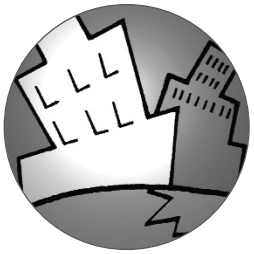

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Earthquake Safety

American Red Cross

Visit the American Red Cross Web site
at *www.redcross.org/disaster/masters*

LESSON PLAN 5

Tsunamis

Students must understand how earthquakes cause tsunamis. If they live in or visit a coastal area prone to tsunamis, they should be prepared to go inland and uphill to high ground.

Key Terms and Concepts

coast
earthquake
evacuation
high ground
inland
Ring of Fire
sea level
tsunami
tsunami detection
tsunami WARNING
tsunami WATCH

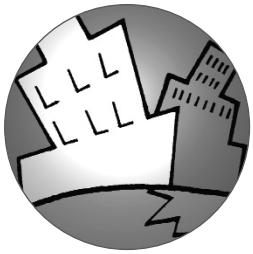
Purpose

To have the students use their knowledge and research to identify and share science and safety information on tsunamis

Objectives

The students will—

- Use the KWHL chart on *In the Know* to guide group research on tsunamis.
- Conduct research to classify, gather and share information on tsunamis.
- Read *The Big Wave* by Pearl S. Buck to discover cultural information about areas where tsunamis occur and write character studies to describe the experience. (Linking Across the Curriculum)
- Research to find and share information about past tsunamis. (Linking Across the Curriculum)
- Research the 2004 Indonesian Sumatra Tsunami, and the earthquake which caused it, to create an audiovisual presentation designed to promote tsunami safety. (Linking Across the Curriculum)
- Use 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 they live in a tsunami-risk zone.
- Read and discuss articles about safe escapes from tsunamis to determine what is necessary for public education.
- Use the Background and online resources to identify and classify actions during a tsunami as safe or unsafe.
- Create and disseminate a class education product for tsunami safety.



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LESSON PLAN 5

Tsunamis

- Use the class product to help families discuss safe actions in case of a tsunami WARNING and to disseminate safety information throughout the community. (Home Connection)
- Use the Internet to research and conduct a roundtable discussion on tsunami detection and warning programs run by the government. (Linking Across the Curriculum)
- Explain the adage "Better safe than sorry" and identify situations that could prove the adage true. (Linking Across the Curriculum)
- Experience the tsunami detection system online and discuss the National Oceanic and Atmospheric Administration's response for tsunami safety. (Linking Across the Curriculum)
- Use the Internet to research tsunami devastation. (Linking Across the Curriculum)

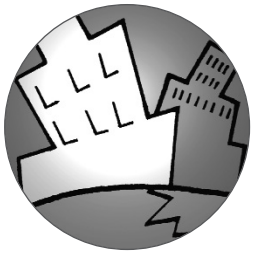
Activities

"Tsunami 411"

"Go to High Ground"

American Red Cross

Visit the American Red Cross Web site at *www.redcross.org/disaster/masters*



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LESSON PLAN 5

Tsunamis

Materials

- *In the Know*, 1 copy per student
- Chart paper and markers
- Internet and/or media center access for research
- Tsunami Science and Safety (from the Background), 1 copy per group
- *The Big Wave* by Pearl S. Buck (Harper Collins 1947, 1976) (Linking Across the Curriculum)

American Red Cross

Visit the American Red Cross Web site at *www.redcross.org/disaster/masters*

"Tsunami 411"

SET UP 10 minutes **CONDUCT** 60 minutes, plus research and presentation

Science: Earth Science; Language Arts: Reading and Research

TEACHING NOTE KWHL is an acronym for a teaching approach that builds on past knowledge to advance learning. Students can work individually or in small groups to begin the KWHL process. Label each of three sheets of chart paper with one of the phrases that compose the acronym KWHL: "What We **K**now," "What We **W**ant to Know" and "**H**ow We Can Find Out." Later, the students will complete "What I **L**earned."

1. Write the word **"TSUNAMI"** in large, bold letters on the chalkboard. As students enter the class, distribute *In the Know* and provide time for individuals or small groups to write down everything they know about tsunamis.

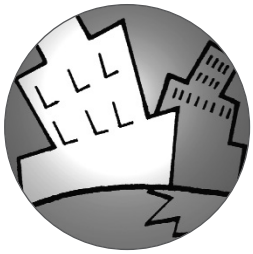
2. As the students complete the first three columns of their KWHL charts, ask them to transfer their information to the three class charts: "What We Know," "What We Want to Know" and "How We Can Find Out." Remind the students not to duplicate information if others have already included facts, questions or resources that they have also listed.

