



National Tsunami Hazard Mitigation Program Meets in American Samoa

By Sarah Rogowski, NWS Tsunami Program Analyst and NTHMP Administrator

IN THIS ISSUE:

NTHMP Meets in American Samoa	1
NTHMP Summer MES Summer Meeting	3
NTHMP Summer WCS Summer Meeting	4
NTHMP Summer MMS Summer Meeting	5
New NOAA/NWS Tsunami Program Manager Corina Allen	6
USVI Strengthens Tsunami Preparedness Efforts	7
Contributions of the NTHMP to Tsunami Preparedness in PR	8
Tsunami Ready Survey in the Caribbean Region	10
Damages and Exposure from Tsunami in CA	11
OR Hazard Preparedness Updates	12
Am. Samoa, CA, Guam and PR Finalize Tsunami Alerting and Response Timelines	13
TsunamiReady® Prg Recommendations	14
Embracing Resilience in the Face of Cascadia	14
Tsunami Research	16
NTHMP Related Events	16

The 2024 National Tsunami Hazard Mitigation Program (NTHMP) Annual Meeting was held in American Samoa, July 23-25, 2024 as well as a tour of the Pacific Tsunami Warning Center (PTWC) and the International Tsunami Information Center (IRC) on Ford Island, at the NOAA Daniel K. Inouye Regional Center (IRC), in Honolulu, HI on July 22nd and 26th. Staff from the NWS Weather Service Office (WSO) Pago Pago and the American Samoa Department of Homeland Security (ASDHS) played host for this event with representatives from the NWS Tsunami Program and around 40 attendees representing the state and territory NTHMP partners, and partnering federal agencies. This was the first ever NTHMP Meeting hosted on a U.S. island territory in the Pacific.



Tsunamis pose a major and ever-present threat to U.S. coastlines. This was most recently demonstrated

when a major earthquake the morning of September 29, 2009 generated a destructive, basin-wide tsunami. The tsunami resulted in approximately 190 fatalities across the islands of American Samoa, Western Samoa, and Tonga.

The first full day of the meeting in American Samoa began with a focus on the island state and territory partners and the unique threats and challenges they face from their remote locations and limited resources. NTHMP members were invited to attend an 'Ava Ceremony led by the High Chief of the village near the site of multiple fatalities from the 2009 tsunami that impacted Pago Pago. The group then visited the National Marine Sanctuary of American Samoa to hear directly from our Island Caucus representatives from American Samoa, Puerto Rico, Guam, Hawaii, Alaska, and CNMI. Representatives from FEMA presented their continued work to incorporate tsunami information into the National Risk Index (NRI).

Day 2 of the meeting was held at the US Army Reserve facility and featured briefings and discussions from each of the NTHMP subcommittees - Mapping and Modeling (MMS), Mitigation and Education (MES), and Warning Coordination (WCS) - as well as the Coordinating Committee (CC). The CC voted to endorse the recommendations made by the MES Tiger Team for the TsunamiReady® program, ways to improve our communications both within the

(Continues on page 2)

TsulInfo Alert

Prepared and published bimonthly by the Washington State Department of Natural Resources, Washington Geological Survey, on behalf of the National Tsunami Hazard Mitigation Program (NTHMP), a state/federal partnership led by the National Oceanic and Atmospheric Administration (NOAA).

This publication is free upon request and is available in print by mail and online at:

<http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis/tsuinfo-alert>

**Assembled and edited by Stephanie Earls,
Librarian, Washington Geological Survey
Washington Dept. of Natural Resources**

1111 Washington St. SE, MS 47007

Olympia, WA 98504-7007

360-902-1473 (p) 360-902-1785 (f)

stephanie.earls@dnr.wa.gov



NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM LIBRARY CATALOG:

<http://d92019.eos-intl.net/D92019/OPAC/Index.aspx>

The views expressed herein are those of the authors and not necessarily those of NOAA, the Washington Department of Natural Resources, or other sponsors of TsulInfo Alert.

National Tsunami Hazard Mitigation Program Meets in American Samoa

By Sarah Rogowski, NWS Tsunami Program Analyst and NTHMP Administrator

(Continued from page 1)

NTHMP and with our stakeholders, and future support of the TsulInfo newsletter. Additionally, the CC discussed preliminary plans for the next NTHMP Meeting. Tentatively, the meeting is planned to be held in Alaska in the Spring of 2025, with more frequent virtual meetings between in-person meetings.

We wrapped up the meeting on Thursday at the Department of Homeland Security with a discussion based on increased communication and collaboration across the subcommittees and caucus. We visited the NOAA Observatory and later heard from the previous Emergency Manager in American Samoa about his experiences from the 2009 tsunami event. As our travels to American Samoa had many of us connecting in Honolulu, we had the opportunity to visit Ford Island and the Pacific Tsunami Warning Center (PTWC) and International Tsunami Information Center (ITIC).



Thank You NWS Pago Pago, especially Meteorologist-in-Charge Elinor Lutu-McMoore and Administrative Assistant Kara Langkilde, and the American Samoa Department of Homeland Security for all of the coordination and showing us the true beauty of American Samoa and why our mission in the NTHMP is so important.

NTHMP SUMMER MEETING

Report from NTHMP Mitigation and Education Subcommittee (MES) Summer Meeting – July 24, 2024

By Nic Arcos (NCEI), Todd Becker (Cal OES), Regina Browne (VITEMA), MES Co-Chairs

The NTHMP's Mitigation and Education Subcommittee (MES) met in-person at the NTHMP Annual meeting held 23-25 July in Pago Pago, American Samoa. The MES meeting took place on the morning of 24 July at the U.S. Army Reserve facility. MES co-chair Nicolas Arcos facilitated the MES meeting, noting that co-chairs Todd Becker and Regina Browne were unable to attend in-person. It was announced that Nicolas and Regina's terms as co-chairs will end by next (Winter) meeting, so States, Territories and Federal partners should please consider volunteering for a 3-year term.

