



Tsunami Evacuation Guidelines for Schools in Hawai'i



The Pacific Tsunami Museum's exhibit mural honors the students and teachers of Laupāhoehoe School who were lost in the April 1, 1946 tsunami. The mural is by Elfie Wilkins, and students, Leah Higa and Ruby Iwata of Hilo, Hawai'i.

INTRODUCTION

Tsunamis are by far Hawai'i's most deadly natural disaster. They have killed more people in Hawai'i than all other natural disasters, including floods, earthquakes, volcanic eruptions, and hurricanes, put together. In the past schools in Hawai'i have been seriously impacted with tragic loss of life of students and teachers. Recent tsunami events around the world have shown the value of tsunami education and preparedness in saving lives of students and staff of schools.

Though general plans may already exist for your school, each school is unique. The school's urban, suburban, or rural setting, and particular geographic location, local topography and near and offshore sea floor bathymetry make each site different from all others. Furthermore the demography of each school and its surrounding area adds to the necessary uniqueness of each school's tsunami preparedness plan to include hazard education and evacuation training and practice.



Illustration by Brook Kapukuniahia Parker

This document shares lessons learned, often at a painful cost, by schools that have been impacted by tsunamis in 2004, 2006, 2009 and 2011 across the Pacific and Indian Oceans, as well as tsunamis in 1946 and 1960 in Hawai'i.



GENERAL RULES

1. Flexible and Dynamic

All plans must be flexible and dynamic and designed to include provisions for adapting to fluid situations. Many natural hazards can occur simultaneously. For example, a large local earthquake, in addition to generating tsunami waves that can arrive within minutes, may well destroy bridges along your evacuation route and create local landslides in your area. Such an earthquake or a tsunami could occur during a period of inclement weather when normal evacuation routes are inundated or impassible from rainfall flooding. These eventualities may seem remote, but they have all occurred in the past and will happen in the future.

- ❖ Your plan must take these possibilities into consideration as well as accounting for inevitable improvements and adaptations you will make to your plan as you run through it every year.

2. Notification Procedures

Understand the Civil Defense warning system, but do not assume that you will receive a timely warning. Civil Defense sirens do occasionally malfunction and do not cover all areas. Telephone service (cell and land lines) will become saturated and inoperable, and power failures will occur.

- ❖ Do not rely on using the PA or bell system during a tsunami emergency. Power failures may make the system inoperable. Have a back-up system, such as a megaphone or actual bell, and practice with the back-up system so that both staff and students understand its significance.

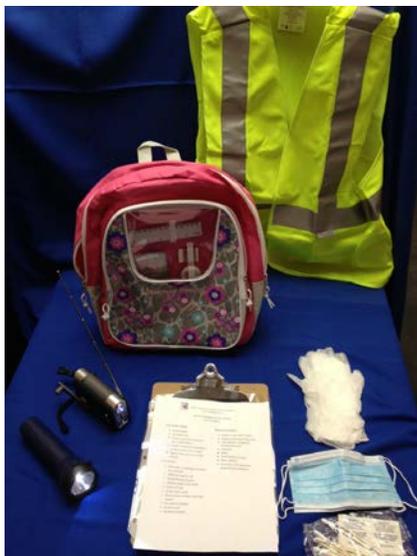
- ❖ Appoint a “Communications Officer” for your school. This person would be in charge of making sure that the school-wide notification system and back up were regularly tested (bell, bull-horn, fog horn etc.). They would verify that teachers had, understood, and tested intra-school communication devices, such as walkie-talkies, and that there were multiple communication systems to receive notification from agencies and first responders. A good fall-back procedure is to have a NOAA weather radio or other portable radio tuned to a local radio station with back-up power. These stations are part of the Emergency Alert System and will broadcast critical information.

Tsunamis generated from distant sources may allow several hours for notification and orderly evacuation, but a locally-generated tsunami can arrive with NO warning other than Nature’s own warning - an earthquake. Past local tsunamis in Hawaii (1868, 1975) allowed only minutes to evacuate between the earthquake tremors and arrival of the first tsunami waves.



