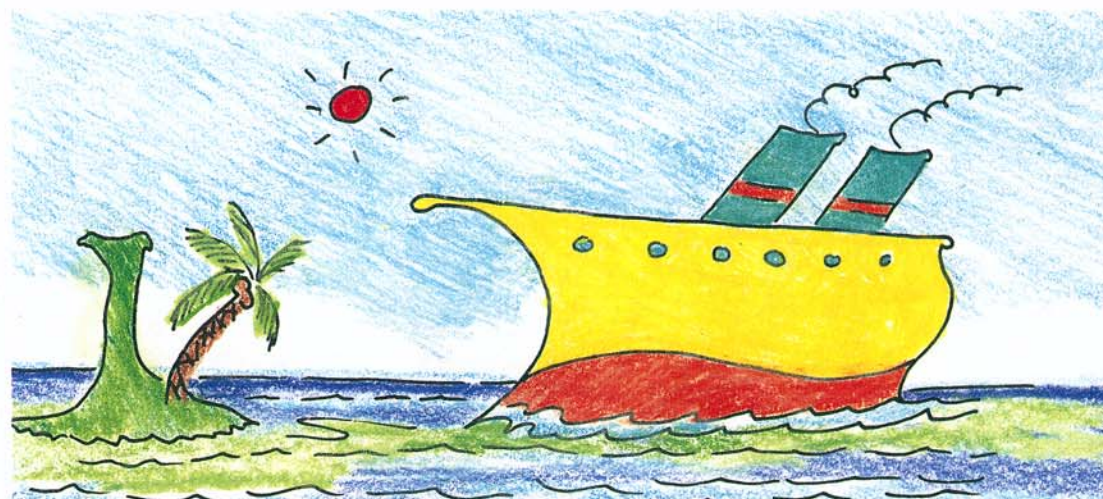


ACKNOWLEDGMENTS

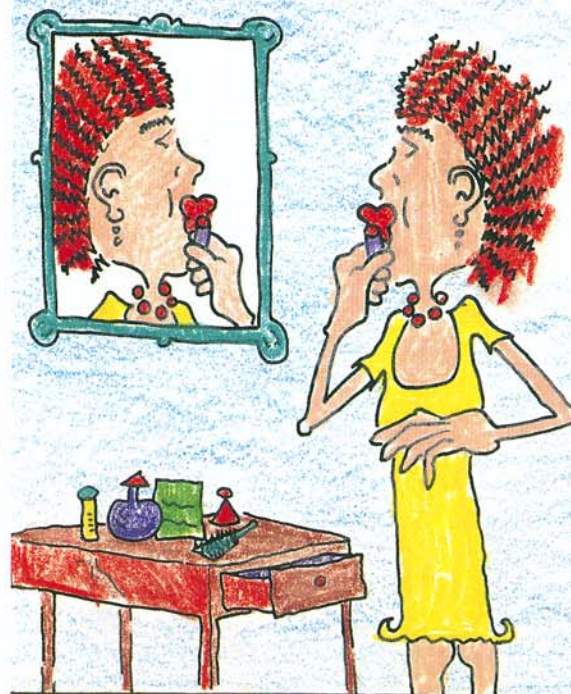
The International Coordinating Group for the Tsunami Warning System in the Pacific of the Intergovernmental Oceanographic Commission, at its Thirteenth Session in Ensenada, Mexico (September 1991), encouraged the preparation of a book designed to inform young persons about tsunamis and the dangers which they present and what should be done to save lives and property.

This book is the result of that encouragement. Dr. George Pararas-Carayannis, Ms. Patricia Wilson, and Mr. Richard Sillcox are its authors. The illustrations were created by Mr. Joe Hunt.

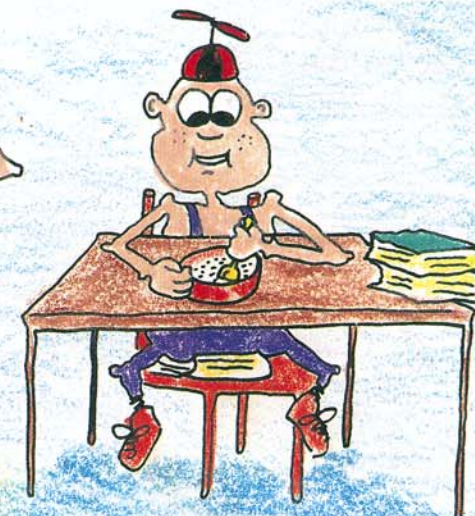
The preparation and printing of the book were supported by a very generous grant from the Intergovernmental Oceanographic Commission of Unesco.



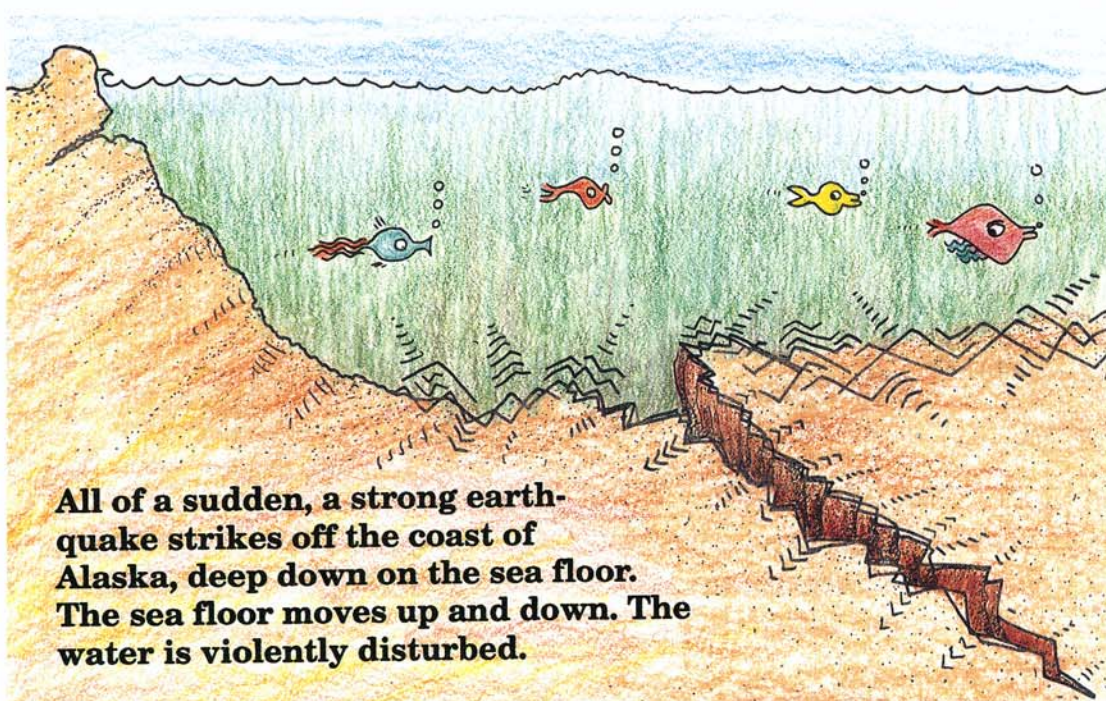
Over the blue, calm water of the Pacific Ocean, a cruise ship is sailing towards Hawaii. It is warm and sunny in Honolulu. A thousand miles away, in Alaska, it is snowy and cold.



It is breakfast time in Honolulu and in Anchorage Alaska. Parents are getting ready to go to work.

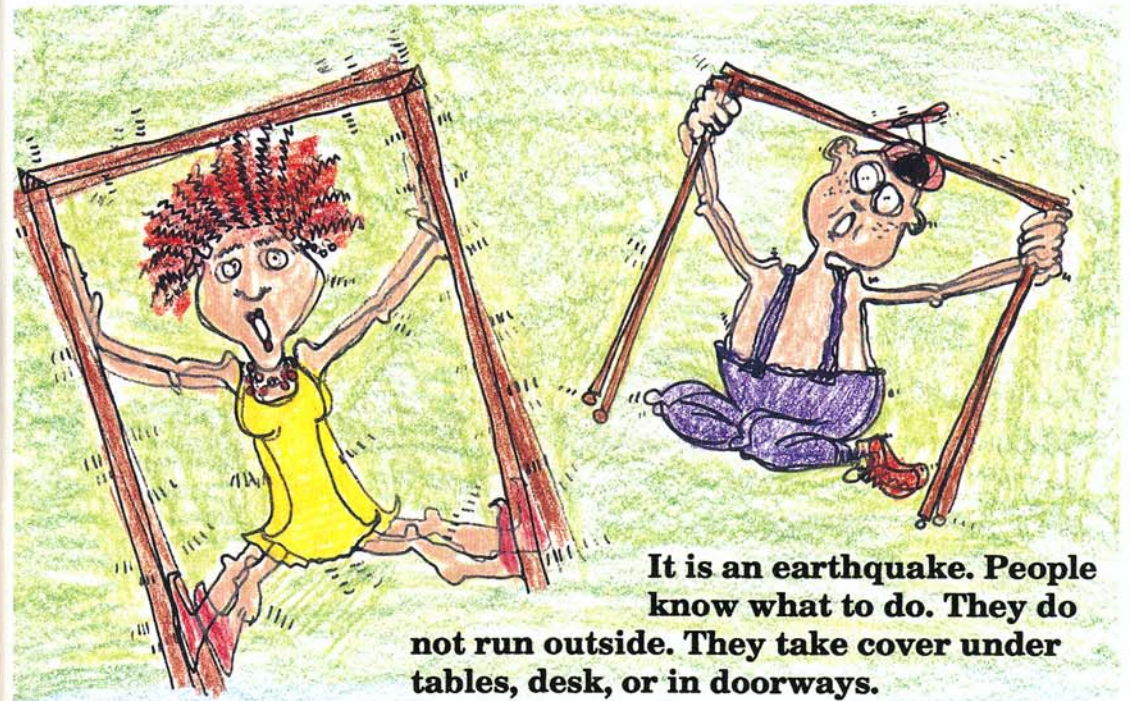
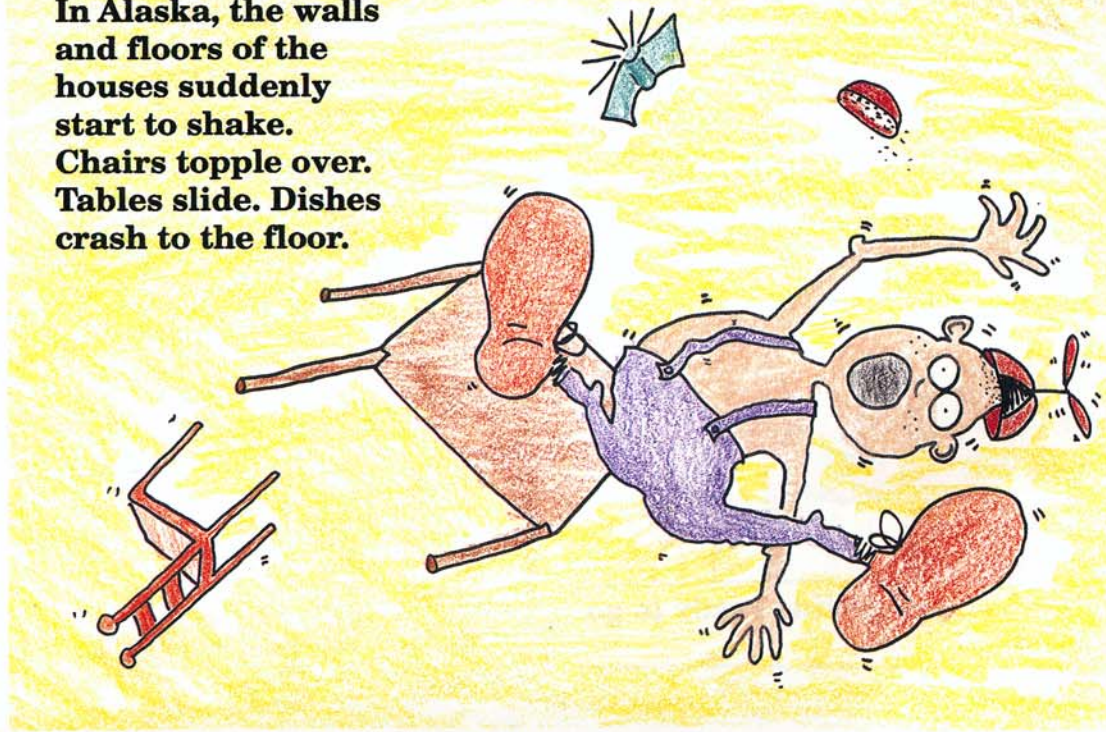


Children are getting ready to go to school.