The majority of the MES meeting was focused on Partner briefings. The MES Partner briefings are an opportunity to share tsunami preparedness and mitigation accomplishments as well as other activities initiated by a Partner agency. The following Partners were able to attend and provide an in-person briefing: Alaska, American Samoa, California, Commonwealth of the Northern Mariana Islands (CNMI), Federal Emergency Management Agency, Guam, Hawaii, International Tsunami Information Center, Oregon, Puerto Rico, U.S. National Tsunami Warning Center, U.S. Virgin Islands and Washington. (Note: East Coast and Gulf Coast regions provided briefings but were unable to attend). A variety of topics were covered in the briefings, but one commonality amongst many Partners were the issues surrounding sirens. The complicated procurement process as well as the high-cost of purchase, transport, installation and maintenance of sirens were central themes. CNMI noted their mobile sirens as a good alternative. Meanwhile, American Samoa highlighted the use of village bells as a local alternative and redundancy to their existing siren system.

A variety of new outreach and educational efforts were highlighted at the briefings including informational playing cards by CNMI and a children's book by Hawaii. In Guam, a tsunami hazard and preparedness educational video, [Tsunami Mikenna](#), is being refreshed for outreach campaigns. In addition to outreach and educational products, new approaches for engaging the public were discussed, such as Washington's AMA ("Ask Me Anything") on Reddit, which had an impressive reach of 531,000.

Tsunami signage was another common theme, as the challenges in costs and vandalism were noted by multiple partners. Meanwhile, others (e.g., California, Puerto Rico) noted progress in areas of thermoplastic signage on streets.

However, the most common theme among all presentations was that information sharing between the States and Territories was critical to supporting local and regional efforts. In many cases, States and Territories looked to past and existing MES Partner efforts for guidance.

The latter part of the MES meeting was dedicated to MES "Work Plan 2023/24" updates. Some Work Plan activities were completed, or near completion, including: "Social Vulnerability Analysis Using FEMA's Hazus Software, A Guide For Emergency Managers" now [available](#); MES TsunamiReady® Recommendations (provided to NTHMP Coordinating Committee for NWS review); Tsunami Debris Guidebook (Oregon is finalizing document); Evacuation route wayfinding project (Washington State Tsunami Wayfinding guide is in process of being finalized). The MES Work Plan 2024/25 will begin to be developed at the MES virtual meeting on 14 August.

Finally, the MES would like to congratulate Jeff Lorens (National Weather Service) for his upcoming retirement. MES thanks Jeff for his numerous contributions over the years to the MES, and NTHMP as a whole.



Skylar Suiso (HI-EMA) presenting new tsunami efforts in Hawaii, including an educational children's book.

NTHMP SUMMER MEETING

Report from NTHMP Warning Coordination Subcommittee (WCS) Summer Meeting — July 24, 2024

By Ethan Weller, Washington Emergency Management Division

From July 23rd to July 25th, the members of the National Tsunami Hazard Mitigation Program (NTHMP) gathered in Pago Pago, American Samoa for the bi-annual meeting. The NTHMP is comprised of three subcommittees: the Mapping and Modeling Subcommittee (MMS), the Mitigation and Education Subcommittee (MES), and the Warning Coordination Subcommittee (WCS). Each subcommittee is chaired by federal, state, or territory representatives from various agencies to lead ongoing projects.

At the WCS meeting, several projects were discussed. The National Weather Service (NWS) is conducting a social science survey in which they are getting first-hand opinions and answers to questions related to tsunami alerting. They have interviewed Federal partners and a bevy of State partners, but they are still gathering input from more state partners and local partners, broadcast media members and the public. This project is ongoing, with a preliminary report expected in the back half of next year.



The Pacific Tsunami Warning Center (PTWC) and National Tsunami Warning Center (NTWC) then updated the NTHMP on their projects. The PTWC is currently hiring and onboarding three additional staff at this time. Over the past year, they have issued 51 messages for 12 total events. 42 distant tsunami information statements were issued for their Pacific customers, including the international countries under their area-of-responsibility. Of those 42 distant information statements, 36 of those were sent out to Hawai'i or the Pacific U.S. territories (American Samoa, Guam, and CNMI). Only 2 distant tsunami information statements for the Caribbean partners, although they sent out 24 local information statements for Puerto Rico and the Virgin Islands. As for their ongoing projects, PTWC is continuing work on new methodologies, including GNSS, volcanoes as tsunami sources, and looking into seismic sensors for SMART cables. They conduct or participate in the PacWave and CaribeWave exercises in addition to supporting local exercises in Hawai'i. Additionally, they provide training for the territories in conjunction with the International Tsunami Information Center (ITIC).

The NTWC has recently hosted important partners at their facility in Alaska, including a weeklong training for Warning Coordination Meteorologists on the West Coast. The Pacifex exercise was held in May, and the Lantex exercise for the Pacific and Gulf Coast will be held on November 7th later this year. [Tsunami.gov](https://tsunami.gov) is also undergoing improvements as part of a multi-year project, with opportunities to gather feedback from NTHMP partners in the near future.

Additionally, the Tsunami Warning Centers are in the middle of the ATOMS project, which is aiming to create a common messaging platform for both centers to create more consistency between bulletins sent out by the centers. This will allow the Warning Centers to more effectively back each other up should one experience service disruption during a tsunami. The first phase of this project is expected to be complete sometime in 2026, with another phase still seeking funding.

The Hazard Simplification Deep Dive project funded by NTHMP and led by a Tsunami Program Coordinator from

(Continues on page 5)

NTHMP SUMMER MEETING

Report from NTHMP Warning Coordination Subcommittee (WCS) Summer Meeting — July 24, 2024

By Ethan Weller, Washington Emergency Management Division

(Continued from page 4)

Washington was also discussed. This is a multi-year project for NTHMP states and territories aimed to evaluate the impacts of an alerting change. The first phase of the project is nearly complete, which was to document all existing alerting and response procedures, processes, and products into a Tsunami Alerting and Response Timeline. The next phase of the project will be for all states and territories to utilize the Tsunami Alerting and Response Timeline to estimate the time and cost burden of a potential alerting change (such as removing the “Advisory” alert level from tsunami bulletins) and to document any known alerting and communication gaps, needs, and challenges. This information will help drive the direction of the WCS by working to address the gaps for all NTHMP partners.

