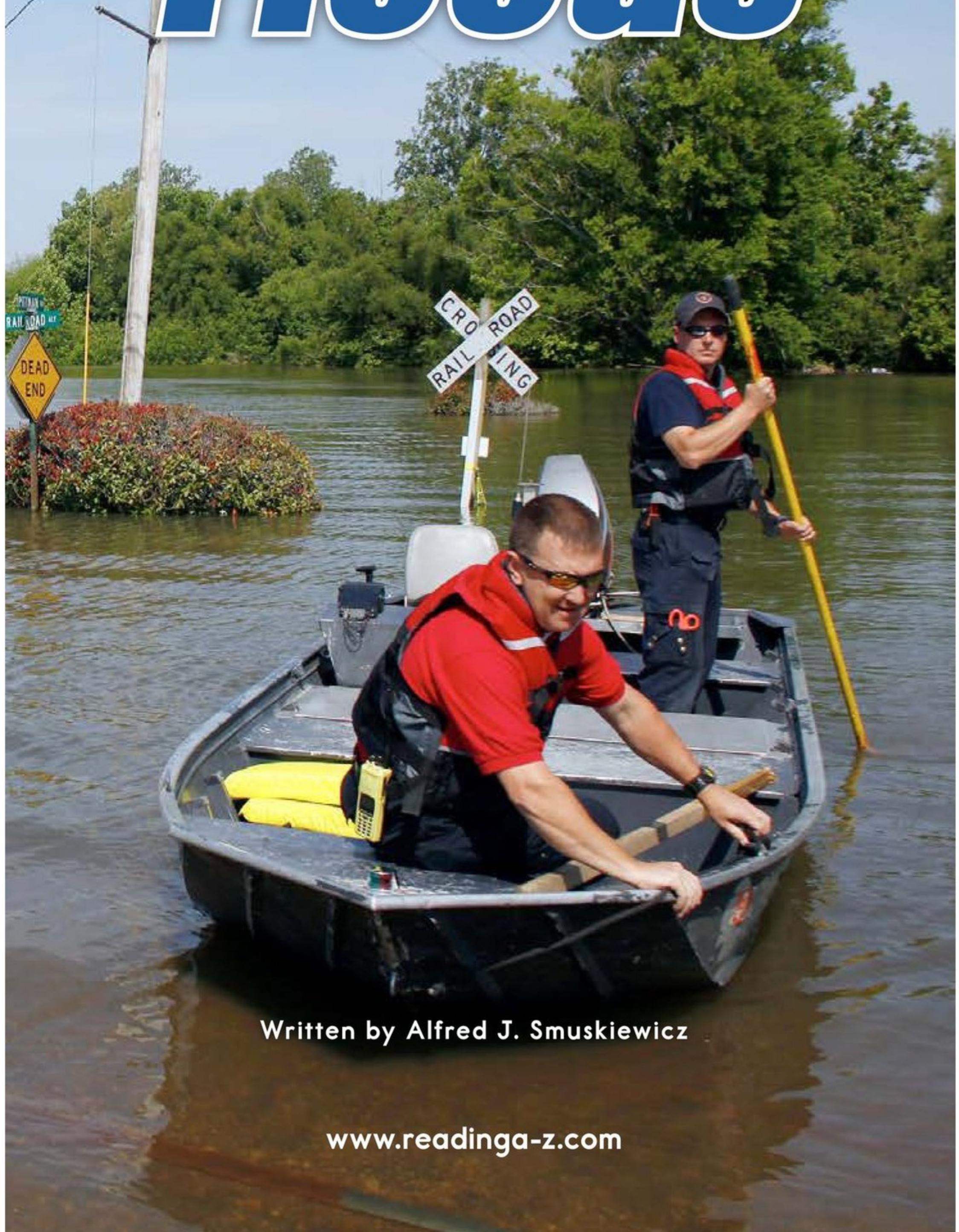


LEVELED BOOK • V

Floods



Written by Alfred J. Smuskiewicz

www.readinga-z.com

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Introduction

In August of 2005, much of the city of New Orleans, Louisiana, was flooded. Hurricane Katrina sent millions of gallons of water flowing over the protective **levees**. The flooding caused billions of dollars in damage and cost almost two thousand people their lives. Years later, the effects of the flood can still be seen throughout the city.

The flooding in New Orleans was devastating and extreme, but floods happen around the world every day, usually with much less impact. In fact, many areas rely on regular flooding to add **nutrients** to soil. These nutrients support the growth of crops as well as forests and other natural habitats.