3. Evacuation Plan and Materials

- ❖ Many schools have a prominently-marked (red) *tsunami emergency folder* in each classroom and office. This folder should include:
 - a. simple, step-by-step evacuation instructions,
 - b. a clearly marked evacuation map that someone unfamiliar with the school (a substitute) can understand,
 - c. a frequently updated class roster,
 - d. any necessary student medical histories,
 - e. emergency contact information for parents/guardians,
 - f. pencil and waterproof paper for notes.



- ❖ Also, be sure to have any necessary evacuation equipment distributed where needed so as to avoid the time lost picking up equipment from “the office”:
 - a. traffic control vests,
 - b. flashlights,
 - c. walkie-talkies,
 - d. bull horn or whistle and
 - e. traffic control aids.
- ❖ The optimal solution is to have all necessary emergency equipment and materials (essential files, etc.) in a backpack with a note attached for any other items that should be included, but have other regular uses in the classroom or office.
- ❖ The School Nurse or Health Aide should transport a first aid kit and other needed medical supplies to the safe area.
- ❖ Custodial staff should bring toilet paper and trash bags - you don't know how long you'll be in the safe area.
- ❖ Food Services staff should transport liquids to prevent dehydration and non-perishable edibles so the students will have a snack while they wait.

Critical to the smooth operation of any tsunami evacuation plan is the focused, undivided attention and participation of school faculty and staff.

- ❖ Because many faculty and staff have their own families, who are naturally their first priority, it is essential that all faculty and staff have a family emergency plan which can operate without their personal active participation. This should be updated prior to the first day of school each year or with any change in the family situation.

4. Training

All students, faculty and staff should be trained to recognize Nature's warning signs of an impending tsunami both with and without a large local earthquake (water withdrawing or surging inland, strange noise from the sea, etc.), and know the correct action to take. They should also understand the necessary action to take during an earthquake which may occur prior to a local tsunami. They should practice evacuating using the actual primary route, and a back-up route that could be used, during the announced annual training event. At regular intervals there should also be unannounced evacuation exercises when an unprompted response can be determined, analyzed, and if necessary improved upon.

- ❖ Panic: Both students and adults may panic during a real natural hazard event. Drilling to create a practiced response can help prevent panic. Unannounced drills can also help highlight areas that need fine tuning or things that planning and theorizing did not account for.
- ❖ Every Staff Persons' Kuleana: Not only administrators and current teachers should be familiar with the evacuation plan, but also coaches, substitute teachers, and aides, as they may end up



responsible for students during an evacuation.

- ❖ Parents' Kuleana: As part of training for an evacuation, parents/guardians should be repeatedly informed NOT to come to the school, as their children will NOT be there. Parents trying to find their children during an emergency have led to added confusion, needless traffic congestion, and even loss of life during actual tsunami events.

5. Evacuation Mode

All students, faculty and staff should avoid using motor vehicles for evacuation whenever possible. Motor vehicles have proven to be death traps during real tsunami events when panic and the resultant traffic congestion make roads impassable. To this is added the possibility of road and bridge damage from a local earthquake.

- ❖ Evacuate on foot if at all possible.
- ❖ Arrange to have assistance provided for those in need of help during an evacuation by pairing up younger children or slower students with a buddy or older students to assist them.
- ❖ Buddy systems have proven their worth in both tsunami drills and actual events.

6. Evacuation Route

- ❖ Plan your evacuation route and an alternate route bearing in mind a worst-case scenario when a local earthquake might generate landslides at the base of steep slopes, or rainfall might create flood conditions along local streams, storm sewers or flood canals.
- ❖ Tsunamis have been shown to follow streams and flood canals and may therefor propagate much farther inland

than noted on some current evacuation maps.

- ❖ Look for overhead power lines that could fall during an earthquake or high wind conditions, and be aware of any potential hazardous materials (petroleum, gas, sewage lines, etc.) along or near your evacuation routes
- ❖ And update plans as necessary due to changes in any of the above.
- ❖ The last people to leave the school site should be your "*Crisis Team*" who should carry out a final sweep to make sure no one is left behind. It is also important that school utilities such as gas and electric be cut off at their source prior to final evacuation. This can reduce damage to facilities, and avoid potential lawsuits due to collateral damage adjacent to school property.