Lastly, NOAA personnel talked in-depth about the behind-the-scenes process that is taken for any major service change to be implemented and how the NTHMP fits into the process. Since the Tsunami portion is just one part of II service programs within the National Weather Service, the flow of any change must pass to various governing bodies who then pass along decisions to the Branch Chiefs of each service program. It was discussed that the NTHMP is in a unique position, being a body of subject matter experts within a specific hazard. NOAA stated they would lay out the full process in future discussions.

The following items were moved to a later meeting: Pacifex exercise review, the use of Slack, and the Wave Arrival Tiger Team updates.

Report from NTHMP Mapping and Modeling Subcommittee (MMS) Summer Meeting — July 24, 2024

By Alex Dolcimascolo (WGS); Elizabeth Vanacore (UPR); and Summer Ohlendorf (NTWC), MMS Co-Chairs

In July, many members of the NTHMP traveled to American Samoa for this year’s annual meeting. In addition to the remarkable and unprecedented cultural excursions planned by the American Samoan leadership team, the Mapping and Modeling Subcommittee (MMS) was able to hold a valuable meeting that focused on not just MMS-related work plan activities, but also on much broader discussion relating to new funding opportunities, collaboration between the MMS with other subcommittees of the NTHMP, and public relations.

In the work plan portion of the MMS meeting, members had the opportunity to request areas in need of DEM development. The National Centers for Environmental Information (NCEI) can support up to two projects for this fiscal year cycle. Discussions around this topic led to the consideration for development of DEMs in the Alaska-Aleutian Island chain, where many of the volcanoes can generate tsunamis. Focusing DEM development near the Alaska Island arc would significantly improve the accuracy of topography and bathymetry needed to capture these volcanoes.

Other topics related to the workplan featured an update regarding to:

- 1) the work of the USGS Powell Center and the progress-to-date of probabilistic tsunami hazard analysis (PTHA) seismic sources,
- 2) a strategy proposed by the Wave Arrival Tiger Team for standardizing tsunami arrival time guidance in mapping and modeling,
- 3) a summary of the Monte Carlo approach to L(andslide)PTHA with next steps.

(Continues on page 6)

NTHMP SUMMER MEETING & NEWS

Report from NTHMP Mapping and Modeling Subcommittee (MMS)

Summer Meeting — July 24, 2024

By Alex Dolcimascolo (WGS); Elizabeth Vanacore (UPR); and Summer Ohlendorf (NTWC), MMS Co-Chairs

(Continued from page 5)

Furthermore, the MMS has also completed its guidance and best practices for tsunami hazard analysis, modeling, and mapping for maritime communities. MMS and NTHMP leadership will work together to host this document on the NTHMP website. Next steps include passing this document to the Mitigation and Education Subcommittee (MES) to complete the next component on guidance for tsunami response, preparedness, and education.

Following work plan updates, the MMS considered the implications of the recent funding cuts to the NTHMP, and a paradigm shift may be necessary in how the MMS (and the NTHMP at large) operate to achieve long-term posterity. Not only does the MMS need to work more efficiently with funding, but prioritizing improved public relations may serve as a fundamental objective to generate the funding support needed to maintain the stability of the MMS work plan. In the short-term, the importance of publishing a summary report of all MMS and NTHMP activities has reemerged as a top priority. And for the long-term, showcasing the reach and value of the MMS with engaging metrics and data will become paramount in advocacy for the NTHMP. Strategies discussed included developing focused publications (with press releases) on identifying where the most risk can be reduced with the least cost, modernizing the NTHMP website and TsunInfo platform with citable DOIs, and improved social media presence that incorporates the use of #tsunami & #NTHMP. Platforms such as YouTube and other video-based applications are also critical outreach tools in the times of today.

Brainstorming these public relations improvements and collaboration efforts with other NTHMP subcommittees will continue at our next virtual meeting, anticipated to take place in September 2024. The MMS also plans to meet bimonthly for the foreseeable future. Detailed notes from this last meeting (and past/future meetings) can be found on the [NTHMP website](#).

Welcome Corina Allen As New NOAA/NWS Tsunami Program Manager

Many of you know Corina Allen, as she comes to us from the Washington (State) Geological Survey where she was the Chief Hazards Geologist. She has been the Washington State Science Representative for the National Tsunami Hazard Mitigation Program (NTHMP) for over seven years and was a member and co-chair of the Tsunami Science and Technology Advisory Panel (TSTAP), under the NOAA Science Advisory Board (SAB). Corina has worked closely with local, state, and federal governments and partners to advance tsunami research, produce hazard maps and evacuation products, conduct education and outreach, and respond to tsunami events. She is passionate about communicating science and coordinating with stakeholders at all levels to ensure the best information is being used in decision-making. She is looking forward to this new role and being able to work with the Tsunamiverse to make progress on many of the topics and issues that she knows well from being on the "state side".

She has a Master of Science (M.S.) degree in Geology from the University of Nevada, Reno and Bachelor of Science (B.S.) in Earth Sciences from the University of California, Santa Cruz. Her hobbies include asking questions, gardening, snowboarding, camping and outdoor adventures with her friends and family. Please don't hesitate to reach out to her to ask a question, invite her to meetings, or just catch up: Corina.Allen@noaa.gov.



NTHMP PARTNER NEWS

USVI Social Science Survey Strengthens Tsunami Preparedness Efforts

Written By VITEMA and Consult Universal

The U.S. Virgin Islands Tsunami Awareness and Preparedness Survey Initiative has marked a significant milestone in enhancing the territory's resilience against tsunami threats. This comprehensive social science approach, developed in collaboration with primary developer and champion Consult Universal, utilizing the National Tsunami Hazard Mitigation Program (NTHMP) funds, has yielded invaluable insights into community understanding, preparedness levels, and areas for improvement in tsunami awareness.

The initiative, which included targeted surveys for youth, the general community, and individuals with advanced tsunami knowledge, has provided a nuanced understanding of risk perception, preparedness actions, and knowledge gaps across different segments of the USVI population. This data-driven approach aligns seamlessly with the USVI Tsunami Ready Program and Tsunami Ready Supporter Program, enhancing their effectiveness and reach.