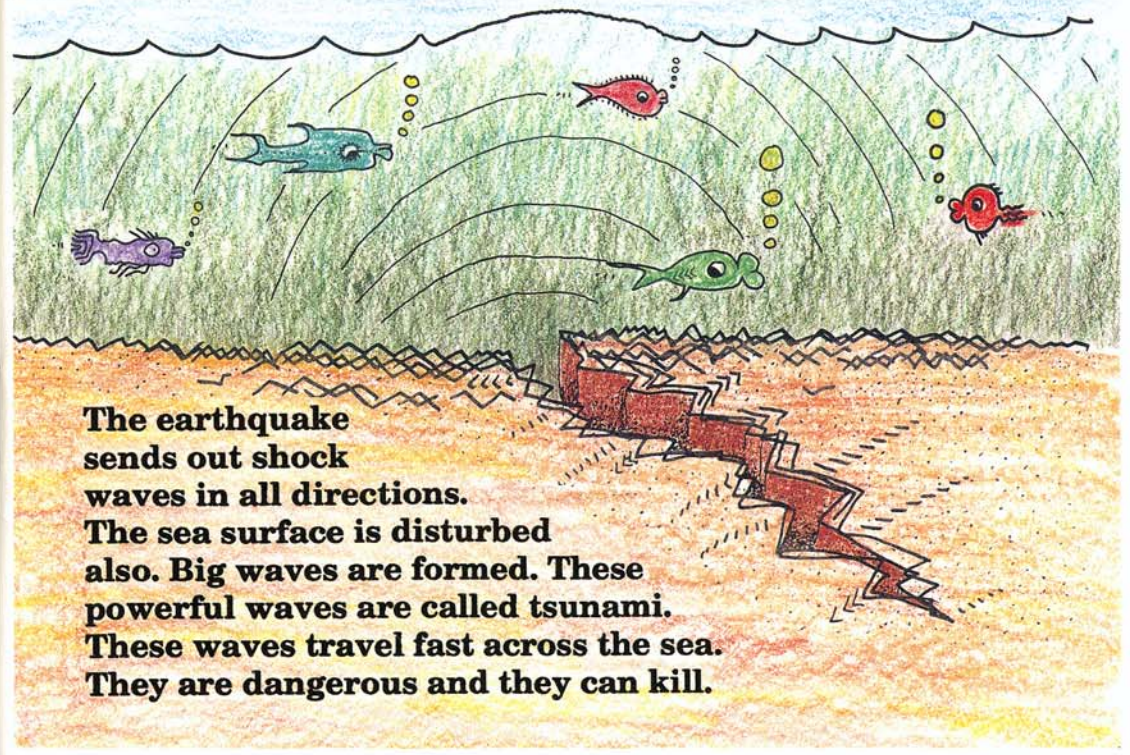


All of a sudden, a strong earthquake strikes off the coast of Alaska, deep down on the sea floor. The sea floor moves up and down. The water is violently disturbed.

In Alaska, the walls and floors of the houses suddenly start to shake. Chairs topple over. Tables slide. Dishes crash to the floor.

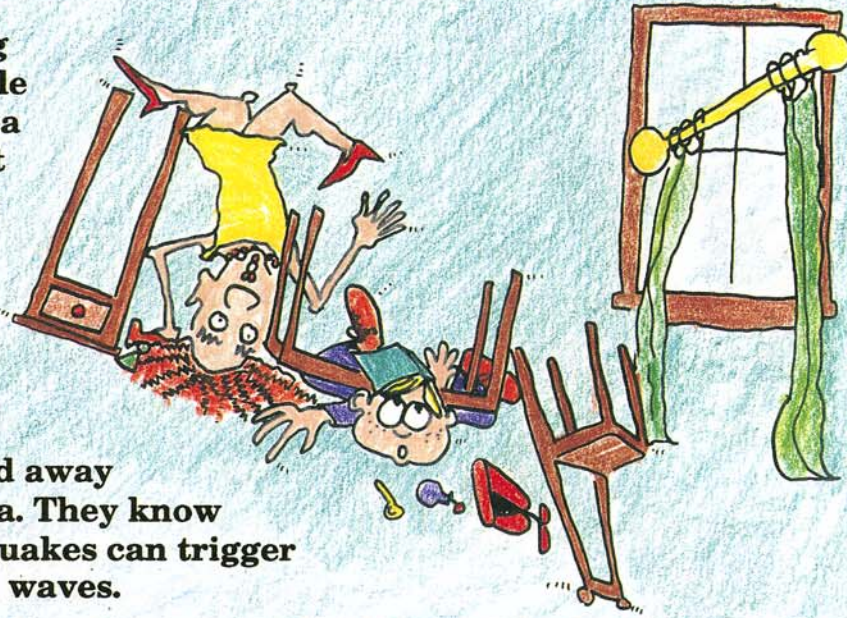


It is an earthquake. People know what to do. They do not run outside. They take cover under tables, desk, or in doorways.

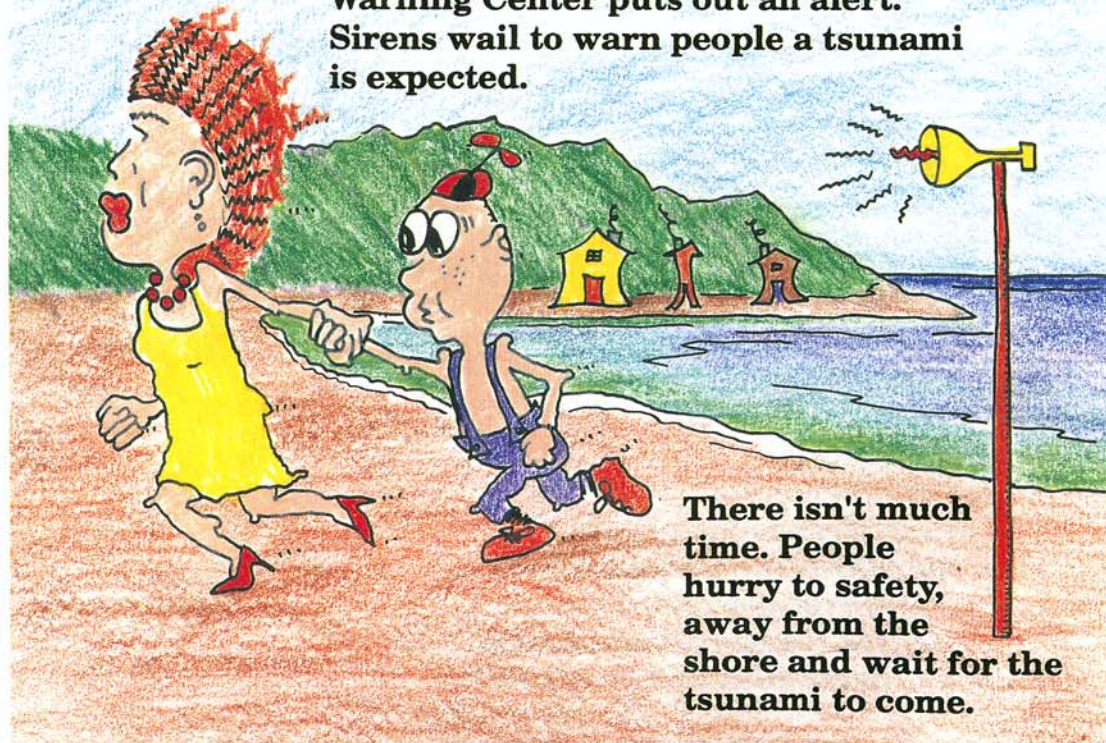


The earthquake sends out shock waves in all directions. The sea surface is disturbed also. Big waves are formed. These powerful waves are called tsunami. These waves travel fast across the sea. They are dangerous and they can kill.

As soon as the shaking stops, people living by sea do not start to clean up the mess. They quickly leave their homes and move inland away from the sea. They know that earthquakes can trigger off tsunami waves.

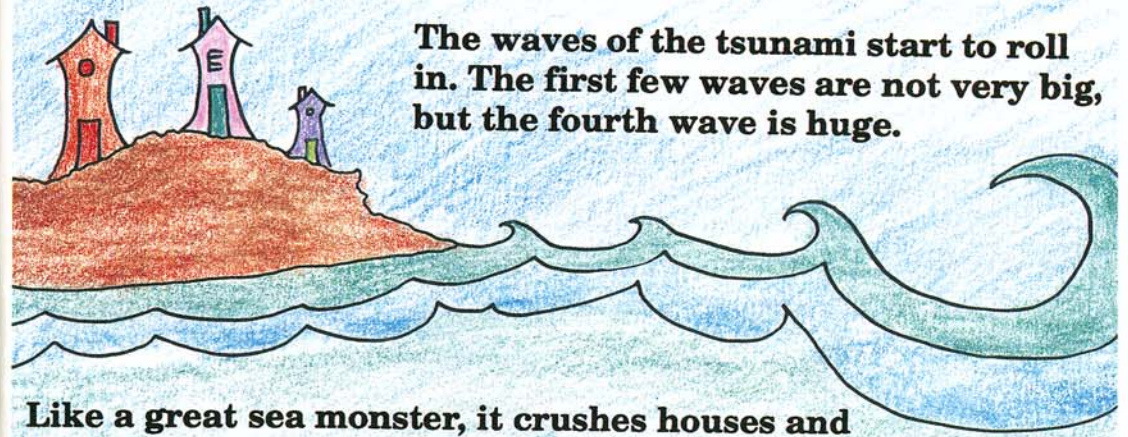


The Alaska Tsunami
Warning Center puts out an alert. Sirens wail to warn people a tsunami is expected.



There isn't much time. People hurry to safety, away from the shore and wait for the tsunami to come.

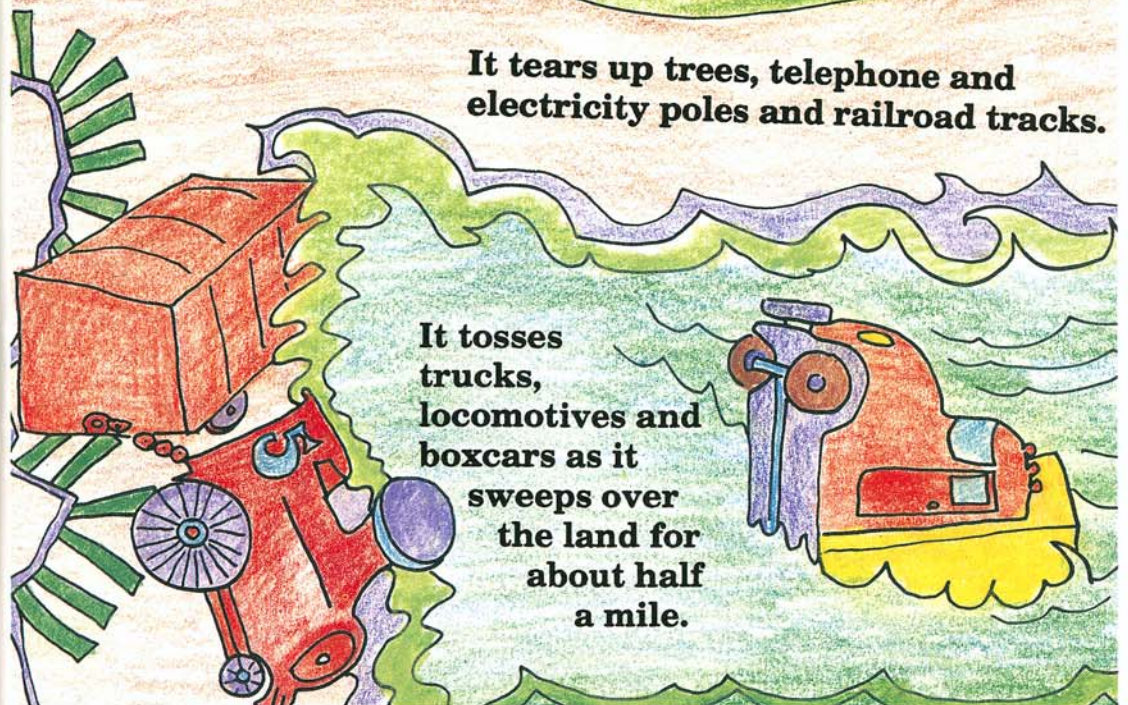
The waves of the tsunami start to roll in. The first few waves are not very big, but the fourth wave is huge.



Like a great sea monster, it crushes houses and buildings.

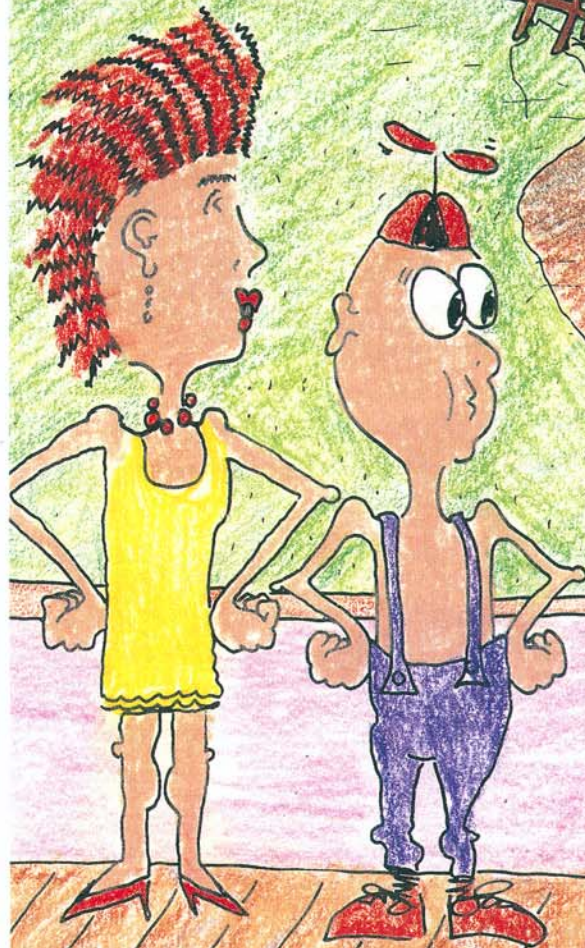


It tears up trees, telephone and electricity poles and railroad tracks.