3. After all the students have added to the class lists, tape them at the front of the class. As whole group, divide the information ("What We Know") and questions ("What We Want to Know") into categories. For example:

   - Information from "What We Know" could be categorized under where or when tsunamis occur, what a tsunami can do or the 2004 Indonesian Sumatra Tsunami.
   - Questions from "What We Want to Know" could be categorized under similar topics, such as the physics of wave formation and travel; the speed of a tsunami wave; the technology for detecting tsunamis; or education about tsunami safety.

   List the categories on separate sheets of chart paper.

4. Next, divide the class into small groups, based on the categories devised. As a class, discuss the resources available, those listed on *In the Know* and the additional resources suggested on the class chart. Allow time for group research with Tsunami Science and Safety in the Background to *Earthquakes*, class science and geography texts, the Internet, the library and the media center.



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LESSON PLAN 5

Tsunamis

Wrap-Up

As students conduct their research, have them keep track of the information they find using the fourth column of *In the Know*. Have the groups share the information for their assigned categories on chart paper entitled: "What We Learned: _____ (category)." Ask each group to present its findings and describe the resources used.

As a class, apply the following questions to assess the research:

- Were all questions answered clearly and adequately? Explain.
- Was "misinformation" discovered in the "What We Know" column and corrected?
- Were the resources the students consulted reliable? Why or why not?

Linking Across the Curriculum

Language Arts: Reading and Writing

Either read to the class or have the students read *The Big Wave*, by Pearl S. Buck. This short book about a tsunami that destroys a village in Japan provides an excellent view of culture and coping with a natural disaster. Have the students write character studies for the people in the story. Challenge some students to include the volcano and the tsunami as important characters as well.

TEACHING NOTE Points to include in a character study:

- Introduction to the main points about the character—name, physical attributes, family, etc.
- Ways the character developed or changed throughout the story
- Personal viewpoint of the character, supported by examples of actions or quotes

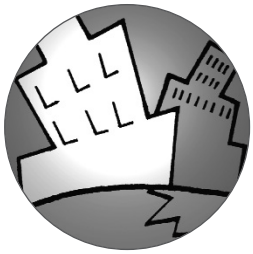
Science: Earth Science; Social Studies: History

Assign small groups to research past tsunamis to better understand these natural phenomena. Tsunamis to consider: Chile, 1960; Alaska, 1964; New Guinea, 1998; Indonesia, 2004. Questions to answer:

- Where and how did the tsunami originate?
- How far did the wave travel?
- Which areas were affected?
- Was there warning?
- What was the damage?

American Red Cross

Visit the American Red Cross Web site at *www.redcross.org/disaster/masters*



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LESSON PLAN 5

Tsunamis

American Red Cross

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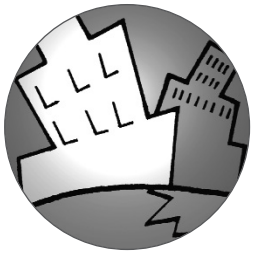
Science: Earth Science; Social Studies: History and Geography; Language Arts: Research and Presentation

The Indonesian Sumatra Tsunami that occurred on December 26, 2004, was one of the most devastating ever in terms of loss of life, economic loss and ecological damage. Invite interested students to create an audiovisual presentation of the tsunami, using it as an impetus to promote tsunami safety. The following Web sites are excellent resources: Center for Tsunami Research at *http://nctr.pmel.noaa.gov/sumatra20041226.html* and the College of Earth and Mineral Science at *http://homepage.mac.com/demark/tsunami/*.



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LESSON PLAN 5

Tsunamis

Materials

- World map or globe
- Internet access or copies of news printouts
- Tsunami Safety (from the Background), 1 copy per student
- Chalkboard and chalk or chart papers and markers

American Red Cross

Visit the American Red Cross Web site at *www.redcross.org/disaster/masters*

"Go to High Ground"

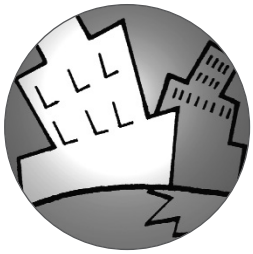
SET UP 5 minutes **CONDUCT** 60 minutes, plus research time

Science: Health; Social Studies: Geography; Language Arts: Reading and Discussion

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

Although tsunamis can occur in the Atlantic Ocean, they may be considered a lower threat because there are fewer earthquakes. The Indian Ocean had not had a tsunami since the 1800s until the devastating 2004 tsunami hit Indonesia and surrounding areas. With this occurence, however, people are beginning to work toward a global warning system for tsunamis, not just a Pacific Basin system.

1. Write the list on the chalkboard of the U. S. states and territories that could be threatened by a tsunami. When the students have found each on a large 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*.)



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LESSON PLAN 5

Tsunamis

2. Next, have the students explain whether or not they live within the Ring of Fire. If so, you are in a tsunami-risk zone.