Key findings from the survey have highlighted:

1. Varied levels of tsunami risk awareness across different age groups and communities
2. Gaps in understanding of proper evacuation procedures and safe zones
3. The effectiveness of current outreach and education programs
4. Preferred methods for receiving tsunami warnings and preparedness information

This initiative exemplifies the power of community engagement in disaster preparedness. The insights gained will be crucial in tailoring our approaches to the specific needs of USVI residents, ultimately saving lives in the event of a tsunami.

The survey results are already informing updates to educational materials, evacuation plans, and warning systems. For instance, the data has prompted a review of tsunami signage placement and the development of more targeted awareness campaigns for specific demographic groups.

Moreover, the success of this social science approach in the USVI serves as a model for other coastal communities facing similar hazards. It demonstrates the importance of understanding human factors in disaster preparedness and the value of collaborative efforts between local, regional, and national organizations.

As the USVI continues to strengthen its tsunami preparedness, this survey initiative stands as a testament to the territory's commitment to building a more resilient community. By bridging the gap between scientific understanding and public awareness, the USVI is taking proactive steps to ensure the safety of its residents and visitors in the face of potential tsunami threats.

The USVI and VITEMA are now looking to build on this success, with plans to conduct follow-up surveys in the coming years to track progress and identify emerging needs in tsunami preparedness across the U.S. Virgin Islands.



NTHMP PARTNER NEWS

Contributions of the NTHMP to Tsunami Preparedness in Puerto Rico

By Roy Ruiz-Vélez, Research Associate, Tsunami Program Coordinator and Víctor Huérfano, Director, Puerto Rico Seismic Network (PRSN), University of Puerto Rico at Mayagüez (UPRM), and Wildaomaris González-Ruiz, Tsunami Program Manager, Puerto Rico Emergency Management Bureau (PREMB).

Puerto Rico has shown significant achievements within the National Weather Service (NWS) TsunamiReady program and the NTHMP (National Tsunami Hazard Mitigation Program). With 46 communities recognized under the TsunamiReady guidelines, 18 TsunamiReady Supporters entities, evacuation maps, thousands of signs installed across the island, tsunami protocols for 120 mass alert systems (sirens), and a wide range of educational materials, the program's progress is evident. Each year, thousands of people participate in tsunami evacuation drills during Caribe Wave, reflecting the last 20 years of effort in tsunami preparedness in Puerto Rico.

These achievements are no coincidence; they are largely the result of support from the NTHMP program, the partnership among federal, state, academic, and local offices and agencies, and the commitment of an entire team. Two decades ago, tsunamis were a little-known topic in homes, schools, and workplaces. Today, tsunami preparedness has reached a



The PR-TR team organized a booth during the visit of the NOAA Hurricane Hunter crew to Aguadilla, Puerto Rico, coordinated by NWS-SJU WFO and NMEAD.

higher priority. Coastal communities have been educated and now know how to respond to tsunami hazards. Puerto Rico has inspired other Caribbean countries, which view the island as a model for tsunami education and preparedness. However, islands like ours face numerous challenges, including frequent changes in municipal emergency management office leaders, turnover among government officials in administrative and decision-making positions, and a lack of scientific and expert personnel at the emergency management offices (EMOs). This creates the urgency for continuous education about tsunamis.



A community leader painting a tsunami evacuation sign on a street in Aguadilla, PR.

Collaboration and knowledge exchange with NTHMP other member states and territories have allowed the development of new ideas. At the international level, Puerto Rico participates in the intergovernmental efforts of The Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS) supporting various working groups and the Caribe Wave regional exercise. At the national level, Puerto Rico participates in different working groups within the NTHMP. Locally, there is the Puerto Rico Seismic Network (PRSN) who serve as the local tsunami and earthquake source of information monitoring seismic and tsunami activity in real time with the support of the PTWC (alert levels, tsunami products and messages).

(Continues on page 9)

NTHMP PARTNER NEWS

Contributions of the NTHMP to Tsunami Preparedness in Puerto Rico

By Roy Ruiz-Vélez, Research Associate, Tsunami Program Coordinator and Víctor Huérfano, Director, Puerto Rico Seismic Network (PRSN), University of Puerto Rico at Mayagüez (UPRM), and Wildaomaris González-Ruiz, Tsunami Program Manager, Puerto Rico Emergency Management Bureau (PREMB).

(Continued from page 8)

Another capability is the tsunami alerting protocol, that includes federal and local agencies (PTWC, NWS-SJU WFO, PREMB, locals EMO and others) and expert personnel, which is a major asset in this program, especially for the maritime community.

Without NTHMP support, many of these advances would not be possible, and the continuity of the tsunami educational program would be at risk. It is crucial for Puerto Rico to continue receiving support from the NTHMP program and its member states to advance tsunami preparedness and protect the over 3.2 million U.S. citizens and nearly 4 million visitors on the island. At the same time, it is important for the national program to maintain the recognition of these 46 TsunamiReady communities, as they represent a large percentage of the total recognized communities in the United States and its territories. This support also positively impacts the NWS San Juan Weather Forecast



María Dolores Faria Public School 2024 Caribe Wave tsunami exercise in Mayagüez, PR.



PRSN personnel educating an attendee during a health and safety fair in Isabela, PR.

Office (NWS-SJU WFO) by reducing the workflow associated with administering and maintaining the TsunamiReady program.

Although much progress has been made, there is still work to be done. New generations must continue striving to create more resilient and prepared communities for coastal threats like tsunamis. New collaboration agreements are needed, more research needs to be done on tsunami sources in Puerto Rico, a review of communication protocols, and more trained personnel. Additionally, it is essential to encourage collaborative agreements between the public and private sectors and to enact laws that facilitate greater participation in tsunami evacuation drills in public schools. To achieve all this, it is necessary to maintain a robust tsunami program on the island, which does not depend exclusively on limited government resources, but also has external support and funding from the NTHMP, as it has so far.