It tosses trucks, locomotives and boxcars as it sweeps over the land for about half a mile.

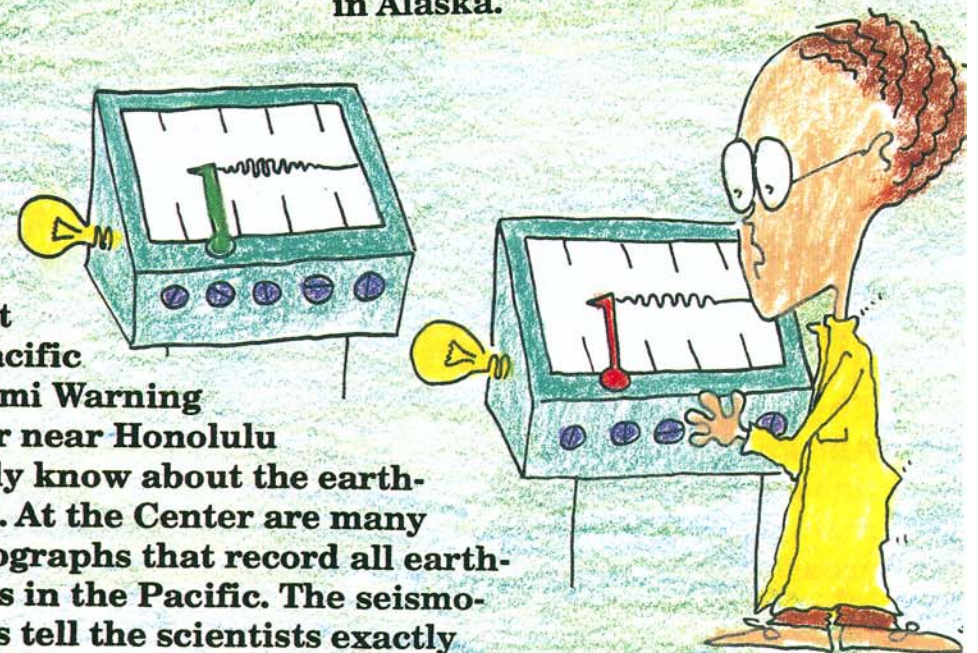
The tsunami waves keep coming but they grow smaller until the danger is over. The tsunami has caused a lot of damage, but no one has been killed.

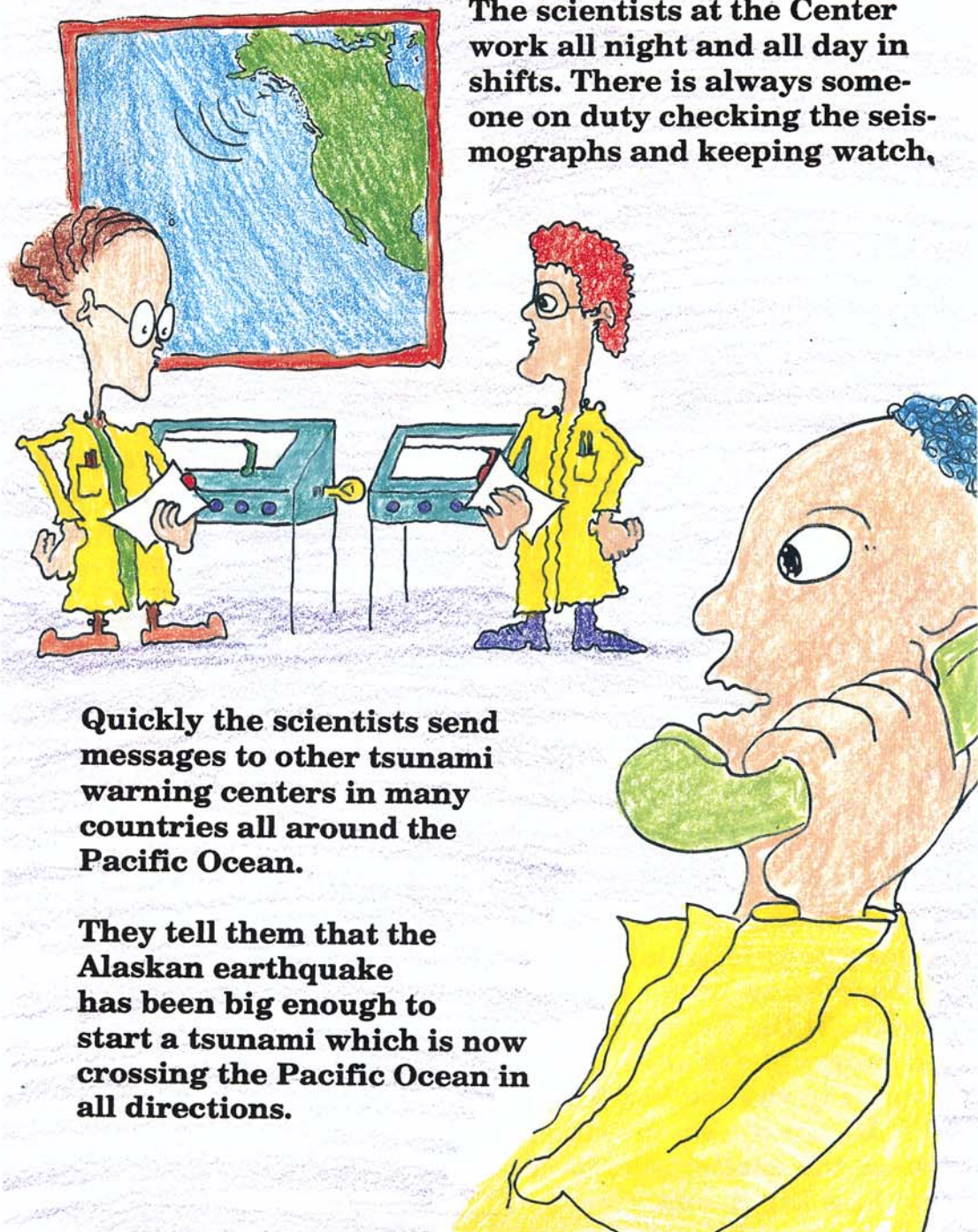


Everyone left the danger zones by the sea. Everyone rushed to safety and higher ground.

In Honolulu, breakfast is finished and parents and children leave home. They have not heard yet about the earthquake or tsunami in Alaska.

But scientists at the Pacific Tsunami Warning Center near Honolulu already know about the earthquake. At the Center are many seismographs that record all earthquakes in the Pacific. The seismographs tell the scientists exactly where the earthquake took place off Alaska and how big it was.

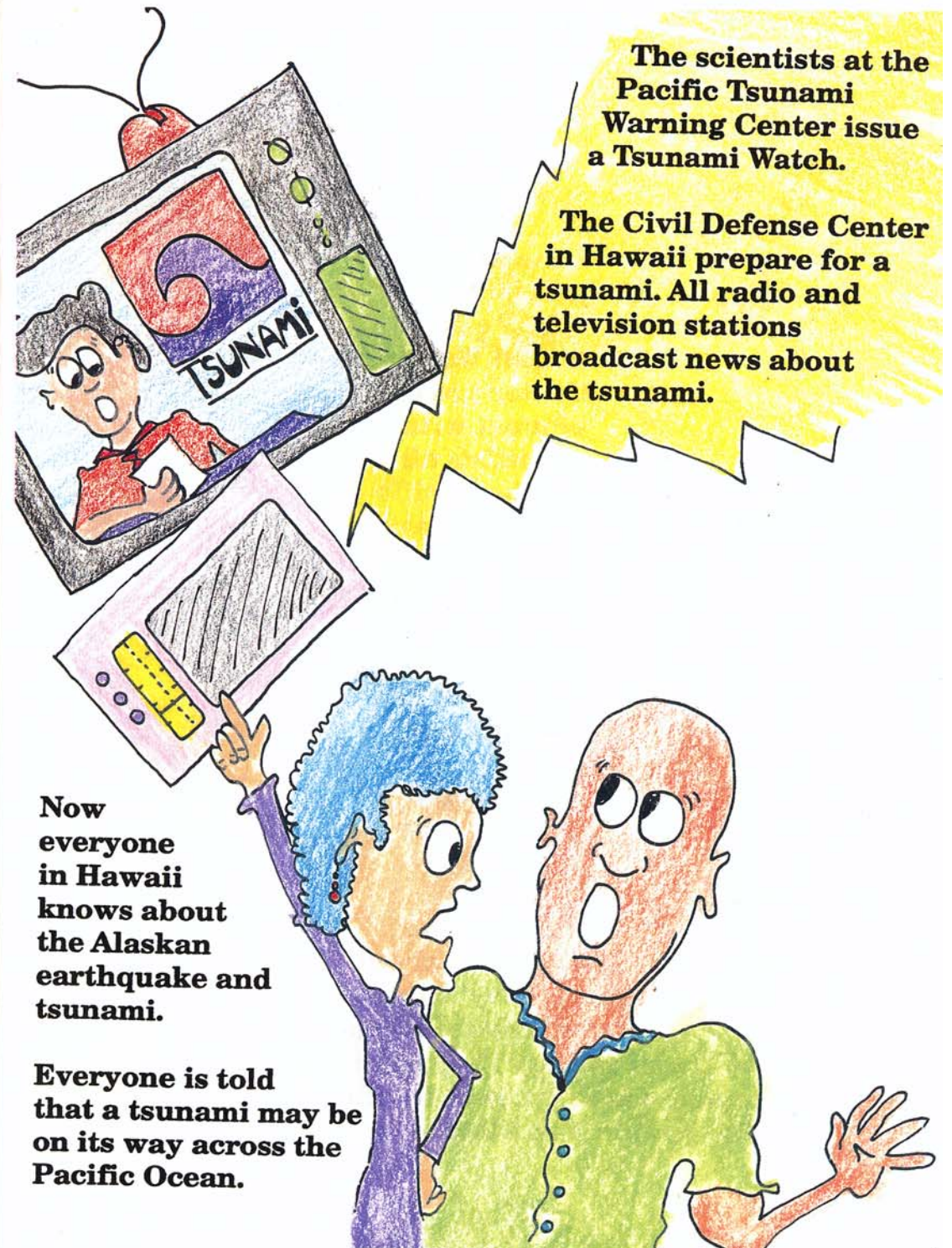




The scientists at the Center work all night and all day in shifts. There is always someone on duty checking the seismographs and keeping watch,

Quickly the scientists send messages to other tsunami warning centers in many countries all around the Pacific Ocean.

They tell them that the Alaskan earthquake has been big enough to start a tsunami which is now crossing the Pacific Ocean in all directions.



The scientists at the Pacific Tsunami Warning Center issue a Tsunami Watch.

The Civil Defense Center in Hawaii prepare for a tsunami. All radio and television stations broadcast news about the tsunami.

Now everyone in Hawaii knows about the Alaskan earthquake and tsunami.

Everyone is told that a tsunami may be on its way across the Pacific Ocean.