In 2005, floodwaters in New Orleans, Louisiana, covered cars and houses for weeks after Katrina, leaving many people without homes or jobs.



In 1993 (right), heavy rains caused water to overflow the Mississippi and Missouri Rivers' normal channels (left) around St. Louis, Missouri.

Overbank Flooding

The most common type of flooding is overbank flooding. In the United States alone, hundreds of these floods occur every year. Overbank flooding happens when water from heavy rains or melting ice and snow fills a river channel beyond its capacity. The extra water flows over the banks and into the **floodplain**, which is the area that the water covers.

Lingeruing Lakes

Increased runoff can cause the amount of water in lakes to build up. Most lakes have ways of draining the water, but some lakes do not. When these lakes overflow their banks, the water has nowhere to go. The flooding can last for years or even decades.

Sand-less Sandbags?

To protect buildings from flooding, people stack bags of sand on top of each other. In 2012, Peyton Robertson, a ten-year-old boy, saw the destruction caused by a hurricane. He invented a new kind of sandbag by filling canvas bags with salt and a special substance that expands when it gets wet. The bags are lighter and make a better seal against water than regular sandbags. His new sand-less sandbags work so well that he won the 2013 Discovery Education 3M Young Scientist Challenge.



Peyton Robertson shows off his invention at the White House Science Fair in 2014.

In areas with wide, flat floodplains, the water may spread slowly and remain for days or weeks. In areas with deep, narrow floodplains, the water moves quickly and floods for only a short time. Many rivers have small floods every year and larger floods every five or so years. Occasionally, heavy **precipitation** causes severe flooding along rivers. These events are often referred to as one-hundred-year floods.

For major rivers with large floodplains, experts are usually able to accurately predict the timing and amount of flooding. For other rivers—those with small, narrow floodplains—the speed and intensity of the moving water can make flood prediction difficult.

Flash Floods

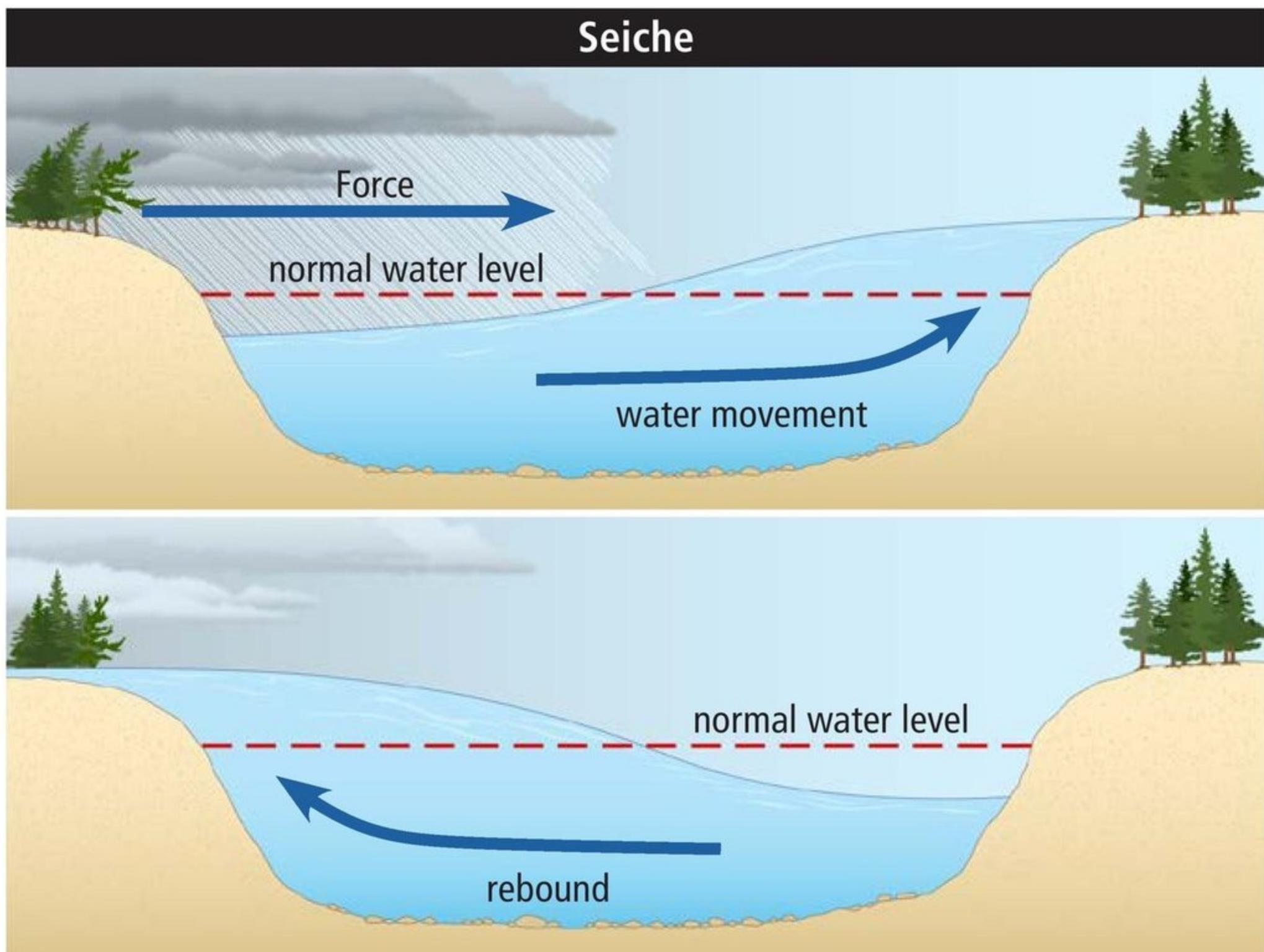
Sometimes floodwater moves so quickly and unpredictably that it becomes a flash flood. This type of flood is defined by a rapid increase in the speed and height of water. This fast-moving water can cause extensive damage. People often do not have time to protect themselves and their property. Most of the damage is caused by the movement of the water. For example, water moving at 10 miles per hour (16.1 kph) has the same force as a 270 mile-per-hour (434.5 kph) wind. To compare, **hurricane**-force winds begin at 74 miles per hour (119.1 kph). During one flash flood in Colorado, water flowing at 30 miles per hour (48 kph) moved boulders weighing more than 250 tons (226,796 kg).