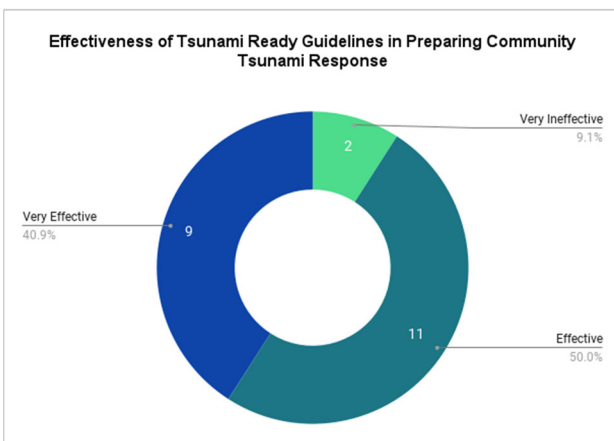
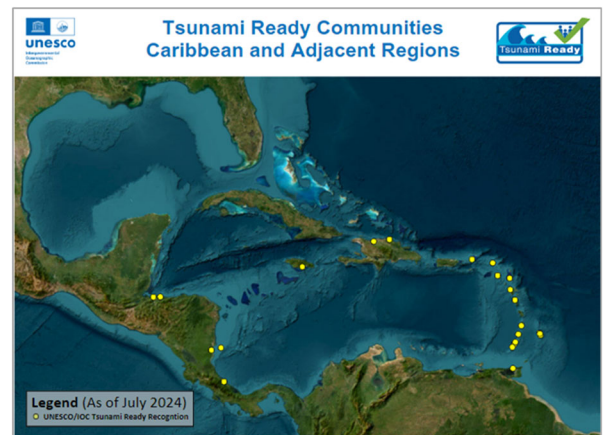
NTHMP PARTNER NEWS

Evaluating Success: Pilot Feedback Survey on Tsunami Ready in the Caribbean Region

By Grace Lemoine, NOAA/NWS Lapenta Scholar; Christa G. von Hillebrandt-Andrade, International Tsunami Information Center Caribbean Office; Fabian Hinds, Coastal Zone Management Unit; Alison Brome, Caribbean Tsunami Information Center

Recognizing the need for proactive measures to mitigate tsunami risks, the Tsunami Ready Recognition Programme was approved by UNESCO/IOC in 2022 after over 11 years of piloting in the Caribbean. With its standardized, community-centric guidelines and indicators, Tsunami Ready is fundamental in the pursuit to minimize the loss of life, livelihoods, and property to tsunamis.

In June 2024, per recommendation of the UNESCO Intergovernmental Coordination Group for Tsunamis and other Coastal Hazards (ICG/CARIBE-EWS), a pilot feedback survey on the implementation of the Tsunami Ready Recognition Programme was administered among the 19 ICG/CARIBE-EWS Tsunami Ready communities who have received their recognition or renewal since 2019. The project sought to assess the survey as a tool for future evaluations of the Tsunami Ready program and benchmarking its effectiveness among the other ICGs. By soliciting feedback from National and Regional Tsunami Ready Boards (NTRB/RTRBs) and Local Tsunami Ready Committees (LTRCs), the survey offered valuable insights into the program's strengths and deficiencies, contributing to the improvement of the program collectively and thus the readiness of communities to respond to tsunami events.



Graphic showing effectiveness ratings of the Tsunami Ready guidelines in preparing communities to respond appropriately to a tsunami.

The survey saw engagement from 16 of 19 communities, who together underscored the program's ease in facilitating public outreach, tsunami education, and the establishment of standardized procedures and operational systems. The feedback further emphasized the program's overall utility in building community preparedness and response for both tsunamis and hurricanes. These efforts have enhanced awareness of community vulnerabilities, contributing to the well-being of residents and tourists by providing essential knowledge about tsunami hazards and risks.

However, the survey also revealed areas where the program could be improved. Communication issues between local and national stakeholders emerged as a key barrier, with respondents indicating a need for more effective and timely dissemination of information. Challenges related to data accuracy and collection were also identified, highlighting the necessity for robust technical assistance to inform preparedness efforts. Most pertinent to communities of Small Island Developing States, resource mobilization and maintaining continuous readiness surfaced as areas requiring attention due to crucial gaps in funding, equipment, and internal expertise.

(Continues on page 11)

NTHMP PARTNER NEWS

Evaluating Success: Pilot Feedback Survey on Tsunami Ready in the Caribbean Region

By Grace Lemoine, NOAA/NWS Lapenta Scholar; Christa G. von Hillebrandt-Andrade, International Tsunami Information Center Caribbean Office; Fabian Hinds, Coastal Zone Management Unit; Alison Brome, Caribbean Tsunami Information Center

(Continued from page 10)

Based on the feedback received, several recommendations have been put forward to enhance the Tsunami Ready program. Establishing a national Tsunami Ready contact is recommended to ensure consistent communication and coordination at the national level. Additionally, implementing the survey upon community recognition and developing an annual reporting mechanism on program indicators will be instrumental in continually monitoring and improving the program's efficacy and progress.

Though it fell short in receiving responses from all NTRB/RTRBs and LTRCs, the survey was largely effective in distinguishing shared challenges faced by communities in the Caribbean, as well as a collective outlook on the program. By addressing identified gaps and building on existing strengths, the program can continue to evolve and improve, ultimately contributing to the overarching goal of the UNESCO-IOC Ocean Decade Tsunami Programme: ensuring that 100 percent of communities at risk of tsunamis are prepared and resilient by 2030 through efforts like Tsunami Ready.

Acknowledgements: I would like to express my deepest appreciation to Mr. Öcal Necmioğlu, Technical Secretary of ICG/CARIBE EWS, for his invaluable feedback and guidance throughout the project.