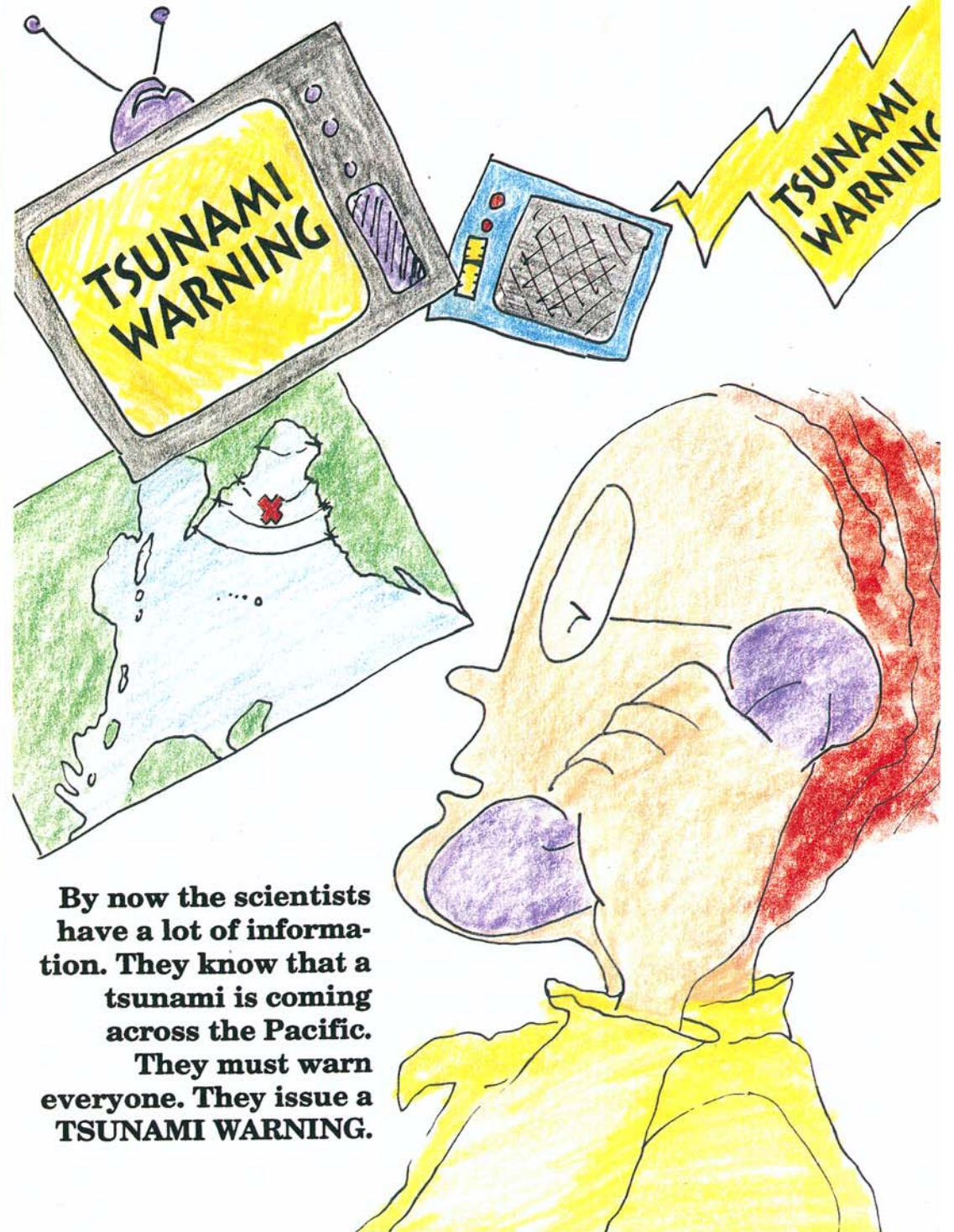
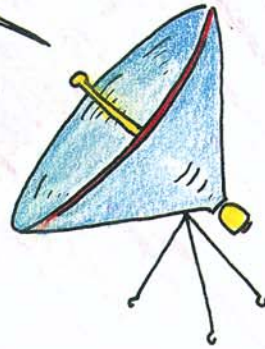


During the Tsunami Watch, the scientists at the Pacific Tsunami Warning Center are in contact with scientists all over the Pacific trying to make sure if a tsunami is really coming.

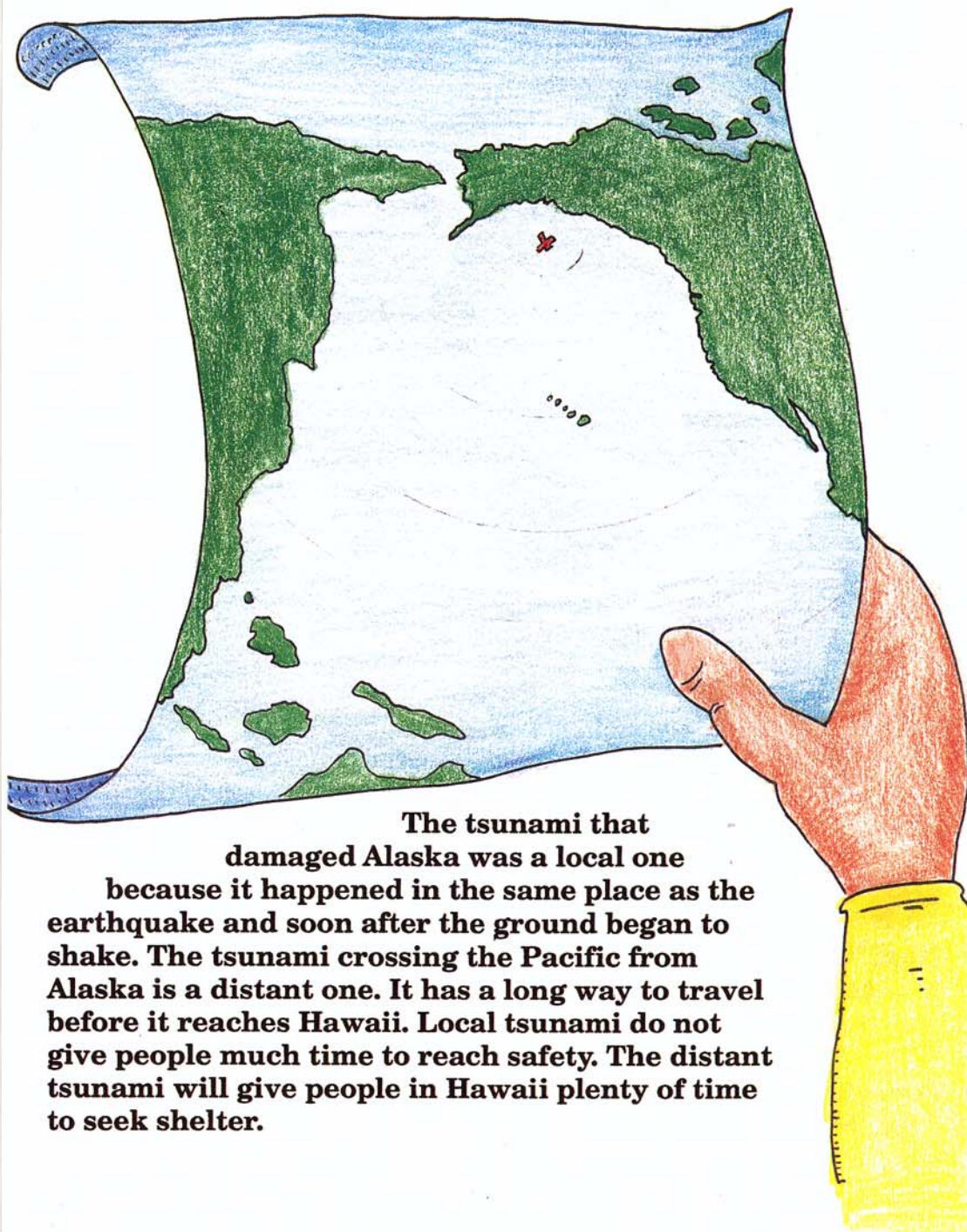
They talk to each other by telephone.

They send messages by satellite.

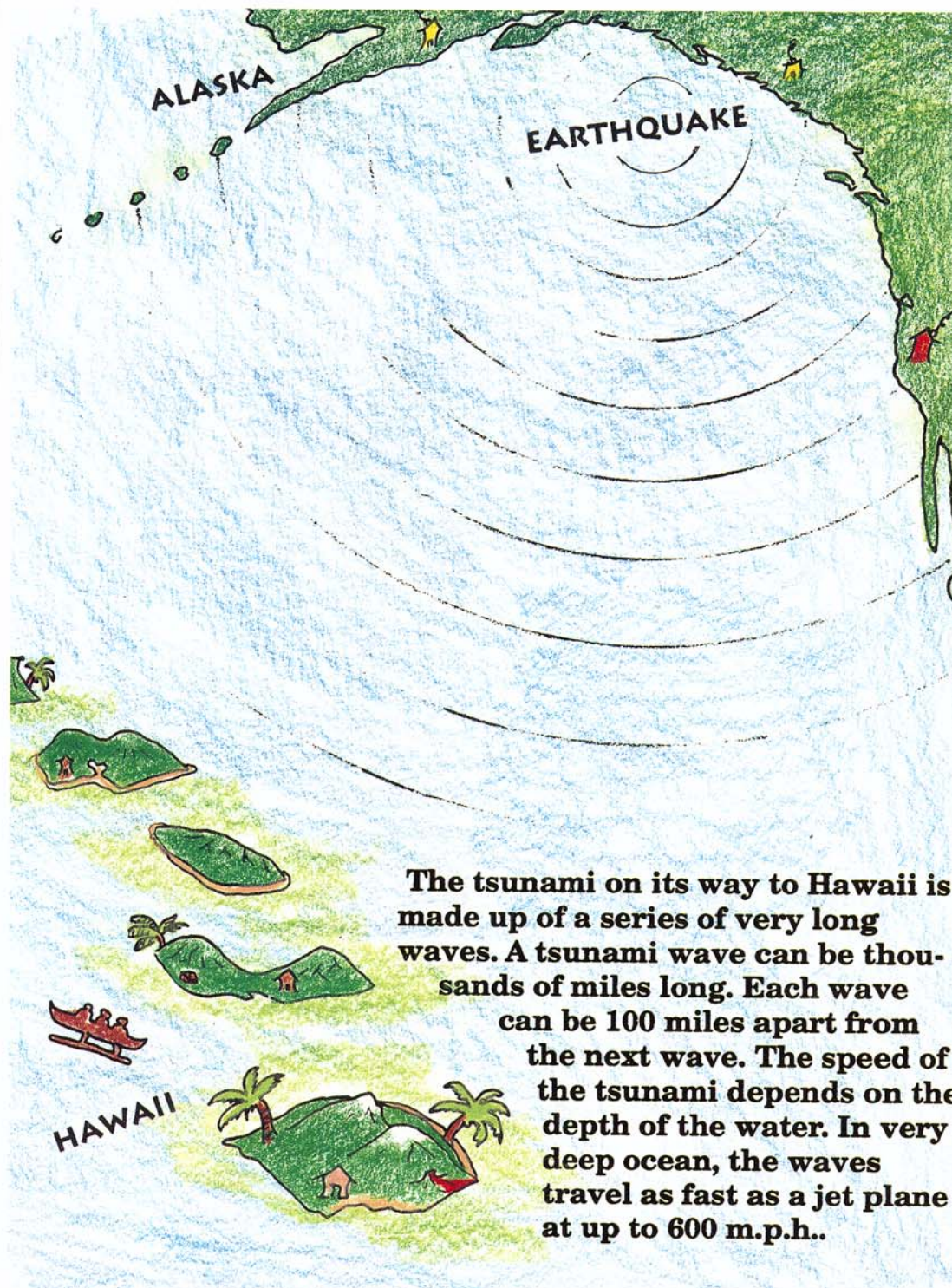
They ask for information about tides. They want to know if water levels are rising or falling. They want to know if tsunami waves are seen in other places like Washington State or California.