7. Self-sufficiency

Do not rely on police, fire, civil defense, emergency managers, Red Cross or other agencies during a tsunami emergency. They will have their hands full and/or be unable to reach you. You must be prepared for all eventualities.

Do not plan to evacuate to a Shelter. Shelters are not opened until after a tsunami event has passed, so there will be NO official shelter during an evacuation.

Do not wait to have your evacuation confirmed by the DOE. They may be unable to communicate with your school and you would be left waiting for the disaster to occur.

Develop plans for evenings, weekend and off-campus school activities. A tsunami emergency may strike when school is not in



regular session but school facilities are in use or students are on a field trip or athletic road trip. They will need a plan.

Community Involvement: It is extremely beneficial to collaborate with neighboring schools and communities in practicing evacuation drills since in an actual event, everyone will be trying to evacuate at the same time. It is helpful for everyone to get as clear a picture as possible of what actual evacuation of an entire community will be like. This will also identify things that other groups do, such as the Community Emergency Response Teams (CERT) and help coordinate plans so that they work together to help and not hinder your school's evacuation. This also brings a community closer together in better preparing everyone for such events.

8. All Clear

Do not respond to an "All Clear" message from the media unless it is directly from your own county Civil Defense or Emergency Management (CD/EM) agency. Neither State Civil Defense nor the Pacific Tsunami Warning Center will issue the official "All Clear." This comes only from your own county's CD/EM agency, which will be aware of the local hazard conditions in the communities on your island. They will need time to make sure that each area is safe and to demobilize emergency personnel. You may wish to have your own "School All Clear" wherein your Crisis Team checks for the safety of facilities, and turns utilities back on prior to permitting reentry of school facilities by anyone including staff.

CONCLUSION

During the 2009 South Pacific Tsunami, 149 people were killed by the waves in independent Samoa, which was struck primarily along its southeast coast. In American Samoa, the main island of Tutuila was impacted on all sides by the tsunami, but a total of 34 were lost. The difference has been largely attributed to training at schools in American Samoa prior to the event.



A monument stands at Laupāhoehoe Point to honor the 24 lives lost in the 1946 tsunami.

The 2004 Indian Ocean tsunami struck on a Sunday, but teachers and students died at a village school in Ranong, Thailand. The students and teachers were at their school that Sunday practicing for the annual New Year's dance performance. They had no plan, and did not understand what was happening.

In Kamishi, Japan during the 2011 tsunami, the high school's broadcast system did not function due to a power failure. Fortunately students had performed drills with students from

the nearby middle school. When they observed the middle school students evacuating, they followed suit. Both schools would have sustained heavy casualties had they not evacuated in a timely manner.

Time and again education and training have proven to be the most critical elements in saving lives during a tsunami emergency. Prepare your school for the inevitable tsunami that will strike us here in Hawaii.



SCHOOL TSUNAMI EVACUATION PLANNING TOOL

A Self-Assessment Checklist for School Preparedness

- Understand the Tsunami Warning system and the signals in your area. Have a back-up alert system for notification (for example: NOAA weather radio).
- Understand Nature's Own Warnings (NOW) - see attachment.
- Have a back-up school alert signal that does not depend on power or technology, i.e. a bullhorn or actual bell, and periodically use during drills to familiarize your school with the signal.
- Have a tsunami emergency folder in each classroom and office, ready to grab, containing:
 - evacuation map,
 - class roster,
 - student medical histories,
 - parent emergency contact information.
- Have all necessary equipment (walkie-talkies, traffic control vests, flashlights, etc.) in each classroom and office where needed.
- Ensure that every faculty and staff member has an updated personal family emergency plan.
- All staff (coaches, substitutes, aides, etc.) know the evacuation plan.
- All parents understand that students will **not** be at school but in the safe area and know where that safe area is.
- Evacuate on foot whenever possible - avoid using motor vehicles.
- Have a "Crisis Team" prepared to do a final sweep of all campus facilities and shut off utilities prior to finally securing the campus.
- Drill using the actual evacuation route from school to the safe area, and drill using an alternate back-up route.
- Carry out "unannounced" drills at regular intervals.
- Carry out joint tsunamis drills with any nearby schools.
- Respond only to an "All Clear" from your own County's CD / EM agency.
- Be self-sufficient - do not rely on police, fire, civil defense or other agencies for help.
- Take this very seriously - it could mean the lives of your students, faculty and staff.



