

Earthquakes K-2

Earthquake Safety



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at www.redcross.org/disaster/masters

LESSON PLAN 4

Tsunamis

Young children should understand that earthquakes can cause tsunamis, and if they live near the water, they should be prepared to go inland and uphill to high ground.

Key Terms and Concepts

coast
earthquake
high ground

inland
Ring of Fire
sea level

seiche (SAYSH)
tsunami (harbor
wave)

Purposes

To inform the students and their families about when and where a tsunami might occur

To help the students and their families learn what to do if a tsunami is expected

Objectives

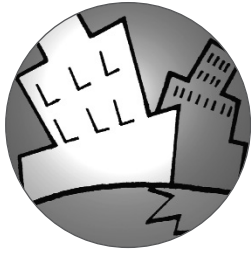
The students will—

- Define and describe waves using demonstrations in water.
- Discuss one or more classroom demonstrations to understand the characteristics of waves.
- Use video, books and pictures to grasp the size and power of tsunamis.
- Search a map or globe to identify the Ring of Fire and point out areas in the United States and its territories that are at risk of experiencing a tsunami.
- Determine whether or not they live in a tsunami-risk zone.
- Use *Is It Tsunami Safety?* to identify and determine safe and unsafe actions during a tsunami and why.
- Refer to *Is It Tsunami Safety?* to help their families discuss safe actions in case of a tsunami WARNING. (Home Connection)
- Explain the adage “Better safe than sorry” and identify situations that could prove the adage true. (Linking Across the Curriculum)

Activities

“What Is a Tsunami?”

“Go to High Ground”



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Materials

Ocean Wave Simulation

- 2-liter clear plastic bottle
- Measuring cup
- 5 ounces (150 ml) water
- 5 ounces (150 ml) vegetable oil
- 3-4 drops blue food coloring

Wave Formation

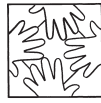
- Bucket, two-thirds full with water
- Pebble
- Baseball bat or stick

The Seiche

- 9" x 13" (23 x 33 cm) cake pan or plastic container, half full with water



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"What Is a Tsunami?"

SET UP 10 minutes CONDUCT 35-45 minutes

Science: Earth Science

1. Have the students talk about waves: Where have you seen waves? What do waves do? How do you know they are powerful?
2. Next, complete all or any of the following demonstrations to give the students an understanding of waves.

Ocean Wave Simulation

Measure about 5 ounces (150 ml) of water and pour it into the plastic bottle. Measure about 5 ounces (150 ml) of oil. Place several drops of food coloring into the oil and pour the mixture into the plastic bottle. The oil will float on top of the water. Shift the bottle left to right, simulating an ocean wave. Have the students observe as the wave grows larger from one end of the bottle to the other.

Wave Formation

Fill the bucket about three-quarters full of water. Set the bucket on a flat surface and wait while the water becomes still. Drop a pebble in the middle of the water. Have the students watch the waves form and describe what happens to the waves farther from the where the pebble was dropped. (As the waves flow away from the pebble [the epicenter of the disturbance], they decrease in height and the ripples [troughs] become further apart.)

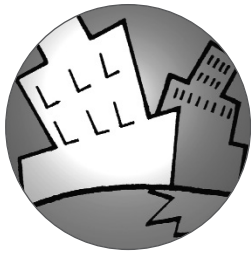
Let the water become still once more and then strike the side of the bucket near the bottom to let students see how the ripples form. Are the ripples smaller or larger on the side where you struck the bucket? (Once again, the waves decrease as they move away from the place of the disturbance that caused the waves.)

TEACHING NOTE If you could conduct this experiment in a pool of water where the depth becomes gradually shallower near the shore, the waves would increase in size as they approached the shore.

The Seiche

Fill the 9" x 13" cake pan or plastic container three-quarters full of water. Hand the pan of water to a student and ask him or her to walk a few steps holding the pan. The water will begin to slosh. Ask the student to stand still; the water continues to slosh. Have the student pass the pan to another student, who tries to walk with it without spilling the water. Discuss the waves created by the movement and how difficult it is to stop or control them.

TEACHING NOTE Although seiches can be caused by earthquakes, they are not tsunamis, but waves that occur within enclosed pools or lakes.



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Wrap-Up

After “making waves” with the class, ask the students to describe what they learned.



Listen to ascertain that students understand—

- An ocean wave is formed by a disturbance in or under the water.
- Waves can increase in size as the water becomes shallower.
- Waves move quickly and cannot be stopped.



Write the word “tsunami” on the chalkboard. Explain that in Japanese, tsunami means “harbor wave.” Tsunamis are most often caused by earthquakes, but they could be caused by a landslide, an erupting volcano or even a large meteor, similar to the pebble in the bucket demonstration.