A flash flood in Pensacola, Florida, in 2014 destroyed this bridge and stranded a motorist.

Seiche

Floods can have causes other than annual precipitation overflowing riverbanks. Sometimes earthquakes or powerful winds and storms cause flooding near lakes by producing a seiche (SAYSH). If you've ever sloshed water back and forth in a cup, you've seen a seiche. The winds or earthquakes cause large amounts of water to shift from one side of a lake to the other. When the water shifts back, it can overflow the banks and flood surrounding areas. Some seiches can cause waves 12 to 16 feet (3.6–4.9 m) high.



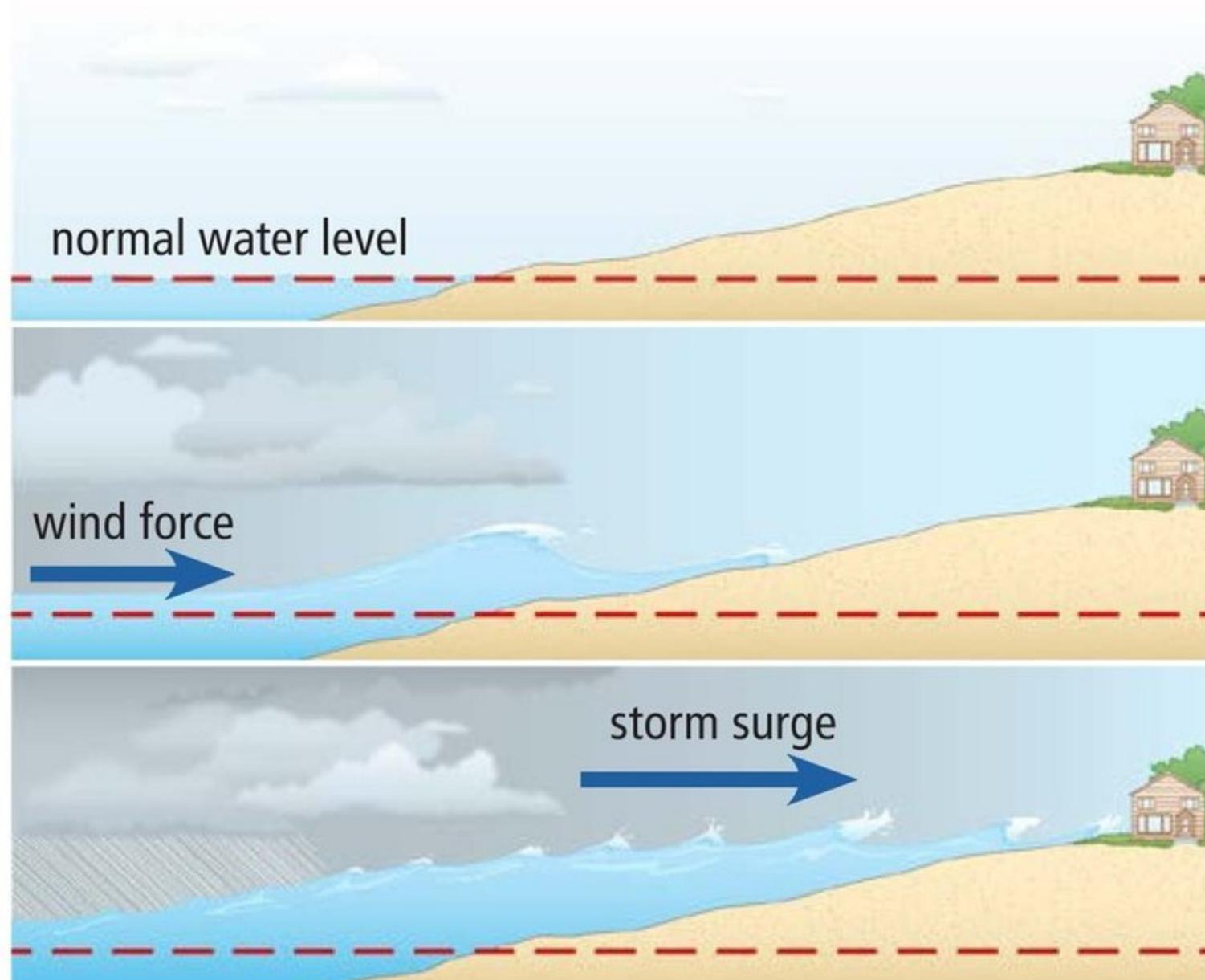
When the force of the storm dies down, the water shifts back and flows over the bank, causing a flood.

Storm Surges

A similar type of event can happen on a much larger scale in the ocean. The powerful winds of some storms, such as hurricanes and cyclones, can push water in front of them. When the water nears the shore, the ground pushes the water upward in what's called a *storm surge*. Rather than sloshing back out to the ocean, however, the water continues forward over the shore and onto the land beyond, causing a flood.

The damage from storm surges, which can be anywhere from 4 to 25 feet (1.2–7.6 m) high, can be considerable. Water can continue to flood onto the land for up to eight hours. Entire coastlines can be wiped away in less than a day.

Storm Surge



Under normal conditions, water does not flow over the shore.

The pressure and force of the storm push the water toward the shore.

As water moves toward the shore, the land forces the water upward, causing a flood.

Megafloods

The power of floods to shape and change the landscape is undeniable. In fact, massive floods, called *megafloods*, may have changed entire continents long ago.