Damages and Exposure from Tsunami in California - Building Losses, Casualties, and Demographics for Exposure to Tsunami Hazard in California

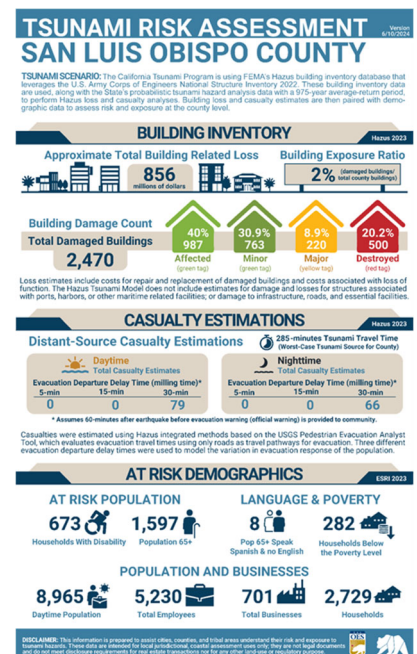
By Todd Becker (Cal OES) and Nick Graehl (CGS), California Tsunami Program

The California Tsunami Program has developed customized reports for possible tsunami damages and exposure in California. These results can be used to support emergency management decision-making for tsunami event planning and response.

The tsunami damage and exposure results are a first-of its-kind for California and provide consistent population exposure and loss estimates using the best-available methods and data. These results are provided at the County and State-levels to provide resources for tsunami planning for emergency management at both the local and state-wide levels.

An interactive dashboard and County-level summary sheets for the tsunami damage and exposure results are provided in ArcGIS StoryMap format. The StoryMap also includes background information and details of the data and methods used for this tsunami risk and exposure assessment.

The California Tsunami Risk and Exposure StoryMap can be accessed at this link (<https://arcg.is/lU09PD>) or with this QR Code:



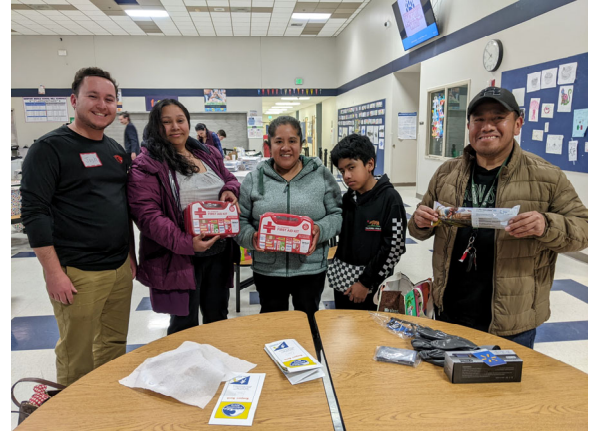
NTHMP PARTNER NEWS

Oregon Hazard Preparedness Updates

By Felicia Olmeta Schult, Oregon Sea Grant

Natural Hazard Literacy and Preparedness For Spanish Speakers—On April 25, 2024, [Cascadia CoPes Hub](#) members Josh Blockstein, Jenna Tilt, and Felicia Olmeta-Schult, delivered a comprehensive 2-hour training session on natural hazard literacy and preparedness at the Newport Middle School in Lincoln County, Oregon. Delivered in Spanish, the session covered the importance of an emergency ‘go-bag’ with recommended supplies and how to use tsunami evacuation route maps. The event attracted 45 people representing 26 families. Hub members were supported by [OSU College of Earth, Ocean, and Atmospheric Sciences \(CEOAS\)](#), [OSU Extension](#), and [OR Sea Grant](#) staff, in collaboration with the American Red Cross and Lincoln County School District. Generous contributions from Samaritan Health Services and OSU Extension and Engagement’s Expanding Access mini-grant enabled them to provide each family with starter supplies for their go-bags, including a Walmart gift card. Following the event’s success, the Lincoln County School District requested a similar session at Taft High School in Lincoln City, Oregon, on May 22, 2024. The Lincoln County Emergency Management Division also attended this event and provided resources. Thirty individuals attended this event. At both events, the team showcased [preparedness videos](#) created in collaboration with the community-based organization Consejo Hispano, further enhancing the community’s readiness for natural hazards.

Online Survey for Oregon Coast Hospitality Industry—Oregon Sea Grant and Oregon State University Extension Service want to support vibrant and sustainable coastal economies and improve preparedness and resilience to natural coastal hazards such as erosion, flooding, and tsunamis (distant and local). In support of the hospitality industry, they are asking owners or general managers of hospitality businesses to complete an online survey. Hospitality businesses are community partners with a large influence on the economy of the Oregon Coast and the well-being and safety of its workforce and visitors. The purpose of the survey is to gauge their interests and needs to be better prepared and able to respond more effectively in the event of natural hazard events. The survey results will inform the development of new training and resources. This survey takes about 20 minutes to complete. Feel free to share [this survey](#) with hospitality businesses on the Oregon coast. If you have any questions or feedback about this survey, please email [Felicia Olmeta-Schult](#), Extension Coastal Hazards Specialist at Oregon Sea Grant. For more information about the Oregon Sea Grant Program [click here](#).



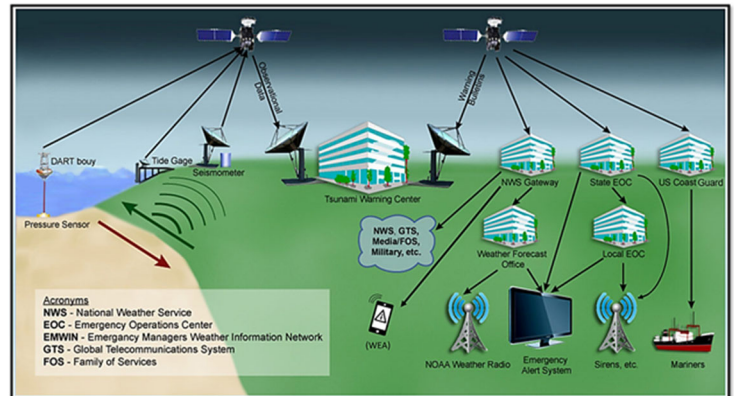
NTHMP PARTNER NEWS

American Samoa, California, Guam and Puerto Rico Finalize Tsunami Alerting and Response Timelines

By Ethan Weller, Washington Emergency Management Division

Over the past three months, Guam, Puerto Rico, California, and American Samoa have finalized an initial version of their respective Tsunami Alerting and Response Timelines. These documents have gathered a comprehensive overview of both who has responsibility for disseminating alerts and other response actions upon receipt of an alert and how these alerts are disseminated from the Tsunami Warning Centers all the way out to the public. The Timelines utilized existing procedures, processes, and products to capture actions taken by Federal, State, Territorial, Tribal and Local partners for each state or territory from the moment that an earthquake is detected to the end of the tsunami threat.