Image courtesy of the U.S. Geological Survey

3. Tsunamis can be devastating, but you can stay safe. Divide the class into two groups. Have one group read and discuss "10-Year-Old Honored For Saving Lives In Tsunami" from KPIX TV at *http://cbs5.com/topstories/local_story_307175210.html*. Have the other read and discuss "Knowledge can save many lives—Disaster Lessons" from the *Medical News Today* at *http://www.medicalnewstoday.com/printerfriendlynews.php?newsid=32174*.

4. Come together as a whole group to discuss the articles.
   - What do the two stories have in common? (In both instances, lives were saved because of prior knowledge. Both the young British girl, Tilly Smith, and the Simuelue villagers read the clues about what was coming and knew to run immediately to high ground.)
   - How were the stories different? (Tilly Smith had learned about the warning signs and safety steps for a tsunami in a formal geography class. The Simuelue villagers had the story and how to stay safe passed down to them by survivors of the 1907 earthquake-induced tsunami.)
   - Why did so many others die all around the Indian Ocean? (There was no official warning system. When warning calls were made, many were ignored or people did not know what to do or where to go to stay safe. Geography may have been a factor, since people had to travel quite a way to get to high ground.)
   - What can be learned from these stories? (There needs to be a better system for detecting and warning people about possible tsunamis. People need to be better educated about warning signals and what to do in case of a tsunami. People should not worry about false alarms, but be willing to go to high ground immediately if they live in a tsunami-risk zone AND if there's been a very large local earthquake, or if a tsunami WARNING has been issued for a tsunami generated some distance away.)

American Red Cross

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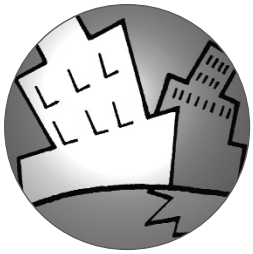

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LESSON PLAN 5

Tsunamis

5. Distribute the Tsunami Safety section in the Background to small groups of students. Challenge them to use the information and other resources to create posters, brochures, slide shows or other presentations aimed to help vulnerable communities stay safe in case of tsunamis.

   Tsunami Safety Sites:

   - The American Red Cross: Tsunami, at *http://www.redcross.org/services/disaster/0,1082,0_592_,00.html*
   - The National Weather Service: West Coast and Alaska Tsunami Warning Center, at *http://wcatwc.arh.noaa.gov/tsunamiready/safety1.pdf*
   - The National Weather Service: What You Should Do, at *http://www.nws.noaa.gov/om/brochures/tsunami6.htm*

Wrap-Up

Reserve time for small group tsunami safety presentations.

As students present their information and education products, discuss and observe for accuracy, clarity and completeness as well as appearance and presentation.

As a class, judge the group products and determine which ideas should become part of a class product used to educate the school community and students' families. Implement the class ideas to create a product that can be distributed throughout the community.

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

Home Connection

Have students share the class tsunami safety product with their families. Invite family members to help disseminate the information through work or community groups in which they participate.

American Red Cross

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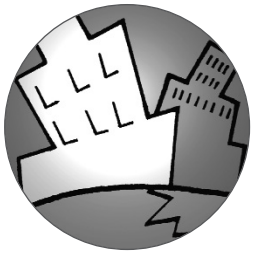

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LESSON PLAN 5

Tsunamis


Linking Across the Curriculum

Social Studies: Government

The federal government is working to improve tsunami protection in the United States and the world. Ask interested students to find out more about the international tsunami detection and warning system, using the Fact Sheet from the Office of Science and Technology Policy at *http://www.ostp.gov/html/TsunamiFactSheet.pdf*. The students will continue online research based on the key components, data and resources cited there. Have the group present their findings in a roundtable discussion entitled "Are We Ready: Tsunami Detection and Warning Worldwide." If possible, invite community emergency responders to join the dialogue.

Science: Earth Science and Health; Social Studies: Government and Geography; Mathematics: Charts and Graphs

Let students experience the tsunami detection system at work. As a class, visit the Pacific Tsunami Warning Center at *http://www.prh.noaa.gov/pr/ptwc/bulletins.htm* to access and discuss the latest seismic events and the response of the National Oceanic and Atmospheric Administration.

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

Tsunami WATCHES and WARNINGS are not perfect. Often, one 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 occasions when 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 the students illustrate warning signs based on statements from the class list and titled entitled "Better Safe Than Sorry."

American Red Cross

Visit the American Red Cross Web site at *www.redcross.org/disaster/masters*

In the Know

Name _____

Directions: It's important to understand the science of tsunamis in order to understand how to stay safe. Before you begin to learn about tsunamis, complete the K-W-H columns of the chart below to see just how much you already know and what you want to learn. Then, conduct research to complete the L column.

K What I KNOW	W What I WANT to Know	H HOW I can find what I want to learn	L What I LEARNED
		NOAA: Tsunami *http://www.tsunami.noaa.gov/*	
		USGS: Tsunami *http://walrus.wr.usgs.gov/tsunami/index.html*	

Note: NOAA=National Oceanic and Atmospheric Administration; USGS=U.S. Geological Survey

American Red Cross

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