Nature's Own Warning Evacuation Signals to Those in the Tsunami Evacuation Zone

Nature's Own Warning (NOW)	Immediate Response	Comment
Feel strong earthquake - have difficulty standing	<p>Protect yourself. If in a Building, Drop to hands and knees to protect yourself from falling objects. Cover your head and neck under sturdy table, desk or with arms and hands. Hold on to something stable. Evacuate tsunami evacuation zone after shaking stops.</p>	Any strong shaking as measured by difficulty in standing, requires you to protect yourself, and then evacuate the tsunami evacuation zone. This is top priority. If in doubt if the shaking is strong or not, evacuate.
Feel weak earthquake	<p>Become Alert - Start counting the duration of shaking in seconds. Don't turn your back to the ocean, observe the water and listen for sounds. Prepare to evacuate the tsunami evacuation zone with little warning.</p>	Feeling an earthquake is likely the first sign you receive related to a locally-generated tsunami. Yet not all earthquakes generate tsunamis. People on Hawai'i generally feel 2-3 earthquakes per year. Since 1901, there have been 6 locally generated tsunamis. ²
Feel earthquake shaking for more than 20 seconds	Evacuate the tsunami evacuation zone	As soon as you feel weak shaking, pay attention to the duration by counting to 20 seconds. Pay attention to the ocean for unusual water changes or sounds.
Feel earthquake and / or hear rumbling noise from ocean - like thunder, truck noise or a jet airliner	Evacuate the tsunami evacuation zone immediately	Sound is often an early warning of imminent danger.
Feel earthquake and hear siren	Evacuate the tsunami evacuation zone immediately	If no earthquake is felt, the siren is your signal to turn on local TV and radio for further instructions and refer to the Civil Defense information in the front of your phone book.
Unusual disappearance of water; exposed reef	Evacuate the tsunami evacuation zone immediately	A later signal – ocean doesn't always recede. May provide enough evacuation time. Better to evacuate if have earlier signals.
Unusual wall of water	Evacuate the tsunami evacuation zone immediately	A later signal – wall of water doesn't always appear first. Even less time to evacuate.



Tsunami Emergency Kit for Schools List of Supplies

ADMINISTRATION SET

(One set per school):

- Walkie-talkie set
- Bull horn
- Whistle
- Portable radio (battery/hand crank)
- Route maps and evacuation plan in Red Folders
- Special Tools (customized by school, i.e. gate keys, bull horn)

OFFICE SET

- Crucial records/documents on flash drives
- Health/medication records for students with special needs

TEACHER SET (One set per teacher)

- Student roster (Red Folder)
- Backpack (distinguishing color)
- Whistle
- Vest for traffic direction
- Flashlight
- Cell phone or walkie-talkie
- Trash bag (bio hazard)
- Clip board, with protector sheet for wet conditions
- Water bottle
- Hand sanitizer
- Snack (crackers)
- Student activity during wait period (i.e. ball, cards)

HEALTH SET - FIRST AID KIT:

- Band-aids, or bandages (variety box 20 pack)
- Adhesive tape (1 roll)
- Gauze Packets (5 pack)
- Alcohol swabs (100 count)
- Hand sanitizer
- Q-tips (100 count)
- Gloves (latex or latex-free) (50 count)
- Eye wash (1 bottle)
- Airway mask
- Ice pack (2 packs)

CUSTODIAN SET

- Special tools: bolt cutters (if applicable)
- Traffic control aids (cones, JPO signs, hazard reflectors, flares)
- Walkie-talkie or cell phone
- Trash bags
- Toilet paper

FOOD SERVICE SET

- Non-perishable snack
- Water or other liquids



Synopsis of Program

The Hawai'i Tsunami Education Curriculum Program (HITEC) is a project of the Pacific Tsunami Museum developed to improve science, math, and technology skills of Native Hawaiian and Hawai'i students. The project is developing curriculum and teacher training serving students in grades 4, 6, 8 and 9 in nine schools on four islands, (Hawai'i, Maui, O'ahu, and Kaua'i), which are located in high risk tsunami and flooding inundation zones. The Program is funded by a three-year grant from the U.S. Department of Education, Native Hawaiian Program. See: <http://discovertsunamis.org>

The Museum is subcontracting with the University of Alaska Fairbanks, Geophysical Institute (GI), and the Pacific American Foundation (PAF) in partnership with a team of cultural advisors and curriculum developers to create a curriculum for the schools and enhance Tsunami Education through a partnership with State Department of Education, the scientific community including the NOAA's tsunami warning centers, the U.S. Geological Survey, the Hawaii Department of Land and Natural Resources, and county civil defense administrators and emergency managers.