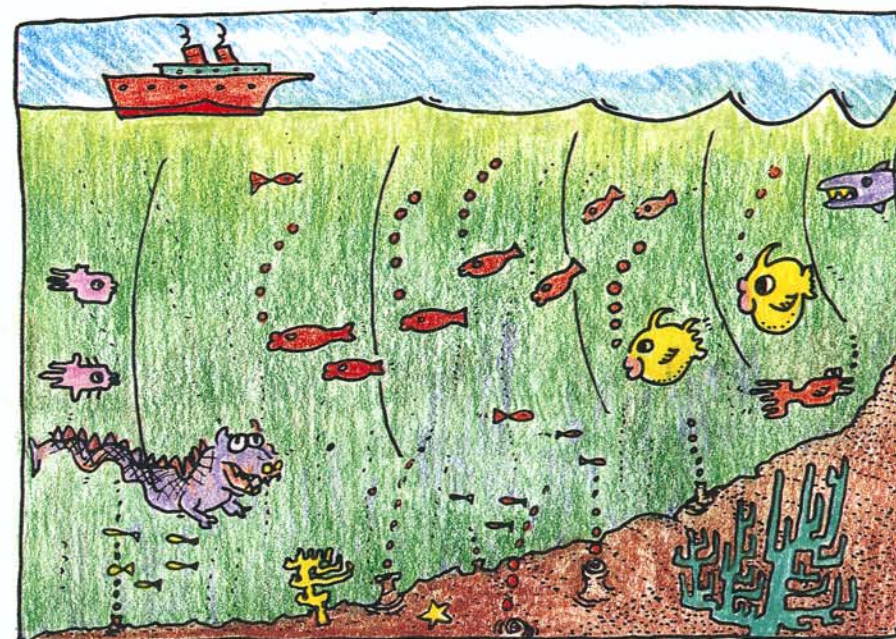
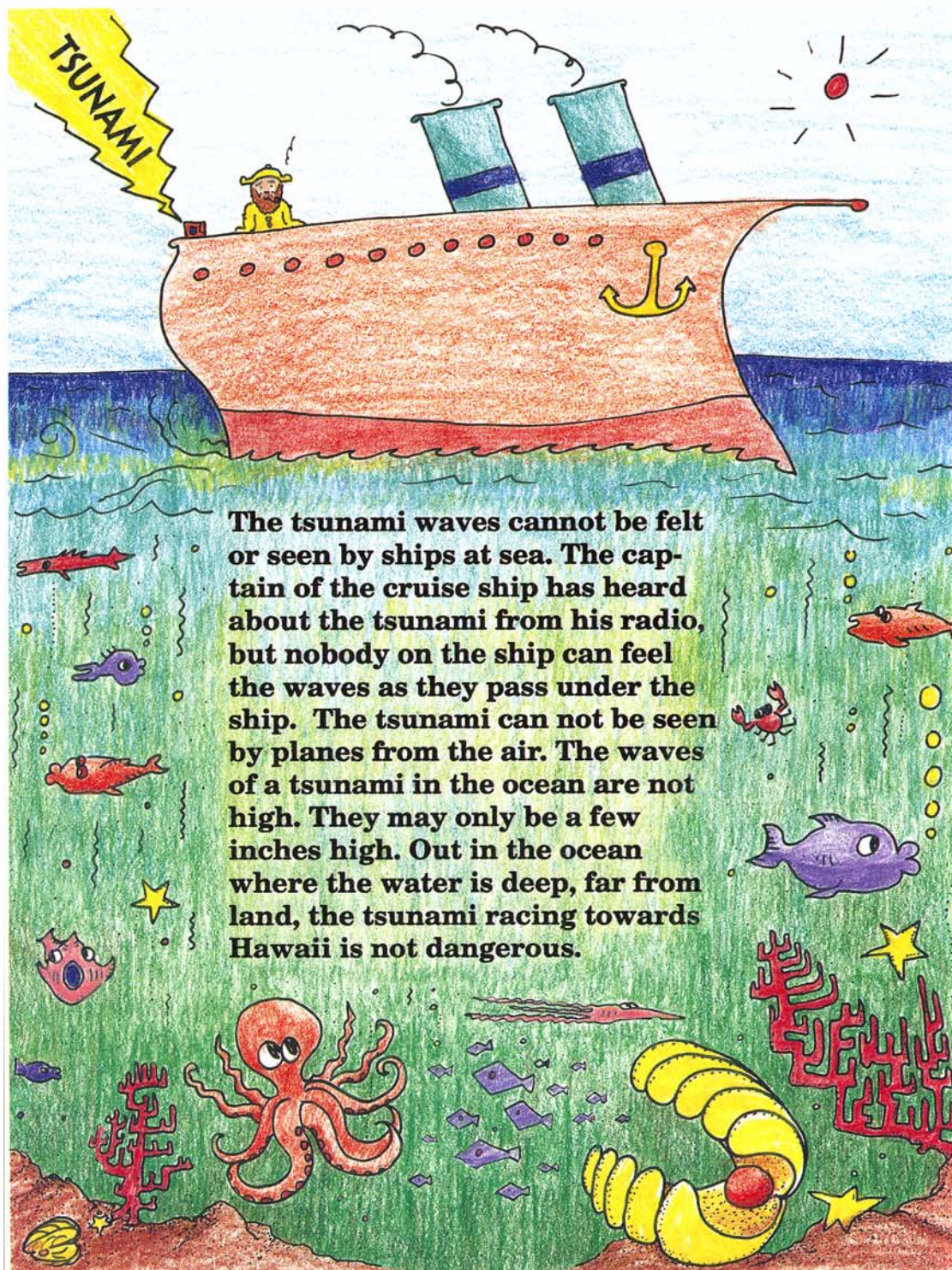
By now the scientists have a lot of information. They know that a tsunami is coming across the Pacific. They must warn everyone. They issue a **TSUNAMI WARNING.**



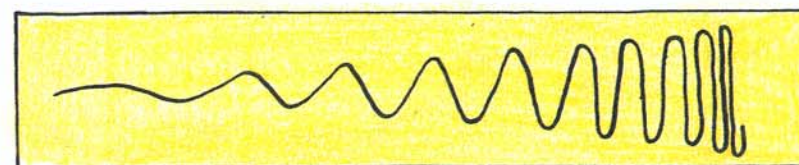
The tsunami that damaged Alaska was a local one because it happened in the same place as the earthquake and soon after the ground began to shake. The tsunami crossing the Pacific from Alaska is a distant one. It has a long way to travel before it reaches Hawaii. Local tsunamis do not give people much time to reach safety. The distant tsunami will give people in Hawaii plenty of time to seek shelter.



The tsunami on its way to Hawaii is made up of a series of very long waves. A tsunami wave can be thousands of miles long. Each wave can be 100 miles apart from the next wave. The speed of the tsunami depends on the depth of the water. In very deep ocean, the waves travel as fast as a jet plane at up to 600 m.p.h..

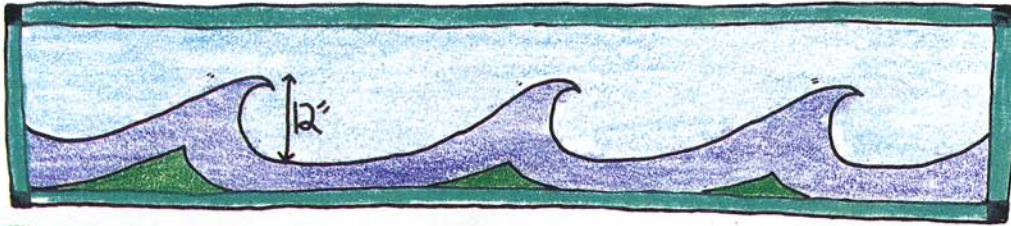


But as the tsunami approaches land it becomes dangerous. The speed of the waves slows down in shallow waters. In 60 feet of water a tsunami travels at 30 m.p.h., the speed of a slow car. The problem is that although the first wave slows down in shallow water, the second wave is 100 miles apart and it is traveling faster. The result is that the distance between the waves does not remain at 100 miles. It grows smaller.

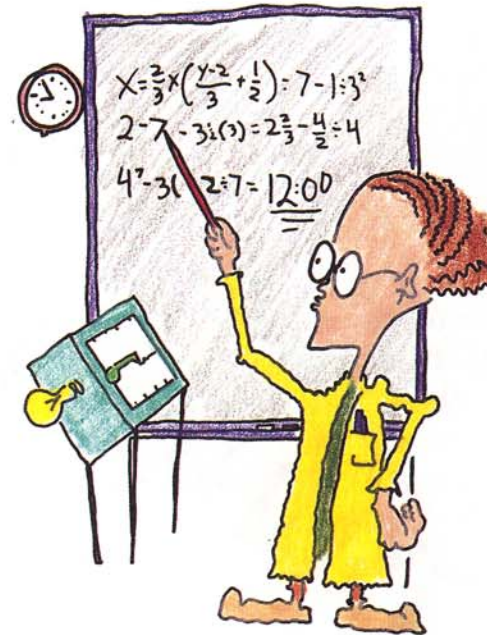
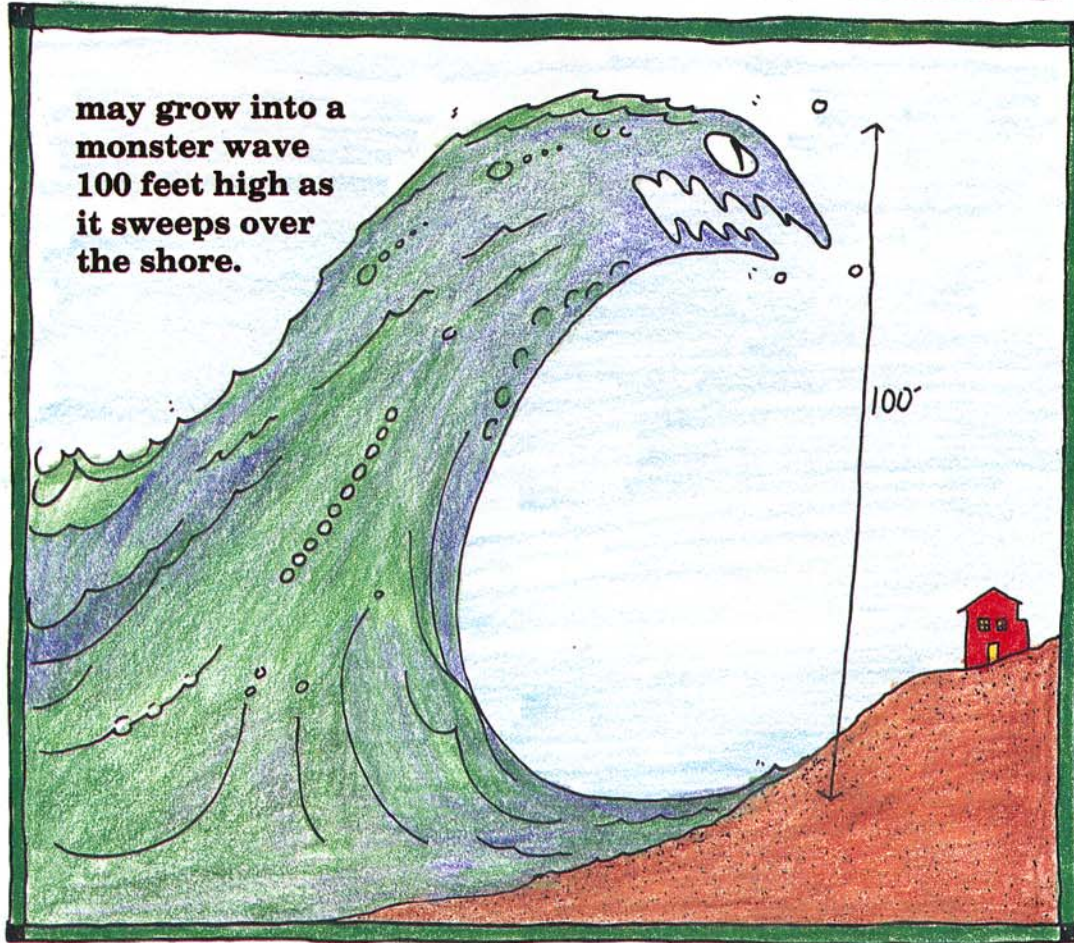


The waves are bunched up more together. This squashing together makes the waves taller.

**This is when the tsunami waves can become dangerous.
A small wave only 12 inches high in deep ocean-**



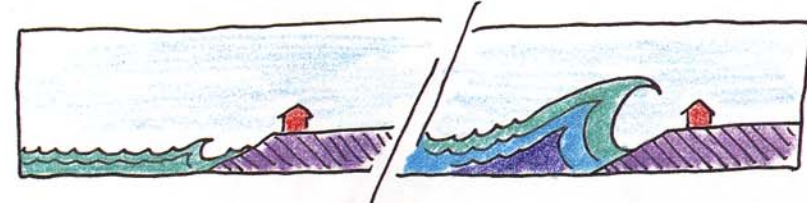
**may grow into a
monster wave
100 feet high as
it sweeps over
the shore.**



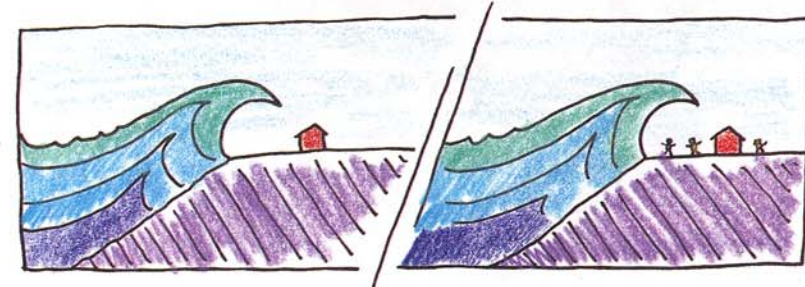
The scientists at the Pacific Tsunami Warning Center can calculate when the first wave of the tsunami will reach Hawaii. It will reach Hawaii at 12 o'clock lunchtime, just five hours after the earthquake took place in Alaska.

