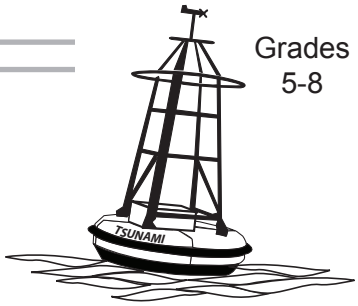
Local Warning

Grades 5-8



Overview:

Students interview local emergency managers to learn about tsunami warning systems. They research and consider the strengths and limitations of different types of warning systems and propose ways to improve local warning.

Targeted Alaska Grade Level Expectations:

Science

[5] SE1.1 The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by identifying a community problem or issue and describing the information needed to develop a scientific solution.

[6] SE1.1 The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by recognizing that technology cannot always provide successful solutions for problems or fulfill every human need.

[5] SE2.1 The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity by investigating a problem or project over a specified period of time and identifying the tools and processes used in that project.

[6] SE2.1 The student demonstrates an understanding that solving problems involves different ways of thinking by identifying and designing a solution to a problem.

[7-8] SE2.1 The student demonstrates an understanding that solving problems involves different ways of thinking by identifying, designing, testing, and revising solutions to a local problem.

Targeted Alaska Cultural Standards:

[C2] Culturally knowledgeable students are able to actively participate in various cultural environments. Students who meet this cultural standard are able to make constructive contributions to the governance of their community and the well-being of their family.

Objectives:

The student will:

- identify safety advice and tsunami knowledge in a traditional story about tsunami warning;
- interview an emergency manager about local tsunami warning systems;
- identify the strengths and limitations of the local system;
- research tsunami warning systems;
- propose ways to improve local tsunami warning systems; and
- demonstrate an understanding that tsunami warning system technology cannot always provide adequate warning for locally generated tsunamis—people must heed natural warnings.

Materials:

- Computers with internet access
- Chart paper and markers or the board
- STUDENT WORKSHEET: “Local Warning”
- STUDENT WORKSHEET: “A Traditional Tsunami Warning Story”
- STUDENT INFORMATION SHEET: “Tsunami Hazard Mitigation Planning”

Whole Picture:

NOAA's West Coast and Alaska Tsunami Warning Center (WCATWC) is responsible for monitoring and issuing warning when a tsunami is likely to strike Alaska and the West Coast. Warnings are broadcast through NOAA Weather Radio and the Emergency Managers Weather Information Network. Visit the following address to learn the NOAA Weather Radio frequency for your area: http://wcatwc.arh.noaa.gov/tsunamiready/nwr.pdf.

NOAA Weather Radio is also part of the Emergency Alert System, which reaches a range of broadcasters and local emergency management officials. When a tsunami is imminent, WCATWC also makes direct contact with at-risk communities, posts warnings on WCATWC and National Weather Service websites, and issues warnings via a public e-mail list server. The Alaska division of Homeland Security and Emergency Management also receives the message and helps to pass warnings to communities, and the US Coast guard relays the message via radio.

Individual coastal communities have different means of issuing tsunami warnings on the local level, including Emergency Alert Systems, Cable Overrides, NOAA Weather Radio in public buildings, sirens, and other systems. Communities also have different protocols for responding to a warning. It is important for those living in or visiting tsunami prone areas to know and understand the tsunami warning and response protocol in their location. It is essential that residents learn to heed both natural and official tsunami warnings because many of the tsunamis that strike Alaska are locally generated, meaning there is often little or no time to issue an official warning. Natural tsunami warnings include: (1) an earthquake that lasts 20 seconds or longer and makes it difficult to stand up; (2) a sudden, noticeable rise in coastal water; (3) water drawing back from the coast, leaving an expanse of sea floor visible; and (4) a roaring sound from the ocean.

NOAA'S National Weather Service has developed a program to help coastal communities prepare for a tsunami event. The TsunamiReady™ program (http://www.tsunamiready.noaa.gov/) connects community planners with tsunami experts and lays out criteria that participating communities must meet to be deemed TsunamiReady™. Some of these criteria include: (1) establish a 24 hour warning point and emergency operations center; (2) have more than one way to receive tsunami warnings and to alert the public; (3) promote public readiness through community education and the distribution of information; and (4) develop a formal tsunami plan, which includes holding emergency exercises. Visit the West Coast and Alaska Tsunami Warning Center website at (http://wcatwc.arh.noaa.gov/) to see a list of TsunamiReady™ communities and to download brochures and information about how to prepare for a tsunami event. As of September 2009, only 5 Alaska communities were TsunamiReady™.