An Innovative Program:

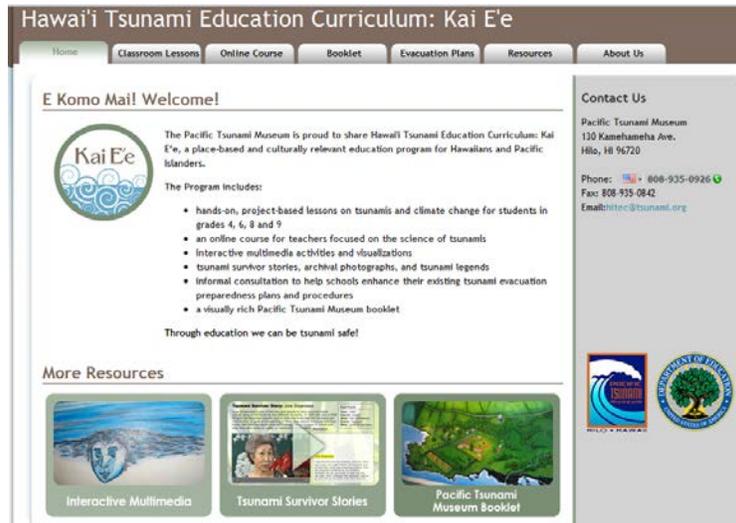
Unlike any other tsunami curriculum available, HITEC will be developed using three specific approaches shown to increase student success:

- 1) a new curriculum titled, "Kai E'E – Mounting Seas: Pacific Tsunami And Climate Change Curriculum," which is a hands-on standards-aligned science, math, and technology curriculum, including service learning projects, scientist and community leader mentorship, and peer-to-peer mentoring to engage students directly in the community as an overall emergency preparedness effort;
- 2) an organizing topic of local, real, and cultural concern: tsunamis, highly relevant to students and communities whose schools are located in inundation zones; and
- 3) a holistic, culturally sensitive approach that values *kupuna* or elders knowledge. Combined science and traditional knowledge can play a major role in saving lives during natural disasters, as in the aftermath of the Dec. 26, 2004 Indian Ocean Tsunami when the Associated Press reported how indigenous knowledge saved the lives of

aboriginal tribes along the eastern Bay of Bengal and how an elementary schoolgirl's knowledge about tsunamis saved the lives of beachgoers.

HITEC Aligns with National and Hawai'i Standards:

HITEC will be designed in alignment with national common core standards for language arts and math and with the Hawaii Department of Education (HIDOE) Content and Performance Standards (HCPS) III for science, as well as General Learner Outcomes (GLOs). The final version will be aligned to national common core science standards. The version will contain student worksheets translated into the Hawaiian language for immersion students. The curriculum's lessons also align to *Nā Honua Maui Ola* (NHMO), Hawaiian Cultural Pathways for Healthy and Responsive Learning Environments, developed by Ka Haka 'Ula O Ke'elikōlani, University of Hawai'i at Hilo with the Native Hawaiian Education Council.



Scientists will ensure scientific accuracy:

University of Hawaii – Hilo Professor Walter Dudley, author of the comprehensive science book, *Tsunami!*, will work with an advisory committee of scientists at PTWC. WCATWC and other agencies to ensure the scientific accuracy of HITEC instruction materials.

Products that endure beyond grant end:

HITEC products will include an extensive **Teacher's Manual** containing 21 hands-on activities that target all learning styles and use multiple assessment strategies. Student worksheets in the Manual will be translated into the Hawaiian language. A **multimedia virtual tsunami laboratory on DVD**, through interactive activities, will help visual learners understand scientific concepts and encourage use of modern technology to pass on oral history and other cultural information on tsunami aftermath, such as traditional song, dance, legends, photos, and art. A permanently maintained **website** will serve as a communication hub for the program. Students and teachers will create several culminating, service-learning projects joining an overall effort of tsunami hazard mitigation. Survivor stories will be archived on the website of the Pacific Tsunami Museum.

