



## Hurricanes

### Background

## MASTERS OF DISASTER®

# Hurricanes

Hurricanes is one of the topics in the series of *Masters of Disaster* materials created by the American Red Cross for schools, clubs, organizations and families across the country. This module leads young people to an understanding of how hurricanes form; the impact a strike can have on a community; and the safe actions to take if the National Weather Service issues a Hurricane WATCH or WARNING.

These activities are specifically tailored for reaching children in lower elementary (K–2), upper elementary (3–5) and middle school (6–8) grades. *Hurricanes* is divided into two sections, Hurricane Science and Hurricane Safety.

### ***Masters of Disaster Connections***

Refer to the following modules in the *Masters of Disaster* series to learn more about a particular topic and to reinforce the objectives of the lesson.

- Hurricanes are extremely powerful cyclones that generate tornadoes and lightning. The heavy rains produced by hurricanes often cause major floods. *Masters of Disaster's Tornadoes, Lightning and Floods* offer comprehensive lessons that complete a student's understanding of hurricanes.
- An essential part of preparing for any disaster is to be ready with plans, supplies and practice. *Be Disaster Safe* from *Masters of Disaster* inspires young people by teaching them to prepare for all hazards.
- The lessons of *In the Aftermath* focus on recovery after a disaster—for the individual, the school and the community.

### Why Talk About Hurricanes?

There are no other storms on earth like hurricanes. Views from satellites located thousands of miles above our planet show how these powerful, tightly coiled weather systems are unique. Each year, on average, ten tropical storms (of which six become hurricanes) develop over the Atlantic Ocean, the Caribbean Sea, or the Gulf of Mexico; many remain over the ocean. On average, five hurricanes strike the coastline of the United States every three years. Of these five, two will be major hurricanes (storms of category 3 or higher on the Saffir-Simpson scale, which corresponds to hurricanes with winds at or above 111 miles [179 kilometers] per hour).

Timely warnings have greatly diminished hurricane fatalities in the United States, but property damage continues to mount. We can do little about the hurricanes themselves. However, the National Oceanic and Atmospheric Administration's Tropical Prediction Center and National Weather Service field offices team up with other organizations in a large-



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scale warning and preparedness effort. These include other federal, state and local agencies; rescue and relief organizations; the private sector; and the news media.

### Hurricane Science

#### The Formation of a Hurricane

A hurricane is a huge tropical cyclone that packs heavy rain and strong winds that rotate around a center of low pressure. In the Northern Hemisphere, the circulation is counterclockwise; in the Southern Hemisphere, it is clockwise. A tropical cyclone with sustained winds of 74 miles (119 kilometers) per hour or more is called a hurricane if it originates in the North Atlantic Ocean, the Caribbean Sea, the Gulf of Mexico and the eastern North Pacific Ocean; it is called a typhoon if it originates in the western Pacific Ocean and a tropical cyclone if it originates in the Indian Ocean. The word “hurricane” comes from the Spanish word “huracán,” which may have derived from the name of the Mayan storm god Huraken or from any of a number of other Caribbean native terms for evil spirits or big winds.

#### The Life Cycle of a Hurricane

A hurricane evolves through three distinct stages:

1. **Tropical Depression.** A tropical depression begins as a tropical wave, which is a weak area of low pressure without defined circulation. If the wave becomes more organized, with deep convection observed and a closed surface wind circulation around a well-defined center with sustained winds of 38 miles (61 kilometers) per hour or less, it is a tropical depression.
2. **Tropical Storm.** If wind speeds attain 39 to 73 miles (62 to 118 kilometers) per hour, the tropical depression is considered a tropical storm and is assigned an official name by the National Weather Service.
3. **Hurricane.** When the winds of a tropical storm reach a constant speed of 74 miles (119 kilometers) per hour or more, it officially becomes a hurricane. Hurricane winds blow in a large spiral around a relatively calm center called the eye, which generally is 20 to 30 miles (32 to 48 kilometers) in diameter. The storm may have a diameter of up to 400 miles (644 kilometers). Atlantic hurricane season extends from June 1 through November. In the East Pacific, the season extends from May 15 through November, and in the West Pacific, from July 1 to December 15. Most hurricane activity occurs within these dates, but tropical cyclones can occur year-round.



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### The Five Categories of Hurricane (Saffir-Simpson Scale)

Category	Winds	Damage
1	74–95 mph (119–153 kph)	Minimal
2	96–110 mph (154–177 kph)	Moderate
3	111–130 mph (178–209 kph)	Extensive
4	131–155 mph (210–249 kph)	Extreme
5	>155 mph (>249 kph)	Catastrophic



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The 12 Forces of Wind (Beaufort Wind Scale)			
Force	Description	Winds	Signs
0	Calm	0 mph (0 kph)	Smoke rises vertically.
1	Light air	1–3 mph (1–5 kph)	Smoke drifts, but wind vanes or flags do not move.
2	Slight breeze	4–7 mph (6–11 kph)	Leaves rustle and wind vanes move.
3	Gentle breeze	8–12 mph (12–19 kph)	Leaves and small twigs are in constant motion; flags are extended.
4	Moderate breeze	13–18 mph (20–29 kph)	Dust and loose paper blow; branches move in trees.
5	Fresh breeze	19–24 mph (30–39 kph)	Small, leafy trees begin to sway.
6	Strong breeze	25–31 mph (40–50 kph)	Large branches are in motion; whistling is heard in utility wires.
7	Moderate gale	32–38 mph (51–61 kph)	Whole trees are in motion. It is difficult to walk against the wind.
8	Fresh gale	39–46 mph (62–74 kph)	Twigs break from trees.
9	Strong gale	47–54 mph (75–87 kph)	Roof shingles blow free; slight structural damage can occur.
10	Whole gale	55–63 mph (88–101 kph)	Trees are broken or uprooted; there is considerable structural damage.
11	Storm	64–73 mph (102–118 kph)	Widespread damage occurs; trees blow a distance.
12	Hurricane	74+ mph (119+ kph)	Extreme destruction occurs; buildings are destroyed, trees and utilities are down.