This collaborative effort is part of the ongoing tsunami portion of the [NWS' Hazard Simplification Project](#), in which NOAA is evaluating how the public perceives and acts on their various tsunami-related alerts. Washington Emergency Management hired a Tsunami Program Coordinator to oversee the project as their tsunami program was the first to create a Tsunami Alerting and Response Timeline after the January 2018 7.9 Magnitude earthquake in Alaska created the need for a clearer understanding of how the alert process works. Washington's document provided critical information for the creation of templates for both National and Pacific Tsunami Warning Center partners.



The above diagram shows the flow of information during an earthquake and tsunami for NTWC partners. The left side of the graphic shows green and red arrows signifying the earthquake and the various ways in how the seismic data is captured and sent to the Tsunami Warning Center. The right side of the diagram shows how the Tsunami Warning Center disseminates their warning bulletins to their various customers and out to the public. Note: This diagram does not depict an exact representation of the process but rather a general overview of what dissemination may look like.

Thanks to funding from the NTHMP, over the course of the past year Washington's Tsunami Program Coordinator has worked closely with state and territory emergency managers, personnel from the National and Pacific Tsunami Warning Centers, National Weather Service (NWS) Weather Forecast Offices (WFOs), Coast Guard, Navy, and seismic networks to help support the creation of the documents for each state or territory.

To round out the first phase of the project, the Commonwealth of the Northern Mariana Islands and the U.S. Virgin Islands are nearing the finalization of their Tsunami Alerting and Response Timelines.

The Tsunami Alerting and Response Timelines have established a foundation for alerting and response for each state and territory. These documents are intended to be fluid and updated periodically, as changes in procedures or updated technology used in alert dissemination will need to be captured to maintain accuracy and relevance. However, the alerting and response "snapshot" that is captured within these documents is a first-of-its-kind effort and will help all of those involved in the process; Federal partners at the NWS or the Tsunami Warning Centers will be better able to provide services and support their customers, while the states or territories will better identify their alerting and response-related gaps and work to address them in the next phase of the project. Once partners within the National Tsunami Hazard Mitigation Program identify their gaps, needs, and challenges, this information will be analyzed and shared with partners. Specific needs will be discussed in future meetings of the Warning and Coordination Subcommittee (WCS) and then cross-cutting projects can then be incorporated into the workplan of the WCS.

At the end of the day, timely and effective warnings to the public are critical for tsunami incidents, especially when the source is local. These documents are a major first step to ensuring that the actions taken at all levels of government by critical response partners are the best ones to take to save as many lives as possible.

NTHMP PARTNER NEWS

TsunamiReady® Program Recommendations

NTHMP Mitigation and Education Subcommittee

(Co-chairs: Todd Becker, Cal OES; Nic Arcos, NOAA NCEI; Regina Browne, VITEMA)

The NTHMP Mitigation and Education Subcommittee (MES) was asked to review the TsunamiReady Program Guidelines and forms and provide recommendations at the request of the National Weather Service (NWS) in June 2023. An interdisciplinary work group (Tiger Team) was formed consisting of 13 MES members representing eight States and Territories and multiple NOAA offices.



The TsunamiReady Tiger Team efforts resulted in twenty-five recommendations broadly grouped into three categories: TsunamiReady Guideline and Form Recommendations; NWS Directive 10-704 (TsunamiReady Directive) Recommendations; and General TsunamiReady Program Recommendations.

A document was developed by the TsunamiReady Tiger Team which provides a summary of the recommendations for the TsunamiReady Program and includes additional materials developed by the work group during review of the TsunamiReady Program.

During the July 2024 NTHMP Summer Meeting in American Samoa, the NTHMP Coordinating Committee voted in agreement to endorse the TsunamiReady Program Recommendations and provide the TsunamiReady Program Recommendations to the NWS TsunamiReady Program on behalf of the MES.

The TsunamiReady Tiger Team document: “TsunamiReady® Program Recommendations developed by the National Tsunami Hazard Mitigation Program’s Mitigation and Education Subcommittee as requested by the National Weather Service” can be accessed here: <https://www.weather.gov/media/nthmp/NTHMP%20MES%20TsunamiReady%20Recommendations-final-July2024.pdf>

Embracing Resilience in the Face of Cascadia Threats

By Kenneth Ufkin, Director of Emergency Management, Shoalwater Bay Indian Tribe

In recent months, significant advancements have been made in our understanding of the Cascadia Subduction Zone, particularly the Juan de Fuca–North American Plate interface. These developments have brought to light the segmented nature of this megathrust fault, underscoring the fragility of our environment and the sudden, dramatic changes it can undergo. On July 8, 2024, I had the privilege of hosting a tour for approximately 50 representatives from the Washington Geologic Survey at the Auntie Lee Tsunami Tower, the first free-standing tsunami tower in the United States. This event was not only educational but also a poignant reminder of the urgent need for robust disaster preparedness.

New Insights into the Juan de Fuca–North American Plate Interface

Recent studies have revealed that the Cascadia Subduction Zone is divided into at least four segments, each with distinct geological characteristics. This segmentation can influence the size and impact of potential earthquakes. The segment running from southern Vancouver Island to northern Oregon is particularly concerning due to its smooth interface, which may allow for a larger, more destructive rupture that could significantly impact coastal communities like Tokeland, WA ([State of the Planet](#)) ([ESS UW](#)).

(Continues on page 15)

NTHMP PARTNER NEWS

Embracing Resilience in the Face of Cascadia Threats

By Kenneth Ufkin, Director of Emergency Management, Shoalwater Bay Indian Tribe

(Continued from page 14)

This enhanced understanding of the fault's complexity highlights the necessity for continuous improvement in our disaster preparedness and response strategies. The Shoalwater Bay Indian Tribe's Emergency Management Department has been proactive in addressing these challenges through various initiatives aimed at bolstering community resilience.