Select one of the following to introduce students to the size and power of a tsunami.

Video

“The Wave: A Japanese Folktale.” This video, available in many libraries and from <http://www.phoenixlearninggroup.com> or BFA Educational Media, 1-800-221-1274, tells the tale of a wise farmer who saves the residents of a small island from a tsunami. He sets their rice on fire to get them to climb uphill. Afterwards, they install a bell to warn of future tsunamis. The video is based on a picture book with the same title by Margaret Hodges (Houghton Mifflin, 1964).

Picture Book

The Magic Fan by Keith Baker (First Voyager Books, 1989). This picture book tells the story of a carpenter who lives in a Japanese village. He saves the residents on his island by building a bridge and getting them all to climb it to safety before a tsunami. The artwork is beautiful, but there is a need to emphasize that the bridge is a metaphor for high ground.

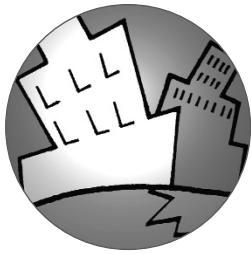
Online

The Japanese woodcut “The Great Wave” by Katsushika Hokusai (1760–1849), showing a tsunami with Mount Fuji in the background, is often used to illustrate tsunamis. The artwork, produced in 1831, is in the public domain and can be accessed at many Web sites, including <http://www.ibiblio.org/wm/paint/auth/hokusai/great-wave.jpg>.

Interestingly, most tsunamis do not break like the wave in the woodcut and, although big, they do not dwarf a mountain. Showing the artwork is a way to begin talking about waves and tsunamis.



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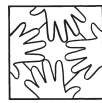
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Materials

- World map or globe
- *Is It Tsunami Safety?* 1 copy per student



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"Go to High Ground"

SET UP 5 minutes CONDUCT 30 minutes

Science: Health; Social Studies: Geography

TEACHING NOTE Tsunamis can occur in the United States and its territories in the following coastal areas: California, Oregon, Washington, Alaska, Hawaii and the Pacific Basin territories of Guam, Northern Marianas and American Samoa.

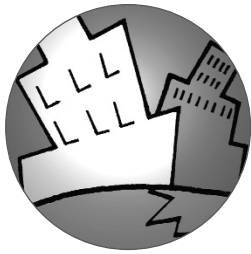
Although tsunamis can occur in the Atlantic Ocean, they are very rare because there is far less geologic activity. The Indian Ocean had not had a tsunami since the 1800s until the devastating 2004 tsunami hit Indonesia and surrounding areas. However, because of this tsunami event, experts are beginning to work toward a global warning system for tsunamis, not just a Pacific Basin system.

1. Once the students locate where they live on a world map or globe, draw a circle that encompasses the Ring of Fire. (An excellent map from the U.S. Geological Survey can be found at <http://pubs.usgs.gov/gip/dynamic/fire.html>.)

TEACHING NOTE For older students, write the list of U.S. states and territories that could be threatened by a tsunami and have them locate each on the map in order to identify the "Ring of Fire."



2. Studying the map, ask the class whether or not they live within the Ring of Fire. If so, they are in a tsunami-risk zone.



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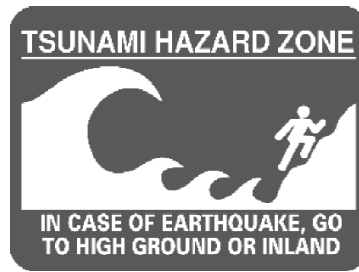


Image courtesy of the U.S. Geological Survey.

3. Distribute *Is It Tsunami Safety?* Ask the students to circle the safe actions to take in case of a tsunami WARNING and put an X over the unsafe actions.



Wrap-Up

As a class, review the pictures and captions to discuss the safe actions to take if you live or visit where a tsunami is possible.



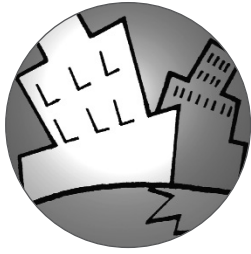
Have the students explain their reasons for identifying both safe and unsafe actions.

Answers to *Is It Tsunami Safety?*

1. **Safe.** If you live in an area where tsunamis are possible, an earthquake longer than 20 seconds could trigger a locally generated tsunami. This type of tsunami could arrive minutes after a strong earthquake has been felt and you must evacuate for high ground immediately after you have **Dropped, Covered and Held On** during the earthquake.
2. **Safe.** The first indication of an approaching tsunami could be water suddenly receding from the shore. You must go to high ground—at least 100 feet (30 meters) above sea level—immediately.
3. **Safe.** The first indication of an approaching tsunami could be an unusual rise in the water along the shore. You must head inland and up to high ground immediately.
4. **Safe.** Stay at your safe evacuation spot until you hear the All-Clear Signal. Tsunamis are a series of waves that could last over a period of several hours—the first wave is not usually the largest.
5. **Unsafe.** If the water recedes unexpectedly, a tsunami that has been generated by a distant source could be following immediately. The coming wave is incorporating, or swallowing, the receding water.