Evidence suggests that about fifteen thousand years ago in North America, an ice dam broke in what is now Montana. That collapse released water from a huge lake. The megaflood spread across the Pacific Northwest and completely changed the landscape in some areas.

Scientists have found evidence of another megaflood that took place more than seven thousand years ago. Water from melted glaciers caused the level of the Mediterranean Sea to rise. The water flowed into the area between Europe and Asia, creating the Black Sea.



Rising waters in the Mediterranean Sea flowed through the Turkish Straits into the lake that became the Black Sea.



Mangrove forests in salt marshes are unique ecosystems that protect coastlines from severe flooding and provide protection for many living things.

The Good in Floods

While floods can be incredibly **destructive**, they are an essential part of many natural **ecosystems**. For example, many ecosystems along rivers or in existing floodplains need floods to survive. Water in rivers carries **sediment**, which is full of nutrients. When the river floods and the water **recedes**, it leaves the sediment behind. The nutrients nourish plants, which provide food for animals. The water may also be a signal for some animals to start producing young.

Salt marshes along some coasts flood every day with the ocean tides. They are home to many plants as well as fish, birds, insects, and other animals. These living things rely on the regular flooding to bring in fresh water and food from the ocean.

Marshes, along with swamps and other types of wetlands, also help decrease the severity of floods. They are able to hold large amounts of water and can drain effectively when they become too full. Excess water will flow into these areas instead of to places where it may cause more damage.