Activity Preparation:

1. Identify a local emergency management official responsible for public safety and emergency preparedness. This may be a village public safety officer, police officer, fire chief, an Elder, a church leader or other official person. The clinic staff, village tribal council, and librarian all are likely to know who the local emergency manager is.
2. Arrange a time for the official to visit your classroom to share their knowledge of the local tsunami warning system and other local emergency warning systems.
3. Prior to the visit, explain to students they will learn about the local tsunami warning system by interviewing a local emergency manager. Ask students to work in groups to come up with at least 5 questions to ask the emergency manager. Appropriate questions might include: How do you know when to issue a local warning? How do you make sure everyone in the community knows about the warning? Is there always someone "on call" to receive a warning? Is there more than one way to receive a warning? Do you always have time to issue a warning before a tsunami strikes? What should residents do when they learn about a warning?

4. As a class, create a comprehensive list of interview questions from those the groups came up with. Make copies of this list to distribute to all students on "Interview Day." Leave room for note-taking beneath each question.

Activity Procedure:

1. Distribute the STUDENT WORKSHEET: "A Traditional Tsunami Warning Story" and begin by reading the story. Discuss safety tips and knowledge embedded in the story (i.e. get to high ground, heed warnings, there will likely be more than one wave). Explain this traditional story from Atka and surrounding villages passes on valuable information about how to respond to a tsunami warning. Ask students to answer the question at the bottom of the page.
2. Explain today students will interview a local emergency manager to find out how their community receives warning before a tsunami strikes. Distribute the interview question list to each student. Explain you have left room for note-taking beneath each question. Remind students to listen carefully because the guest may answer the questions before they are asked.
3. Welcome the emergency manager and facilitate the visit. Encourage students to ask questions as appropriate. (Note: Know your interviewee. Some will feel comfortable with impromptu questions, while others will need students to listen quietly but may invite questions at the very end. Ask your interviewee ahead of time when they would like to take student questions. Most Alaska Native cultures value attentive listening and careful observation.) Thank the emergency manager for their time. Remember to have students make thank you cards to deliver later.
4. After the Emergency Manager has departed, discuss new learning about the local tsunami warning system. Students should take advantage of this discussion to jot down further notes on their question list.
5. Now that students know about the tsunami warning system in place in their community, brainstorm strengths and weaknesses of that system. Create a class list of system strengths and weaknesses on the board. Use the Wait Time Method to ensure all students have time to think and contribute:

   Critical Thinking: *Wait Time Method*: Ask students to brainstorm some strengths and weaknesses of the local tsunami warning system. Explain that in order to give students time to think about their answers, you will not call on anyone immediately. Select a wait time between 15 seconds and 5 minutes. When the time is up, begin selecting students to answer.

6. Write student brainstorms on a piece of chart paper and keep the paper posted for reference. Distribute the STUDENT INFORMATION SHEET: "Tsunami Hazard Mitigation Resources" and explain that hazard mitigation consists of actions taken to reduce or eliminate risk to life and property from a hazard event. The tsunami warning and response plans of the community are hazard mitigation plans.
7. Ask students to visit the websites on the information sheet to learn what is recommended for local tsunami warning systems. You may wish to divide students into teams for this activity. Ask students to take notes on what they learn and to watch for ways to address weaknesses in local warning plans.
8. Reconvene as a class and discuss student findings. Distribute the STUDENT WORKSHEET: "Local Warning" and ask students to complete it. Ask student to share their findings and ideas with at least one parent or other adult in their community.

Extension Ideas:

- Arrange for students to visit local emergency facilities and view emergency equipment (tsunami shelter, siren, etc.). Ask a local emergency manager to walk them through the local process of responding to tsunami warning, watch or advisory.