Enhancing Preparedness and Resilience

Our efforts to enhance preparedness, response, and recovery capabilities are multifaceted and deeply rooted in our commitment to safety. We have been hard at work updating our Hazard Mitigation Plan to ensure it reflects the latest scientific data and risk assessments. This involves meticulous reviews and close coordination with FEMA and a multitude of other partners and stakeholders to ensure our strategies are both comprehensive and effective. As they say, “measure twice, cut once” – especially when it comes to cutting down disaster risks!

Training and community exercises are another vital component of our strategy. From HAM radio operations and CPR classes to mass care and sheltering drills, we're ensuring that every community member is equipped with essential skills. Furthermore, annual evacuation exercises to high ground and participating in the annual Great Shake Out event further bolster our commitment to preparedness. Imagine a community where everyone knows how to save a life and set up emergency shelters – we're making that vision a reality, one drill at a time.

Our infrastructure projects also play a crucial role. Relocating the Mobile Command Center to higher ground and upgrading emergency response trailers are steps we've taken to ensure we're ready for any situation. And let's not forget our commitment to long-term food preservation. We've been busily freeze-drying food supplies to ensure we have nutritious provisions during emergencies. It's a bit like preparing for an extended camping trip, only with more freeze-dried peaches and fewer s'mores.

These initiatives are not just about checking boxes; they're about weaving resilience into the very fabric of our community. Each step we take, whether it's a training session or an infrastructure upgrade, brings us closer to a safer, more prepared future.

In addition to these efforts, our Uphill Development Team has been diligently working on a managed retreat strategy to further bolster our community's resilience. This strategy involves obtaining funds and developing plans to move tribal infrastructure and homes to higher ground. By relocating critical facilities and residences, we aim to mitigate the risks posed by rising sea levels, severe coastal erosion, and the ever-present threat of tsunamis. This proactive approach ensures that our community remains safe and sustainable for future generations.

Reflecting on Our Journey

Hosting the tour of the Auntie Lee Tsunami Tower with the Washington Geologic Survey was a significant milestone for us. It not only showcased our preparedness efforts but also reinforced the importance of collaboration and knowledge sharing in building a resilient community. As we continue to enhance our preparedness and response strategies, we are reminded of the delicate balance we maintain with our environment and the critical need to be vigilant and proactive.

The Shoalwater Bay Indian Tribe remains dedicated to advancing our resilience through innovative mitigation efforts and comprehensive emergency management. By aligning our actions with FEMA's mission areas and core capabilities, we are committed to safeguarding our community and ensuring a safer, more prepared future.

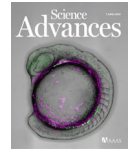
For more information on our initiatives and to stay updated on our progress, please visit the [Shoalwater Bay Indian Tribe's Emergency Management Division website](#).



TSUNAMI RESEARCH & EVENTS

RESEARCH

Carbotte, S. M.; Boston, Brian; Han, Shuoshuo; Shuck, Brandon; Beeson, Jeffrey; Canales, J. P.; Tobin, Harold; Miller, Nathan; Nedimovic, Mladen; Trehu, Anne; Lee, Michelle; Lucas, Madelaine; Jian, Hanchao; Jiang, Danqi; Moser, Liam; Anderson, Chris; Judd, Darren; Fernandez, Jaime; Campbell, Chuck; Goswami, Antara; Gahlawat, Rajendra, 2024, Subducting plate structure and megathrust morphology from deep seismic imaging linked to earthquake rupture segmentation at Cascadia: Science Advances, v. 10, no. 23, <https://doi.org/10.1126/sciadv.adl3198>.



Hughes, K. E.; Fitzsimons, S. J.; Howarth, J. D., 2024, Lacustrine mass movements in active tectonic settings: Lake tsunami sources in New Zealand's South Island: Geomorphology, <https://dx.doi.org/10.1016/j.geomorph.2024.109359>.



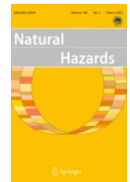
Ledeczi, A. M.; Lucas, M. C.; Tobin, H. J.; Watt, J. T.; Miller, N. C., 2024, Late Quaternary surface displacements on accretionary wedge splay faults in the Cascadia subduction zone: Implications for megathrust rupture: Seismica, v. 2, no. 4, <https://doi.org/10.26443/seismica.v2i4.1158>.



Qu, K.; Li, J. J.; Yao, Y.; Wang, X., 2024, Numerical study on hydrodynamic impacts of 3D excavation pit on tsunami-like wave at fringing reef: Continental Shelf Research, v. 276, article 105243, <https://doi.org/10.1016/j.csr.2024.105243>.



Salamon, Amos; Omira, Rachid; Zohar, Motti; Baptista, M. A., 2024, Modern outlook on the source of the 551 AD tsunamigenic earthquake that struck the Phoenician (Lebanon) coast: Natural Hazards, v. 120, p. 8893-8929, <https://doi.org/10.1007/s11069-024-06559-4>.



Scorzini, A. R.; Di Bacco, Mario; Sugawara, Daisuke; Suppasri, Anawat, 2024, Machine learning and hydrodynamic proxies for enhanced rapid tsunami vulnerability assessment: Communications Earth & Environment, v. 5, article 301, <https://doi.org/10.1038/s43247-024-01468-7>.



UPCOMING NTHMP & RELATED EVENTS

- ◆ September 10-14, 2024—AEG Annual Meeting (Philadelphia, PA) <https://www.aegannualmeeting.org/>
- ◆ September 22-25, 2024 Geological Society of America Annual Meeting (Anaheim, CA) <https://community.geosociety.org/gsa2024/home>
- ◆ October 17th, 2024—The Great Shakeout <https://www.shakeout.org/>
- ◆ November 5, 2024—World Tsunami Awareness Day <https://tsunamiday.undrr.org/>
- ◆ December 9-13, 2024—AGU Fall Meeting (Washington, D.C.) <https://www.agu.org/annual-meeting>