Cultural Stewardship: Cultural stewardship lessons will be intertwined with science learning, mirroring life for Native Hawaiian students rooted in their heritage and



living in an ever-changing society. This will include a project where students will identify, label, and add points of cultural importance to GIS/GPS maps of their communities. Another project, the creation of unique digital storytelling, combines tsunami survivor stories from students' communities with information gleaned from scientist lectures and hands-on classroom activities.

HITEC will prepare students to become "first responders." PAF will work closely with the county Civil Defense / Emergency Management administrators to help students learn to become "first responders" for their ohana (family) and communities for disaster preparedness. Students in field-test schools will prepare emergency preparedness and evacuation route fliers to distribute in the community.

HITEC will provide Teacher Training. Throughout the 3-year grant, HITEC will provide comprehensive Teacher Training, curriculum materials, and classroom supplies to the teachers field-testing HITEC. Community Lectures will occur in Hilo after HITEC Teacher Training Workshops, and will be transmitted live through video conference to participating schools, put on DVD, and uploaded to the HITEC website. In Years 2-3, HITEC will provide Teacher Training statewide through a series of professional conferences.

HITEC scientist mentorship for teachers and students. To provide academic and career focus in the sciences for students, HITEC will establish a mentoring partnership between scientists and middle and high school students that builds throughout the three-year program so that it can be maintained beyond grant end. Career role models involved in the sciences and/or service organizations will provide career and higher-education focus for students and expand teacher resources.

A Unique Partnership: The Pacific Tsunami Museum has forged a partnership with the scientific, university, and disaster preparedness communities to harness the expertise of those who study tsunami science and the social impacts. In an outreach effort, the partners will network with civil defense / emergency management administrators on each island, cultural experts, dedicated to promoting public tsunami education, and the Geophysical Institute of University of Alaska Fairbanks, which has professional connections with the both of the tsunami warning centers in the U.S.: the Pacific Tsunami Warning Center (PTWC) and the West Coast and Alaska Tsunami Warning Center (WCATWC).



The Pacific Tsunami Museum is a private, nonprofit founded in 1994 with assistance from the University of Hawaii at Hilo. Located in Hilo the [Museum](#) is self-sustaining with volunteer staff, admission fees, and various public grants to develop exhibits and outreach programs. Its goals are to disseminate public education about tsunamis for the safety

of people of the Pacific Region; preserve the social and cultural history of Hawaii in regard to major tsunamis which affected the development of these areas; serve as an international center for fostering tsunami research, education, and cultural exchange; and serve as a living memorial to those who have lost their lives to tsunamis. [Dr. Walter Dudley](#) is co-founder of the Museum, chair of the Scientific Advisory Committee, and Emeritus Professor of Oceanography, University of Hawai'i at Hilo.



The Pacific American Foundation (PAF) serves The Museum as a subcontractor and is a nonprofit organization dedicated to improving the lives of Pacific Americans. Established in 1993, the PAF has created a variety of culturally-based and place-based curricula and teacher trainings for public schools including: [Kahea Loko](#), (about the Fishpond), [Aloha 'Aina](#), (the ahupua`a system), and [Malama Kaho'olawe](#), currently being used in classrooms across Hawai'i. PAF also conducts numerous teacher-training sessions throughout the year to help teachers increase student achievement.



Geophysical Institute (GI), University of Alaska Fairbanks serves The Pacific Tsunami Museum as a subcontractor and is a leading arctic and geosciences research center. In partnership with ALU LIKE, Inc., the GI developed a Native Hawaiian culture-based earth and space curriculum, "[Ola Ka Honua: Volcanoes Alive](#)," that comprises a complete 8th grade course, which has been accepted on the HIDEOE's recommended curricula list as supplemental material. It is available in both English and fully translated into Hawaiian. The GI has also conducted a similar project, [Alaska Tsunami Education Program](#) for Alaska students.

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