- Use a NOAA weather radio in your classroom. Visit http://wcatwc.arh.noaa.gov/tsunamiready/nwr.pdf to learn the radio frequency for your area. Listen to the radio with students and discuss emergency broadcasts. Sign up to be on the WCATWC Tsunami Watcher e-mail list. Visit the Tsunami Watcher mailing list site at http://wcatwc.arh.noaa.gov/watcher/tsunamiwatcher.php to sign up for the list serve. Share warning e-mails with students and make sure they understand the content.
- One of the criterion communities must meet to be considered TsunamiReady™ includes promoting public readiness through community education. Ask students to write and illustrate a children's book for local preschoolers that teaches youngsters about local tsunami safety.
- Ask students to create a skit of the traditional tsunami warning story featured in the lesson. After practicing they can perform the skit for an audience of parents or primary students.

Answers:

STUDENT WORKSHEET: "A Traditional Tsunami Warning Story"

1. Answers will vary but should include safety advice such as "heed tsunami warnings" or "get to high ground." Answer also may include tsunami knowledge such as "there will be more than one wave."

STUDENT WORKSHEET: "Tsunami Hazard Mitigation Planning"

1. Answers will vary but should include safety advice such as "heed tsunami warnings" or "get to high ground." Answer also may include tsunami knowledge such as "there will be more than one wave."
2. C.
3. The following items should be identified:
   - an earthquake that lasts 20 seconds or longer and makes standing difficult
   - a sudden, noticeable rise in coastal water
   - water drawing back from the coast, leaving an expanse of sea floor visible
   - a roaring sound from the ocean
4. Answers will vary but should indicate that people near the coast must evacuate to high ground or inland.
5. Answers will vary but should reflect understanding of the current local tsunami warning and response plan.
6. Answers will vary but should directly address weaknesses identified in the previous question.
7. Answers will vary but information should support improvements recommended in the previous question.

Lesson Information Sources:

Atwater, B.F., Cisternas, M.V., Bourgeois, J., Dudley, W.C., Hendley II, J.W., and Sauffer, P.H. (2005). *Surviving a Tsunami: Lessons from Chile, Hawaii, and Japan.* USGS,Reston, VA. Retrieved 4 May, 2009.

Intergovernmental Oceanographic Commission. (2008). *Tsunami, The great waves, revised edition.* Paris, UNESCO, 16 pp., illus. IOC Brochure 2008-1 (English). Retrieved 4 May, 2009. http://www.tsunamiready.noaa.gov/

Kodiak Emergency Services Organization. (2005). *Kodiak area emergency operations plan.* Retrieved 12 May, 2009 http://www.city.kodiak.ak.us/Emergency/Pages/default.aspx.

National Weather Service. (n.d.). *Is your community ready for the next tsunami?* Retrieved 4 May, 2009. http://wcatwc.arh.noaa.gov/tsunamiready/trbrochure.pdf

National Weather Service. (2009). *TsunamiReady™ communities.* Retrieved 5 May, 2009. http://www.tsunamiready.noaa.gov/ts-commuities.htm

NOAA-National Weather Service. (n.d.). TsunamiReady: Working together to save lives Powerpoint presentation. Retrieved 4 May, 2009. http://www.tsunamiready.noaa.gov/

NOAA-National Weather Service. (n.d.). *NOAA Weather Radio: A service of the National Weather Service.* Retrieved 5 May, 2009. http://wcatwc.arh.noaa.gov/tsunamiready/nwr.pdf

Office of Safe and Drug-Free Schools, U.S. Department of Education. (2007). *Practical information on crisis planning: A guide for schools and communities.* Retrieved 4 May, 2009. http://www.ed.gov/admins/lead/safety/emergencyplan/crisisplanning.pdf

Swetzof, S. (2008, May 28) [personal communication]. Chiiquyaakax̂ story.

