Tsunami Alerts

Official warnings are broadcast through radio, TV, and wireless emergency alerts. They may also come through outdoor sirens, officials, text message alerts, and telephone notifications.

### Warning

**Take Action—Danger!** A tsunami that may cause widespread flooding is expected or occurring. Dangerous coastal flooding and powerful currents are possible and may continue for several hours or days after initial arrival. Follow instructions from local officials. Evacuation is recommended. Move to high ground or inland.

### Advisory

**Take Action—A tsunami** with potential for strong currents or waves dangerous to those in or very near the water is expected or occurring. There may be flooding of beach and harbor areas. Stay out of the water and away from beaches and waterways. Follow instructions from local officials.

### Watch

**Be Aware—A distant** earthquake has occurred. A tsunami is possible. Stay tuned for more information. **Be prepared to take action if necessary.**

### Information Statement

**Relax—An** earthquake has occurred, or a tsunami warning, advisory or watch has been issued for another part of the ocean. Most information statements indicate there is no threat of a destructive tsunami.

Note: Tsunami warnings, advisories, and watches may be updated or cancelled as information becomes available. Advisories and watches may be upgraded if the threat is determined to be greater than originally thought.

[www.tsunami.gov](http://www.tsunami.gov)

**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

**National Weather Service**  
[weather.gov/tsunamisafety](http://weather.gov/tsunamisafety)



## Today in Tsunami History

March 27, 1964  
Great Alaska Earthquake and Tsunamis

Tsunami damage: Kodiak, Alaska (top), Seward Port, Alaska (bottom)

<http://www.noaa.gov/hazard/images/event/show/2>

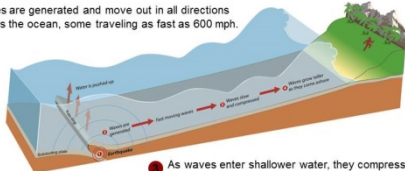
**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

**National Weather Service**  
[weather.gov/tsunamisafety](http://weather.gov/tsunamisafety)

## How a Tsunami Works

Most tsunamis are caused by large earthquakes below or near the ocean floor, but they can also be caused by landslides, volcanic activity, certain types of weather, and meteorites.

- A plate shifts abruptly, causing an earthquake, and displacing water.
- Waves are generated and move out in all directions across the ocean, some traveling as fast as 600 mph.



- As waves enter shallower water, they compress, their speed slows, and they build in height.
- The wave height increases, and associated currents intensify, becoming a threat to life and property.

Credit: University of Alaska, modified by NOAA/NWS

**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

**National Weather Service**  
[weather.gov/tsunamisafety](http://weather.gov/tsunamisafety)

## National Tsunami Hazard Mitigation Program

*Mission: To mitigate the impact of tsunamis through public education, community response planning and accurate hazard assessment*

### Hazard Assessment

- Developing, standardizing, and improving tools that show how tsunamis could affect people and property, e.g., tsunami inundation (flooding) and evacuation maps

### Warning Guidance

- Providing input to the operational U.S. Tsunami Warning System to help refine warning system messages, graphics, procedures, exercises and dissemination systems

### Mitigation

- Using education and outreach to increase awareness and encourage preparedness
- Promotes and providing guidance on other risk reduction activities, e.g., evacuation planning and integration of tsunami risk into land-use policy and planning

<http://nws.weather.gov/nthmp/index.html>

## Tsunami Preparedness

### Tsunamis

- A tsunami is a series of powerful waves accompanied by unusually strong currents.
- The first wave may not be the largest or most damaging.
- A tsunami can strike any ocean coast at any time.
- Tsunamis are a serious threat to life and property on the coast.
- Even small tsunamis can be dangerous, especially to swimmers, surfers, and boats in harbors.
- Tsunamis cannot be prevented.



**But, there are things you can do to keep yourself and your loved ones safe in the event of a tsunami!**



**Building a Weather-Ready Nation**

[www.weather.gov/tsunamisafety](http://www.weather.gov/tsunamisafety)

## Preparedness Presentation

## Social Media