Nature's Engineers

Beavers are known for building dams on streams, rivers, and ponds as well as in lakes. They make their dams out of logs and branches, and glue them together with mud and wet plants. Some beaver dams are longer than 1,000 feet (300 m). These dams back up the flow of water from a stream, causing ponds to form. The dams reduce flooding in these areas by holding back the water that runs into streams during heavy rains. The excess water is then released a little at a time instead of all at once.

People and Floods

Nature has found many ways to handle floods; however, it can sometimes be difficult for people. Modern construction covers up or destroys many of the natural systems for handling floods. With nothing to **absorb** or stop the water, it flows on top of the ground, causing much more damage.

As a result, people have created multiple lines of defense from floods. The most obvious are the gutters, drains, and sewers that take water from the streets and quickly move it away. This urban **drainage** system is effective most of the time. However, it causes some problems. The increased amount of water draining into rivers and streams can actually cause flooding in other areas.

Most Expensive Floods in United States History

Year	Location	Estimated Cost
2005	Louisiana, Mississippi, Alabama	\$80 billion
1993	Mississippi and Missouri Rivers	\$30 billion
2011	Tennessee to Louisiana	\$9 billion
1995	Southern Louisiana	\$7.8 billion
1951	Kansas	\$6.7 billion
1936	Maine, New Hampshire	\$4.7 billion
1995	Northern California	\$4.3 billion
1965	Colorado	\$3.9 billion
1996–1997	Pacific Northwest U.S.	\$3.5 billion
1913	Ohio	\$3.3 billion
1964–1965	Pacific Northwest U.S.	\$3 billion



The North Sea Protection Works is a unique, complex system of dams, floodgates, and storm surge barriers that allows the Netherlands to exist.

Urban drainage can only handle so much water. People have created other systems to protect themselves from floods. They have built levees, **dikes**, and dams to hold back large amounts of water. Many dams have gates that allow people to control the flow of water through the dam.

These structures help, but they can also cause problems. The blocked water builds up behind them, causing a change in the surrounding ecosystem. They also disrupt flood patterns and ecosystems downstream.

Some systems for protecting people from floods are massive in scale. For hundreds of years, the people of the Netherlands suffered constant flooding. In 1927, they began building the North Sea Protection Works. This complex system of structures took almost twenty-five years to build.

Conclusion

Although we have created many ways to warn and protect ourselves, floods still occur. Every year, floods cause billions of dollars in property damage and take thousands of people's lives. However, they are necessary to the health of many different animals, including people. As we learn more about floods, we may be able to discover a balance between our needs and the destructive and helpful properties of this natural process.

Stay safe during a flood!

- Get information about storm forecasts from the Internet, radio, or television.
- Move to high ground away from rivers, shores, storm drains, or other places where water might rise.
- Make an emergency kit that includes drinking water, canned food, a flashlight, a radio with extra batteries, a blanket, a change of clothes, and some pet food.
- Make sure your pets are safe inside before a storm.
- Never try to walk or swim through moving water during a storm.
- Do not use electrical appliances if they are wet.



Glossary

absorb (<i>v.</i>)	to soak up or take in (p. 13)
destructive (<i>adj.</i>)	causing great damage or harm (p. 11)
dikes (<i>n.</i>)	long walls built to help keep water from flooding an area (p. 14)
drainage (<i>n.</i>)	the act of removing water from somewhere or something (p. 13)
ecosystems (<i>n.</i>)	communities of living things together with their habitats (p. 11)
floodplain (<i>n.</i>)	low, flat land that is covered with water when streams and rivers overflow (p. 5)
hurricane (<i>n.</i>)	a strong, spinning storm with heavy rain and high winds that starts over an ocean, especially the Atlantic Ocean (p. 7)
levees (<i>n.</i>)	ridges or raised areas that prevent a river from overflowing (p. 4)
nutrients (<i>n.</i>)	substances that living things need to live, stay healthy, and grow (p. 4)
precipitation (<i>n.</i>)	water that falls to the ground, such as hail, sleet, rain, or snow (p. 6)
recedes (<i>v.</i>)	moves or pulls back from a previous position (p. 11)
sediment (<i>n.</i>)	particles of dirt and rock that are carried by water, wind, or ice and deposited elsewhere (p. 11)

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Front and back cover: Rescue workers patrol a neighborhood under floodwaters in Vicksburg, Mississippi, in 2011.

Title page: Residents of Wagga Wagga, Australia, band together to pile up sandbags for protection from rising floodwaters.

Page 3: Government workers help families get away from floodwaters in New Orleans, Louisiana.

Floods

Level V Leveled Book

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