West Coast & Alaska Tsunami Warning Center. (n.d.). *Tsunami deadly waters*. Retrieved 5 May, 2009. http://wcatwc.arh.noaa.gov/deadlywaters.pdf

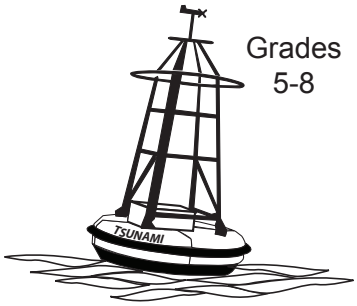
West Coast & Alaska Tsunami Warning Center. (n.d.) *Tsunami, the great waves on the West Coast & Alaska.* Retrieved 5 May, 2009. http://wcatwc.arh.noaa.gov/tsunamiready/greatwave.pdf

West Coast & Alaska Tsunami Warning Center. (2005). *Tsunami potential and response for Augustine Volcano events.* Retrieved 5, May 2009. http://wcatwc.arh.noaa.gov/Augustine/AugustineWeb.htm

Name:_____

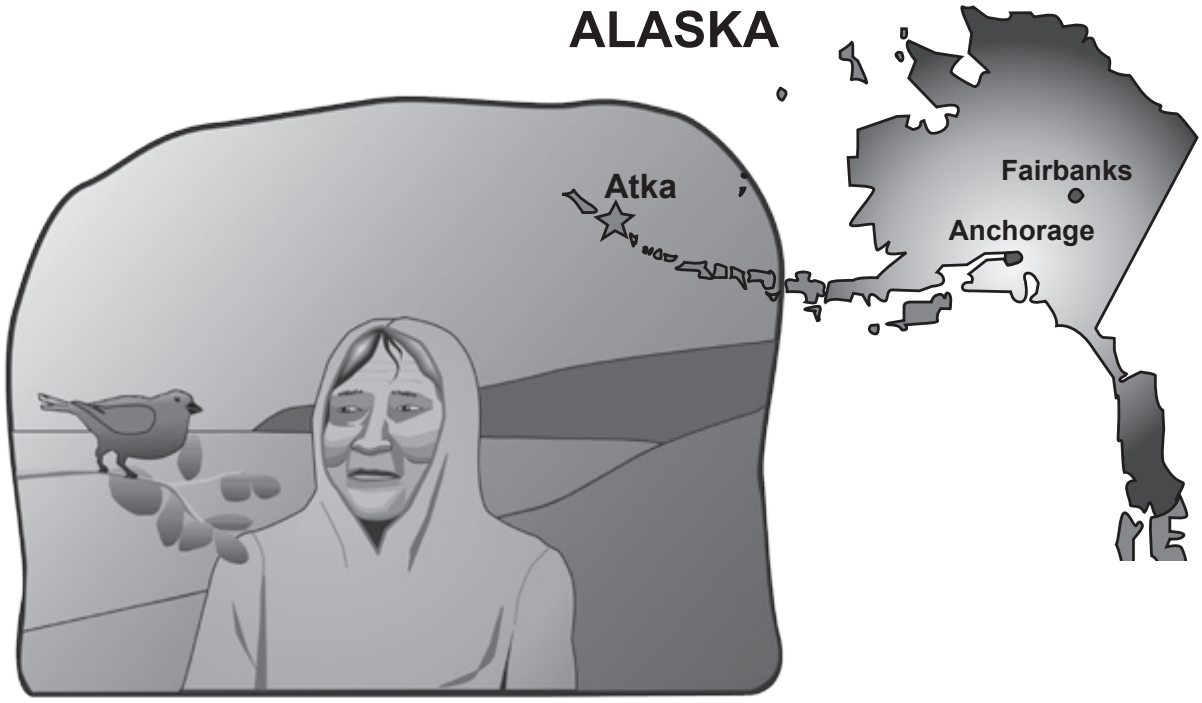
A Traditional Tsunami Warning Story

Student Worksheet



Grades 5-8

Chiiguyaakax̂ is the Aleutian song sparrow. The *Unangax̂* people of Atka, Alaska and surrounding villages have a traditional tsunami story that includes the *chiiguaakax̂*.



Chiiguyaakax̂

A *chiiguyaakax̂* warned an old lady that a tsunami was on its way to the village. Heeding the warning, the lady told the villagers what she had learned from the *chiiguyaakax̂*. Those who believed her went with her up the hill. The others were destroyed along with the village when the great waves came. After the tsunami, the survivors helped the old lady rebuild the village.