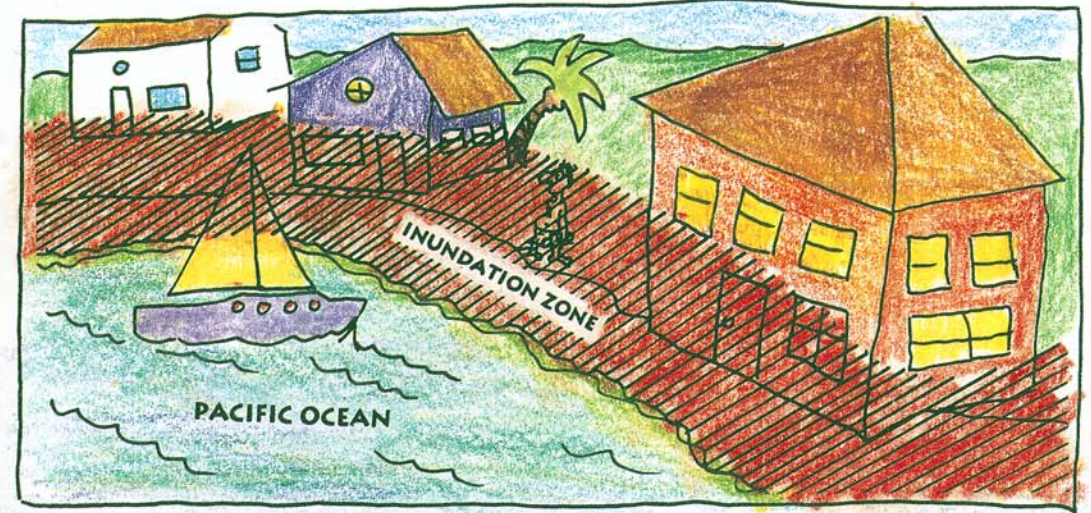
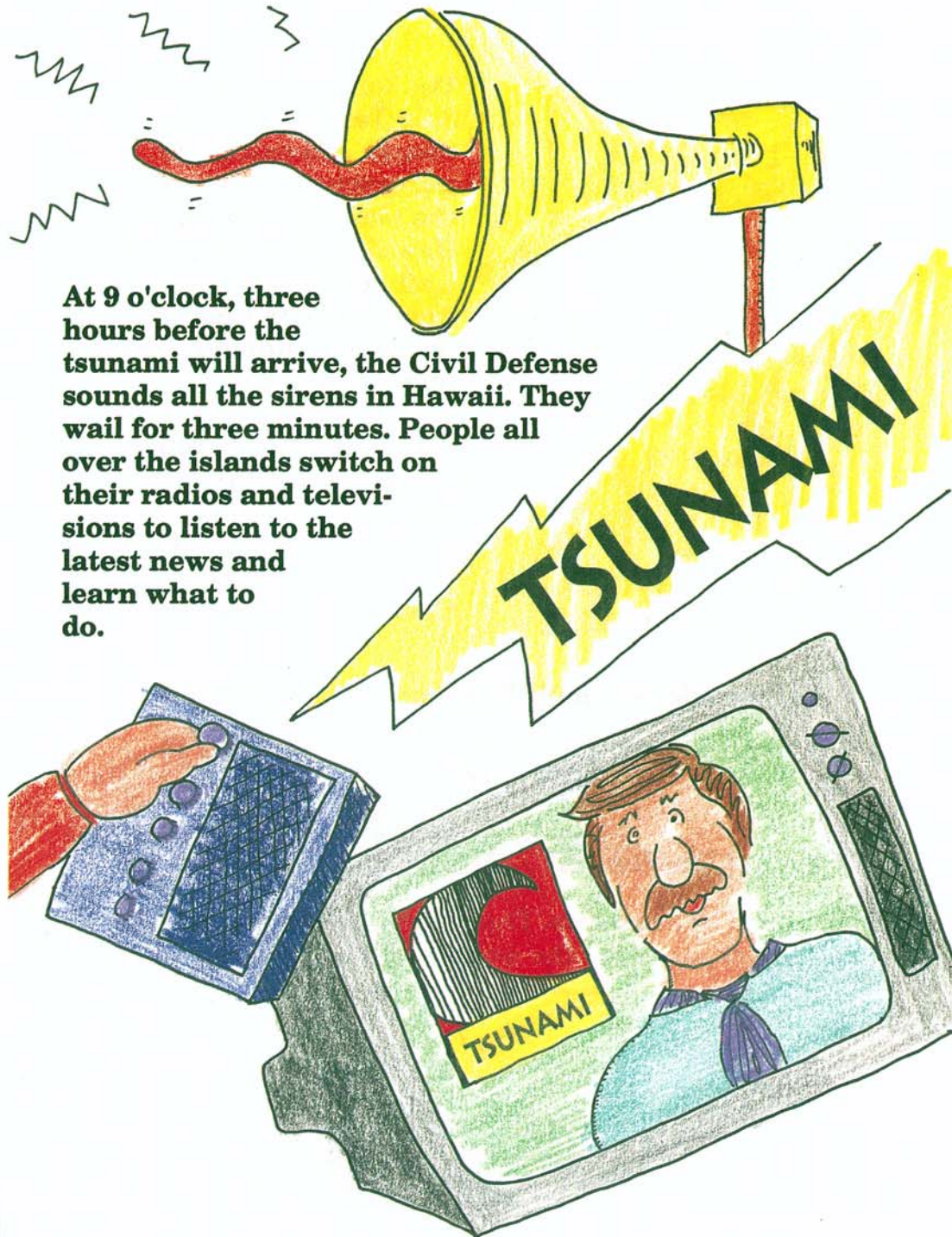
Although the scientists can tell when the tsunami will arrive if it is a distant one, they can not tell how big the waves will be.

They could be small. They could be gigantic.

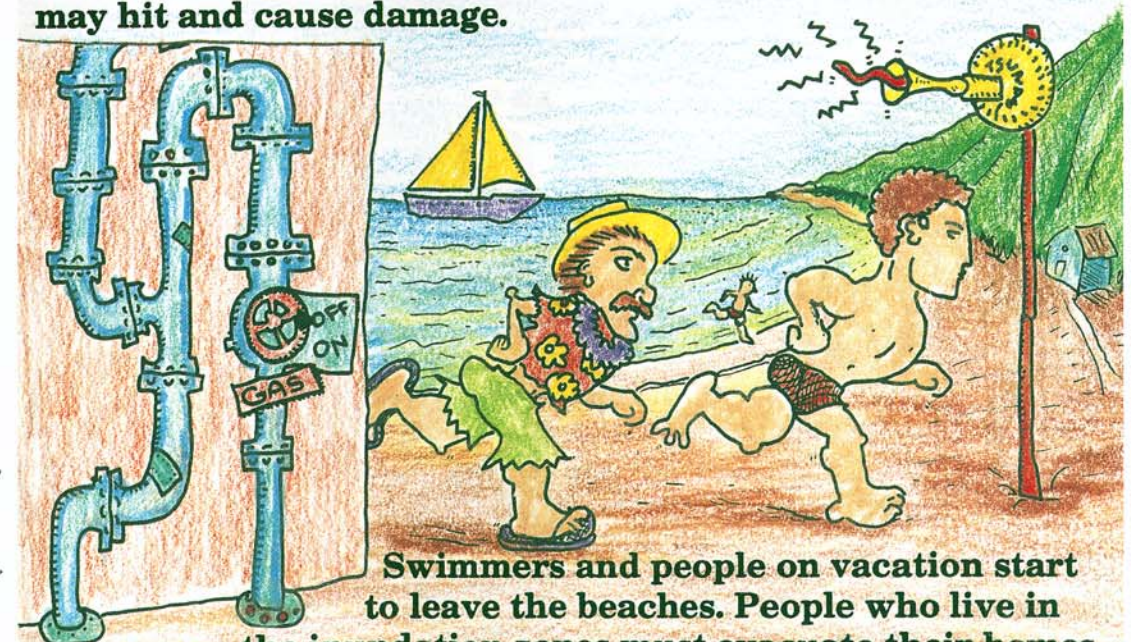


They could be harmless. They could be killers. People must be prepared for the worst and hope for the best.

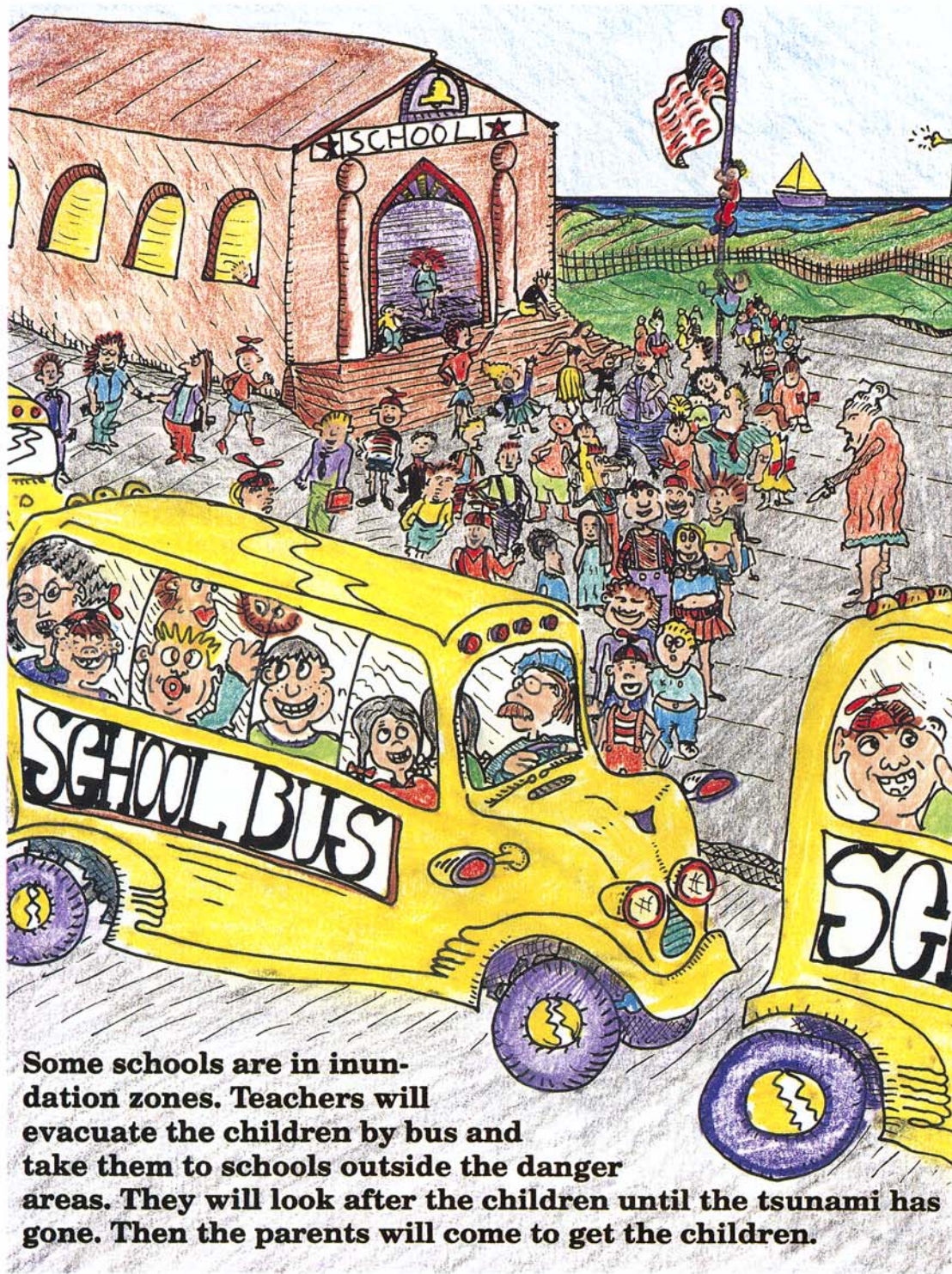




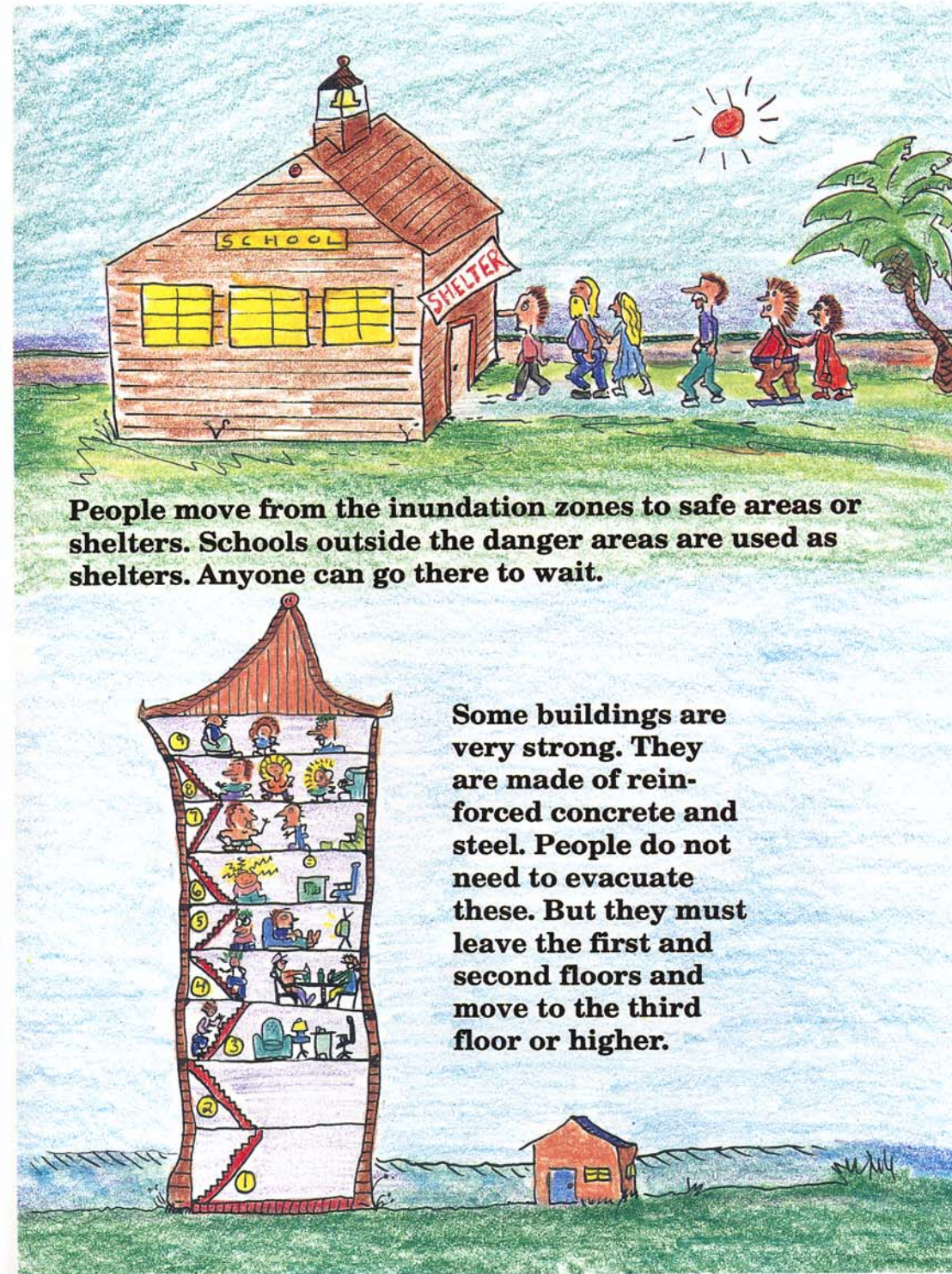
Beaches and low-lying areas along the coast are called inundation zones. These are the places where the tsunami may hit and cause damage.