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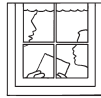


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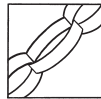
6. **Unsafe.** Tsunamis move quickly. You may have as little as 15 minutes to reach your place of safety. Often, there are so many cars trying to cross bridges that it's imperative to be able to evacuate on foot to a location about 100 feet above sea level within 15 minutes.

TEACHING NOTE If your school is in a tsunami-risk area, conduct a drill of Drop, Cover and Hold On, followed by a tsunami evacuation. Follow the school's planned route or other predesignated evacuation route. Remind students that in case of a real tsunami they might be waiting several hours in their safe place.



Home Connection

Send home *Is It Tsunami Safety?* with the students. Have them review the answers and reasons with their parents. They should identify the signs that tell them where and how to evacuate in case of a tsunami WARNING and practice walking to high ground.



Linking Across the Curriculum

Language Arts: Writing; Science: Health; Fine Arts: Visual Arts

Tsunami WATCHES and WARNINGS are not perfect. Often, one particular beach experiences a tsunami while another nearby does not. A locally generated tsunami could occur after a 20-second earthquake, or 5 minutes of quaking. Have the students explain how the adage "Better safe than sorry" applies to tsunamis. As a class, create a list of times the adage could prove true.

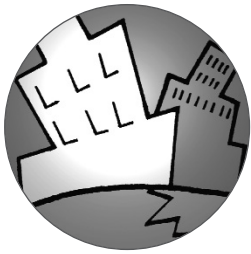
For example:

- Not studying for a spelling test because it might snow tomorrow.
- Not taking your raincoat or an umbrella because the weather forecast is not always right.
- Not getting your flu shot this year because you didn't catch the flu last year.
- Not looking carefully when you cross the alley because cars don't usually come that way.
- Not testing your smoke alarms because you just put in a new battery a couple of months ago.

Have students illustrate warning signs based on statements from the class list and entitled "Better Safe Than Sorry."



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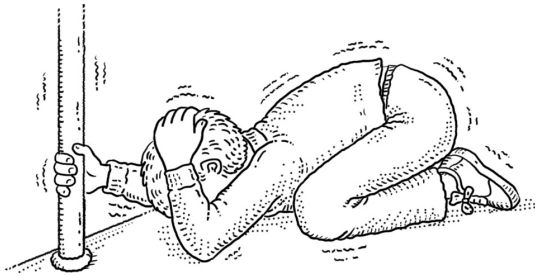


Is It Tsunami Safety?

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Name _____

Directions: If you are in a tsunami-risk zone, you need to know the safe actions to take in case there is a tsunami. What should you do? Circle each safe action. Place an "X" across each unsafe action or statement.



1. "If you feel an earthquake that lasts for 20 seconds or more, go uphill and inland as soon as the shaking stops."

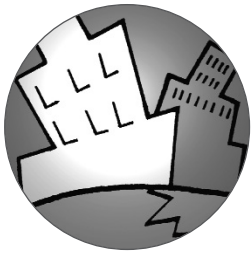


2. "If the sea level suddenly drops, go to high ground."



3. "If the sea suddenly rises, go to high ground."



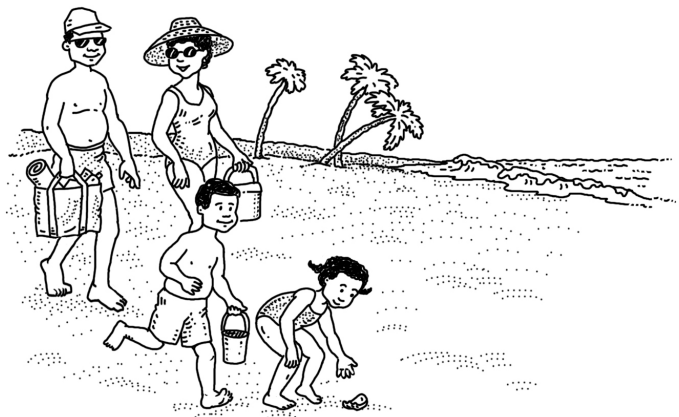


Is It Tsunami Safety?

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4. “Stay in your safe place until the All-Clear Announcement or more than an hour after the last wave.”



5. “Walking on the beach when the water is so far away is really safe.”



6. “There’s plenty of time to get to high ground when the tsunami warning sounds.”