1. What tsunami knowledge and safety tips might someone learn from this story?

_____

_____

_____

_____

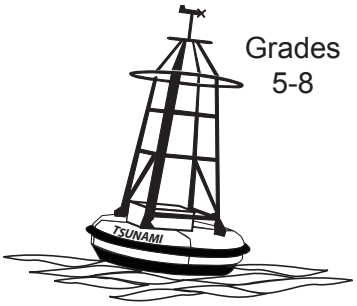
_____

Name:_____

Tsunami Hazard Mitigation Resources

Student Information Sheet

Grades 5-8



Visit these websites, or search the Web to learn more about how communities can prepare for a tsunami event.

The **West Coast and Alaska Tsunami Warning Center** website features tsunami science, warnings, and brochures about how to prepare for and respond to a tsunami event.

http://wcatwc.arh.noaa.gov/

The **Alaska Division of Homeland Security and Emergency Management** has a variety of resources designed to help communities develop hazard mitigation plans.

http://www.ak-prepared.com/plans/mitigation/mitplanresources.htm

NOAA's **National Weather Service** runs a TsunamiReady™ program to help communities develop tsunami warning and response protocols specific to their area.

http://www.tsunamiready.noaa.gov/

The **International Tsunami Information Centre** website includes a variety of tsunami preparedness and awareness information for a worldwide audience.

http://ioc3.unesco.org/itic/

The **Federal Emergency Management Agency** (FEMA) provides assistance to U.S. communities impacted by disasters. Their website includes information on how to prepare for and respond to various disasters, including tsunamis.

http://www.fema.gov/hazard/tsunami/index.shtm

The **National Tsunami Hazard Mitigation Program** website features videos and other publications to help people prepare for a tsunami.

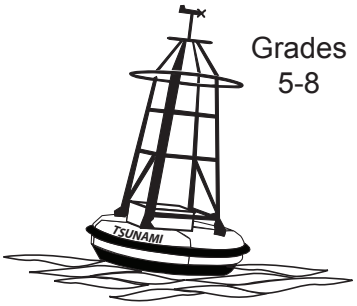
http://nthmp.tsunami.gov/

Name:_____

Local Warning

Student Worksheet (page 1 of 2)

Grades 5-8



1. How do people in your community know when a tsunami warning has been issued?

_____

_____

_____

2. Is there always time to issue an official warning before a tsunami strikes Alaska?

Circle the best answer.

A) Yes. Tide gauges and tsunameters always detect a tsunami long before it strikes, so Tsunami Warning Center scientists have plenty of time to issue warning.

B) Yes. Seismometers designed to detect earthquake action automatically broadcast tsunami warnings when earthquakes occur near coastal Alaska or on the sea floor.

C) No. Locally generated tsunamis can occur within minutes of a large earthquake or landslide, and sometimes do not allow enough time for an official warning.

D) No. Some tsunamis cross full ocean basins, and cannot be detected by modern equipment such as tsunameters in time to issue an official warning.

3. Which of the following are natural warnings that a tsunami may be on its way?

Check all that apply.

___ an earthquake that lasts 20 seconds of longer and makes standing difficult

___ a sudden, noticeable rise in coastal water

___ a siren

___ a thunderstorm that includes hail and heavy rainfall

___ water drawing back from the coast, leaving an expanse of sea floor visible

___ a whale slapping it's tail against the surface of the ocean

___ a roaring sound from the ocean

4. How should you respond to a natural or official tsunami warning in your community?

_____

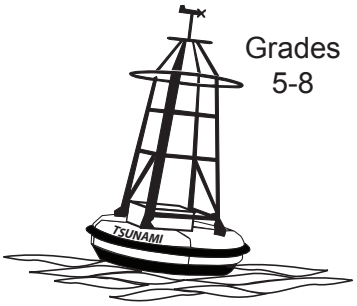
_____

_____

Name:_____

Local Warning

Student Worksheet (page 2 of 2)



Grades 5-8

5. Identify some weaknesses in the local tsunami warning system.

_____

_____

_____

_____

6. How might the local tsunami warning system be improved to address weaknesses?

_____

_____

_____

7. What information might emergency managers need in order to make these improvements? For instance, if you propose installing a siren, the emergency managers might need to know how many sirens to install, and where to put them.

_____

_____

_____

_____

_____

_____