Swimmers and people on vacation start to leave the beaches. People who live in the inundation zones must evacuate their homes. This means they must leave their homes. They switch off water, electricity and gas at the main valves. Hotel staff help their guests to evacuate their rooms. People in shops and offices in inundation zones must evacuate their places of work.



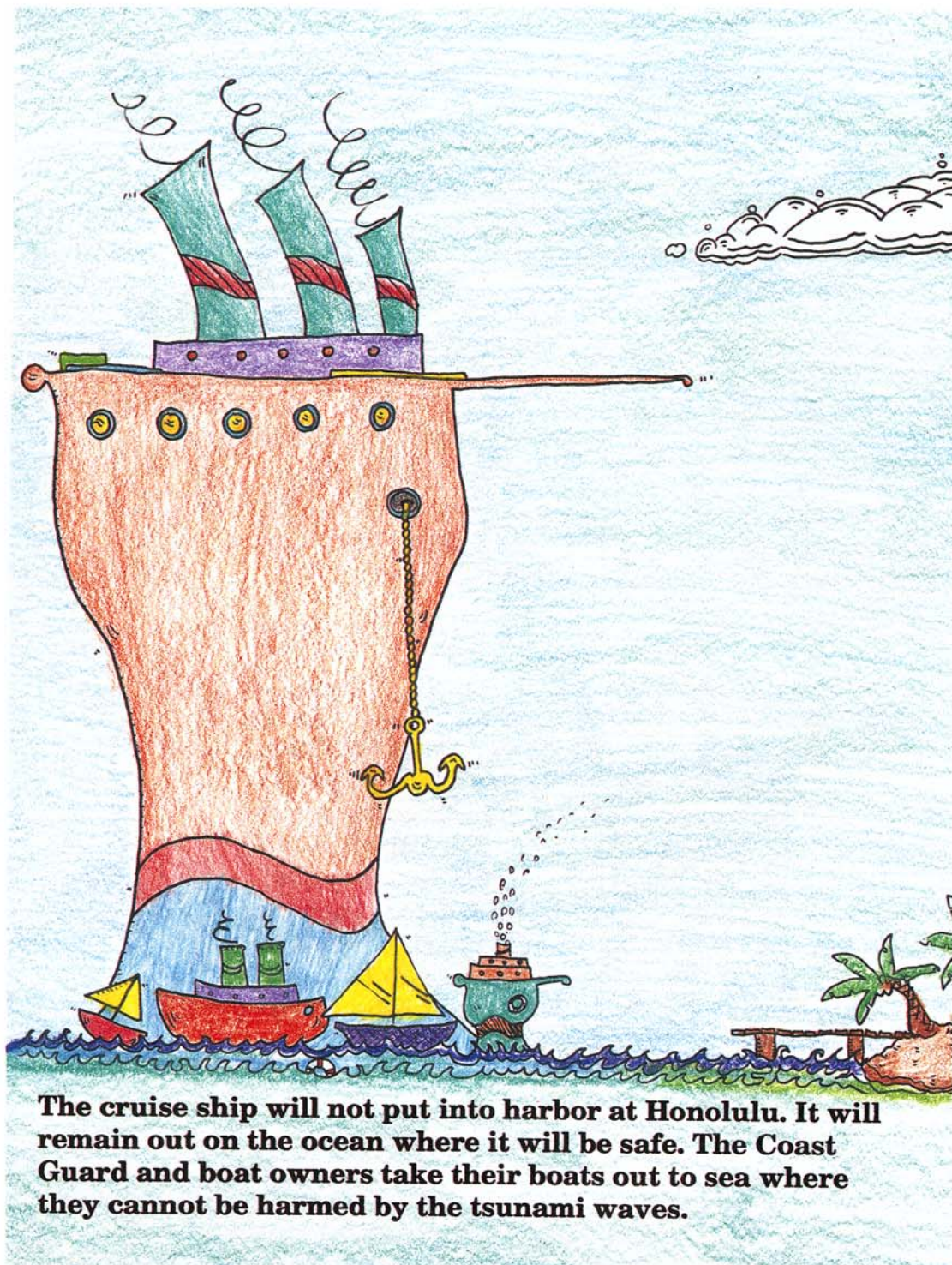
Some schools are in inundation zones. Teachers will evacuate the children by bus and take them to schools outside the danger areas. They will look after the children until the tsunami has gone. Then the parents will come to get the children.



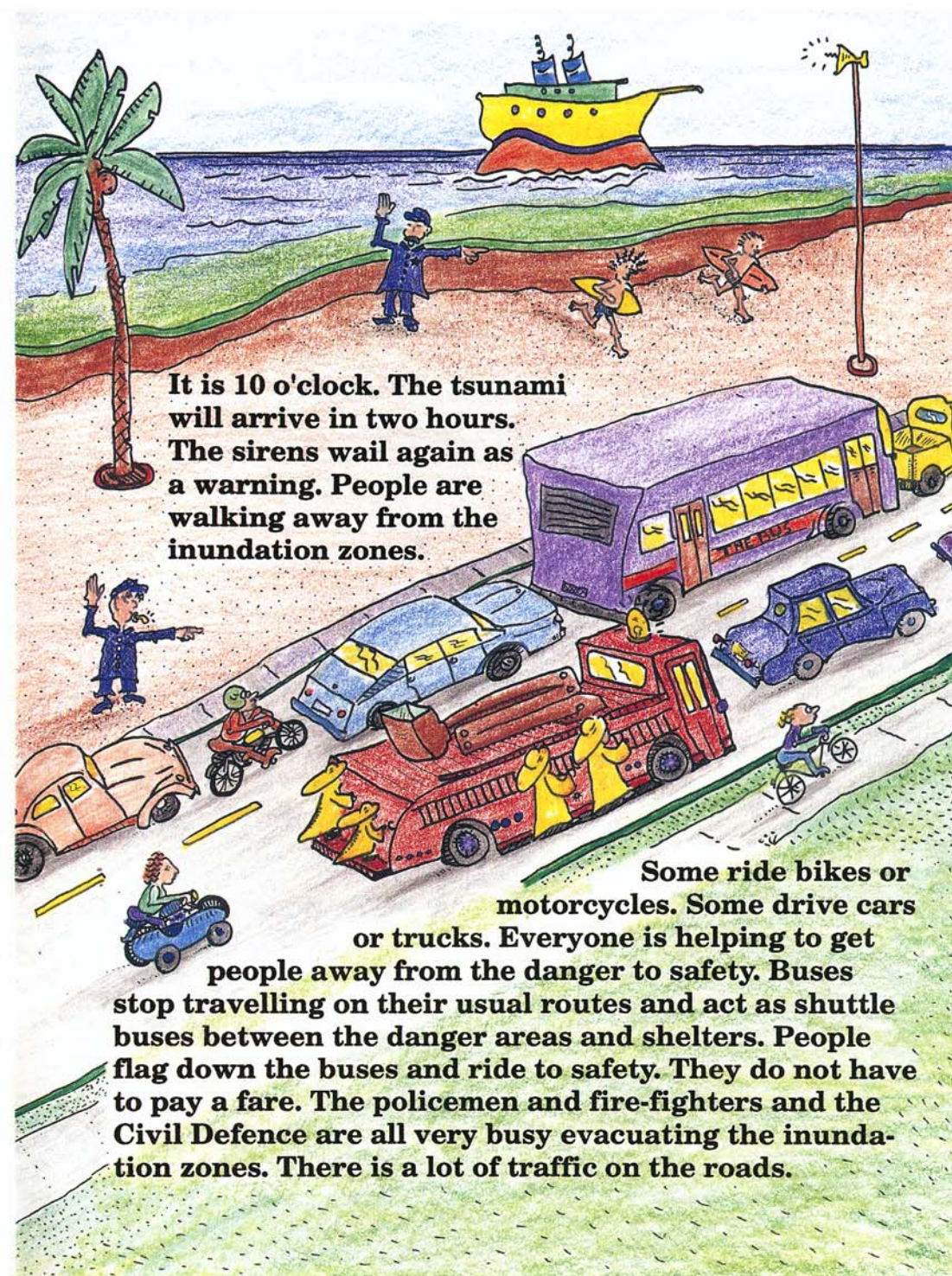
People move from the inundation zones to safe areas or shelters. Schools outside the danger areas are used as shelters. Anyone can go there to wait.



Some buildings are very strong. They are made of reinforced concrete and steel. People do not need to evacuate these. But they must leave the first and second floors and move to the third floor or higher.



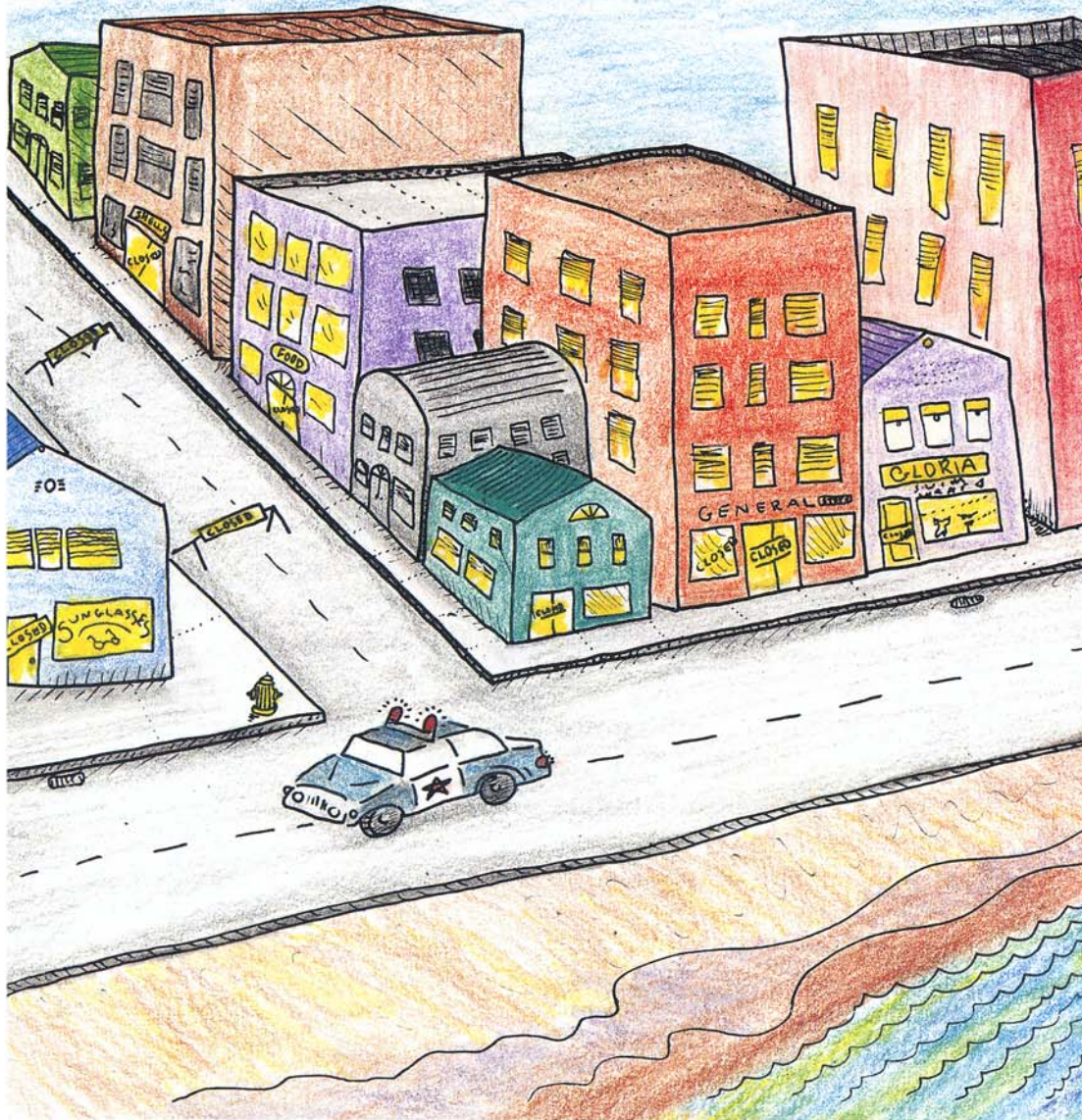
The cruise ship will not put into harbor at Honolulu. It will remain out on the ocean where it will be safe. The Coast Guard and boat owners take their boats out to sea where they cannot be harmed by the tsunami waves.