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### Hurricane Hazards

A hurricane event has the potential to devastate a community.

#### *Storm Surge*

A storm surge is a large dome of water pushed ahead of a hurricane that is making landfall, and it is more dangerous than the high winds. Depending on the strength and velocity of the hurricane, this dome of water can exceed 20 feet (32 kilometers) in height and range from 50 to 100 miles (80 to 160 kilometers) in width. Storm surges can sweep away cars and buildings and flood streets. Islands and bridges can disappear completely for hours under the high waters.

#### *Winds*

Hurricane winds blow in a large spiral around a relatively calm center known as the eye, which is generally 20 to 30 miles wide. These loud and powerful winds travel at speeds between 74 and 200 miles (119 and 325 kilometers) per hour, uprooting trees, ripping the roofs from buildings and demolishing homes.

#### *Floods*

Floods may result from either rainfall or storm surges. A large amount of rainfall within a short period of time causes rainwater to collect outside the normal boundaries of rivers, streams, lakes and flood canals. Most deaths due to hurricanes are related to floods. Torrential rains from decaying hurricanes and tropical storms can produce extensive urban and river flooding. Winds from these storms located offshore can drive ocean water up the mouths of rivers, compounding the severity of inland floods. Inland streams and rivers can flood and trigger landslides. Mudslides can occur in mountainous regions.

#### *Tornadoes*

Hurricanes and tropical cyclones often produce tornadoes, both before and after landfall. Most tornadoes occur in the right-front quadrant of the hurricane, relative to its motion (north and east of the center of a storm.) However, they are also often found elsewhere embedded in the rainbands, well away from the center of the tropical cyclones. Tornadoes can develop at any time of the day or night during landfall. However, by 12 hours after landfall, tornadoes tend to occur mainly during daytime hours.

### Hurricane Safety

Many people do not understand the threat of hurricanes, as each one is different. Over the past several years, hurricane warning systems in the United States have provided adequate time for people on barrier islands and the immediate coastline to move inland when hurricanes threaten. However, due to rapid population growth, it is becoming more difficult to evacuate people from the barrier islands, large cities and other coastal areas because roads have not kept pace with the expansion. The problem is further compounded by the fact that most people now living in hurricane-prone areas have never experienced the direct impact of a major hurricane. Many of these people have been through weaker storm areas along the edges of major hurricanes. The result is a false impression of a hurricane's damage potential. This often leads to delayed actions, which could result in the loss of many lives.



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### Be Ready for Hurricanes

The path of a hurricane can be very erratic, its power very dangerous. As a hurricane gains intensity and approaches land, it is often difficult to pinpoint where it will make landfall. Meteorologists and the National Weather Service track tropical storms and hurricanes by latitude and longitude. By following the reports of a hurricane's path, communities know when to prepare.

### Before a Hurricane

Be prepared before the possibility of a hurricane.

- Know the area's potential for hurricanes.
- Consider the purchase of flood insurance.
- Designate a safe place to go (homes of family or friends farther inland or community shelters).
- Become familiar with local evacuation routes.
- Prepare a family disaster supplies kit (see the lesson plans in General Preparedness).
- Install hurricane shutters or purchase 1/2" outdoor plywood boards for each window of your home.

### Hurricane WATCH

The National Weather Service issues a Hurricane WATCH when there is a threat of hurricane conditions within 24 to 36 hours. Now is the time to—

- Monitor the media for official weather conditions and community instructions.
- Check the family disaster supplies kit to make sure that stored water and canned foods are fresh, medications are updated and batteries are fresh.
- Be sure everyone is aware of the family disaster plan, including the family emergency contacts list.
- Review the evacuation route.
- Call your designated out-of-town contact to line up a place to stay in case you are told to evacuate.
- Be ready to cover all windows with hurricane shutters or plywood.
- Prepare to bring inside any lawn furniture, outdoor decorations or ornaments, trash cans, hanging plants, and anything else that can be picked up by the wind.

### Hurricane WARNING

The National Weather Service issues a Hurricane WARNING when hurricane conditions are expected in 24 hours or less. Now is the time to—

- Continue to monitor the media for the latest information while making preparations to evacuate if the order is given to do so.
- Listen to the advice of local officials, and leave if they tell you to do so.
- Evacuate if you live in a mobile home. (Anyone who lives in a mobile home must evacuate when a hurricane WARNING is issued.)
- If you are not advised to evacuate, stay indoors, away from windows.



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- Cover all windows with hurricane shutters or plywood if they are not already covered.
- Have flashlights ready for use. Do not use candles.

### Evacuation

If you are instructed to evacuate—

- Call your out-of-town contact to tell him or her where you are going.
- Lock and secure your home and leave as soon as possible.
- Take your family disaster supplies kit and go to your out-of-town contact's home or to a community shelter.

### After a Hurricane

Evacuees should return home only when officials say it is safe—and they should return with caution.

- Stay tuned to local radio for information about local conditions and where to get help.
- Avoid loose or dangling power lines; report them to the power company, police or fire department.
- Enter buildings or homes with extreme caution.
- Wear sturdy shoes and protective clothing, including long sleeves and long pants.

For more detailed information about hurricane safety, contact your local chapter of the American Red Cross or visit [www.redcross.org/disaster/masters](http://www.redcross.org/disaster/masters) to obtain copies of the *Masters of Disaster* Hurricane curriculum.



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