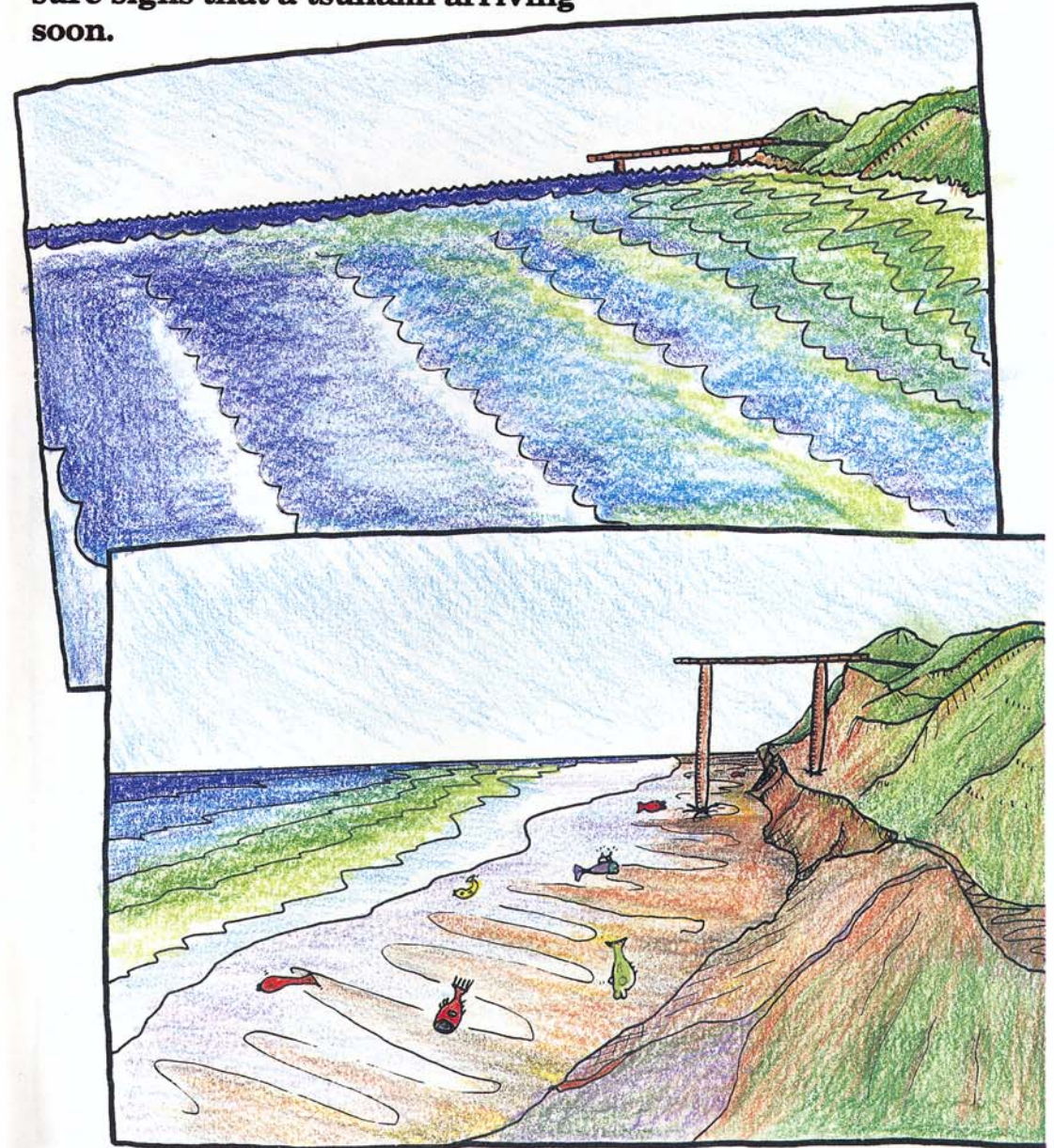
It is 10 o'clock. The tsunami will arrive in two hours. The sirens wail again as a warning. People are walking away from the inundation zones.

Some ride bikes or motorcycles. Some drive cars or trucks. Everyone is helping to get people away from the danger to safety. Buses stop travelling on their usual routes and act as shuttle buses between the danger areas and shelters. People flag down the buses and ride to safety. They do not have to pay a fare. The policemen and fire-fighters and the Civil Defence are all very busy evacuating the inundation zones. There is a lot of traffic on the roads.

At 11 o'clock, the sirens wail again. There is one hour to go before the tsunami arrives. Police are busy checking that everyone has been evacuated. They make sure no one has been left behind in the inundation zones. Then they seal off the roads so that no one can go back to the danger areas. At 11:30 a.m. the sirens sound for the last time. There is nothing left to do except wait.



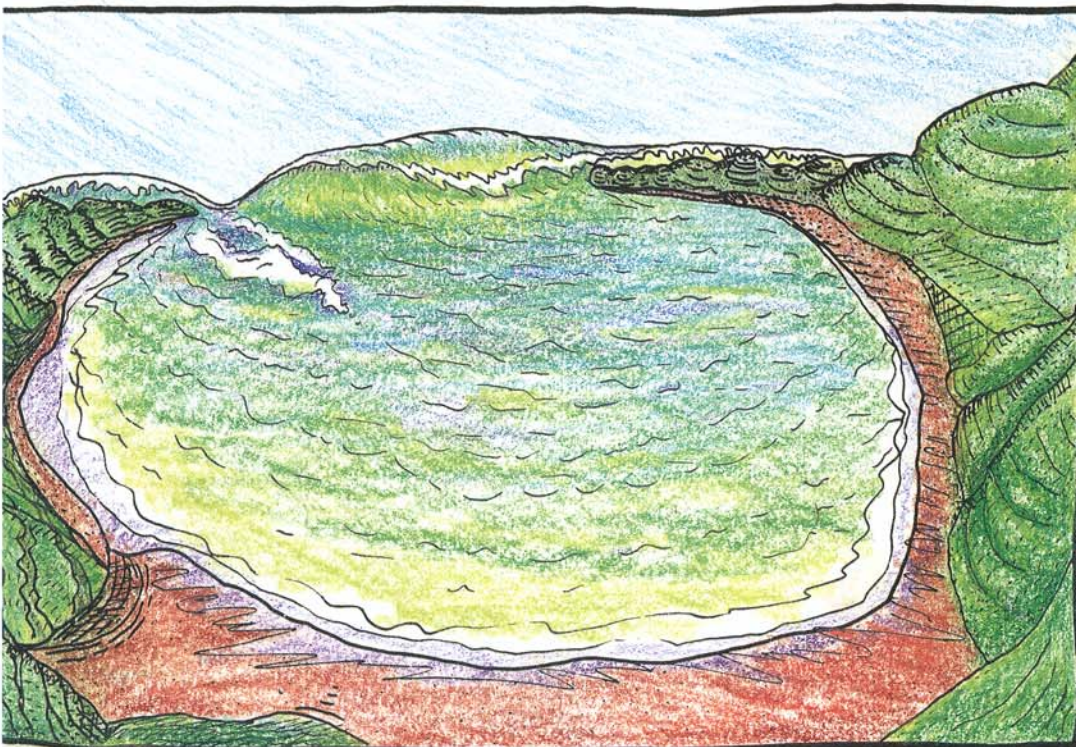
A few minutes later something strange is happening at the beaches. At some places, the sea is rising gently. At others, the water is moving back from the shore and fish are left flapping on the dry beaches. Rising water or receding water are sure signs that a tsunami arriving soon.



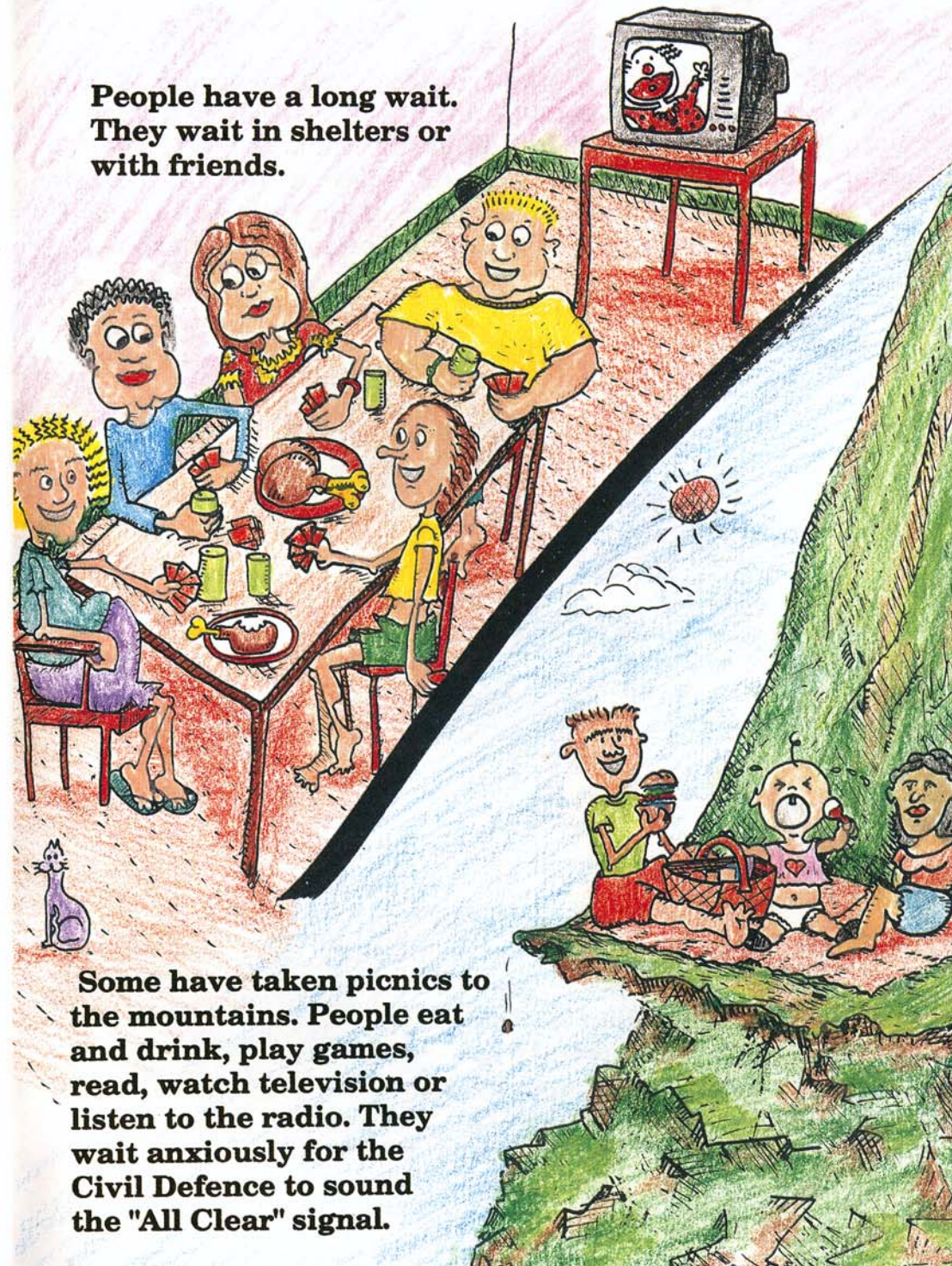
At 12 noon, the first tsunami wave rolls in. Around some parts of Hawaii there are coral reefs and these help to break the force of the tsunami.



But at bays, the waves can be very big because the sides of the bay shorten the length of the wave and push it upwards. There are six waves in this tsunami and they come every hour for the next six hours.



People have a long wait. They wait in shelters or with friends.



Some have taken picnics to the mountains. People eat and drink, play games, read, watch television or listen to the radio. They wait anxiously for the Civil Defence to sound the "All Clear" signal.