

UNDER THE WEATHER

GRADE 8

LESSON # 6

TITLE: Hurricanes

OVERVIEW:

Students will understand and be able to identify the differences between tropical storms and hurricanes.

Understanding and identification of storm classification system.

STANDARDS:

MATERIALS NEEDED:

Student Activity Worksheet

O'ahu Civil Defense Agency Preparation Brochure

Hurricane Makani Pahili Exercise CD and Civil Defense alerts

DURATION: 90 minutes or approximately 2 class periods

PROCEDURE:

1. Describe the hazards that can cause damage and injuries in a hurricane
2. What environmental damage might result from a hurricane? From the related storm surge?
 - A. Impact on the natural environment.
 - B. Damage to habitats and organisms
 - C. Pollution
 - D. Fishing?
 - E. Would there be any benefits from a hurricane?
3. Building a Family Disaster Kit
 - Recommended contents for a survival kit
 - Where is the closest shelter to your home? Your school? Your parents' workplaces?
4. Hurricane Makani Pahili Exercise
 - Set up an Emergency Operations Center
 - Monitor storm progress, assess, and recommend emergency responses

BACKGROUND INFORMATION FOR TEACHER:

Thunderstorm Winds

A thunderstorm is always accompanied by lightning and thunder, and may be accompanied by heavy rains, strong downdraft winds, hail, and waterspouts. Occurring when a growing cumulus cloud turns into a cumulonimbus cloud, thunderstorms are exceptionally dense, and significantly vertical in development.

Thunderstorms are uncommon in Hawaii, and are usually associated with cold

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fronts, Kona lows, or upper troughs between October and April. During the summer, tropical cyclones may also have thunderstorms embedded in their westward-moving cloud bands. The frequency of "thunderstorm days" in Hawaiian waters is very low on a monthly average, with one to three days a month during the winter, and zero to one day a month during the rest of the year.

However, thunderstorms are hazardous to marine interests because of the strong downdrafts, which may gust up to 60 knots (69 mph). The outflow from these downdrafts covers a few miles but lasts only a short time, about a half hour.

Waterspouts

Waterspouts and tornados are the same: small-diameter localized storms formed by winds rotating at very high speeds, usually in a counter-clockwise direction. The funnel is called a waterspout if it's over water and a tornado if over land. When a waterspout moves from water to land, it becomes a tornado. These severe storms of short duration develop from the base of heavy cumulonimbus, or thunderstorms (more commonly from cumulus clouds in Hawaii), and extend downward toward the sea.

Hawaiian waterspouts are usually mild, and do not pack the devastating winds of Midwestern tornadoes. However, the few severe waterspout or tornado incidents studied in Hawaii have indicated destructive wind speeds over 100 mph. The path of destruction is usually narrow, 50 to 300 feet wide, and less than a mile long, however, its speed of travel is faster than a boat.

Waterspouts occur mainly in the winter months, with the probability of one or two in November, December, January, or April. About 30-40 waterspouts are sighted annually in Hawaiian waters, although this is probably a small fraction of the true number of occurrences. Every waterspout has to be treated as though it will be a severe one, even though most waterspouts in Hawaii spin away harmlessly over the open water without causing damage.

Hurricanes and Tropical Storms

A hurricane is a severe large tropical cyclone originating over tropical oceans. Tropical cyclones to the left of the International Date Line (towards Asia), are called typhoons while tropical cyclones to the right of the International Date Line (towards Hawaii and Mexico) are called hurricanes.

Tropical cyclones are classified according to their wind speed intensity.

There is a direct relationship between the central pressure of a hurricane and its maximum wind speed. The lower the pressure, the stronger the winds. The most intense tropical cyclones are the super-typhoons in the Western Pacific.

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Hurricanes don't strike Hawaii often, with most of the threatening tropical cyclones weakening before reaching Hawaii, or passing harmlessly westward and south of the Islands. However, strong winds are always a potential threat from these rare storms, which can occur from June to November. Additional information on hurricanes can be found by visiting the [PDC Hurricane page](#).

- Powerful storms that form over tropical waters, generally from June to December.
- Water temperatures range in the low-to-mid 80s (F), or warmer, to supply the moist air that fuels the clouds.
- Hurricanes have sustained winds of 74 mph or higher.
Standards: Geography, science
- Damaging winds, water spouts, tornadoes, heavy rain, flood, and storm surge.

Tropical Depression
0-38 mph winds

Tropical Storm
39-73 mph winds

Category One (1): Weak
74-95 mph winds / 4-5 ft storm surge

Category Two (2): Moderate
96-110 mph winds / 6-8 ft storm surge

Category Three (3): Strong
111-130 mph winds / 9-12 ft storm surge

Category Four (4): Very Strong
131-155 mph winds / 13-18 ft storm surge

Category Five (5): Catastrophic
> 155 mph winds / >18 ft storm surge

Storm surge

A storm surge is a large dome of water often 50 to 100 miles wide that sweeps across the area near where a hurricane makes landfall. The surge of high water topped by waves is devastating. The stronger the hurricane and the shallower

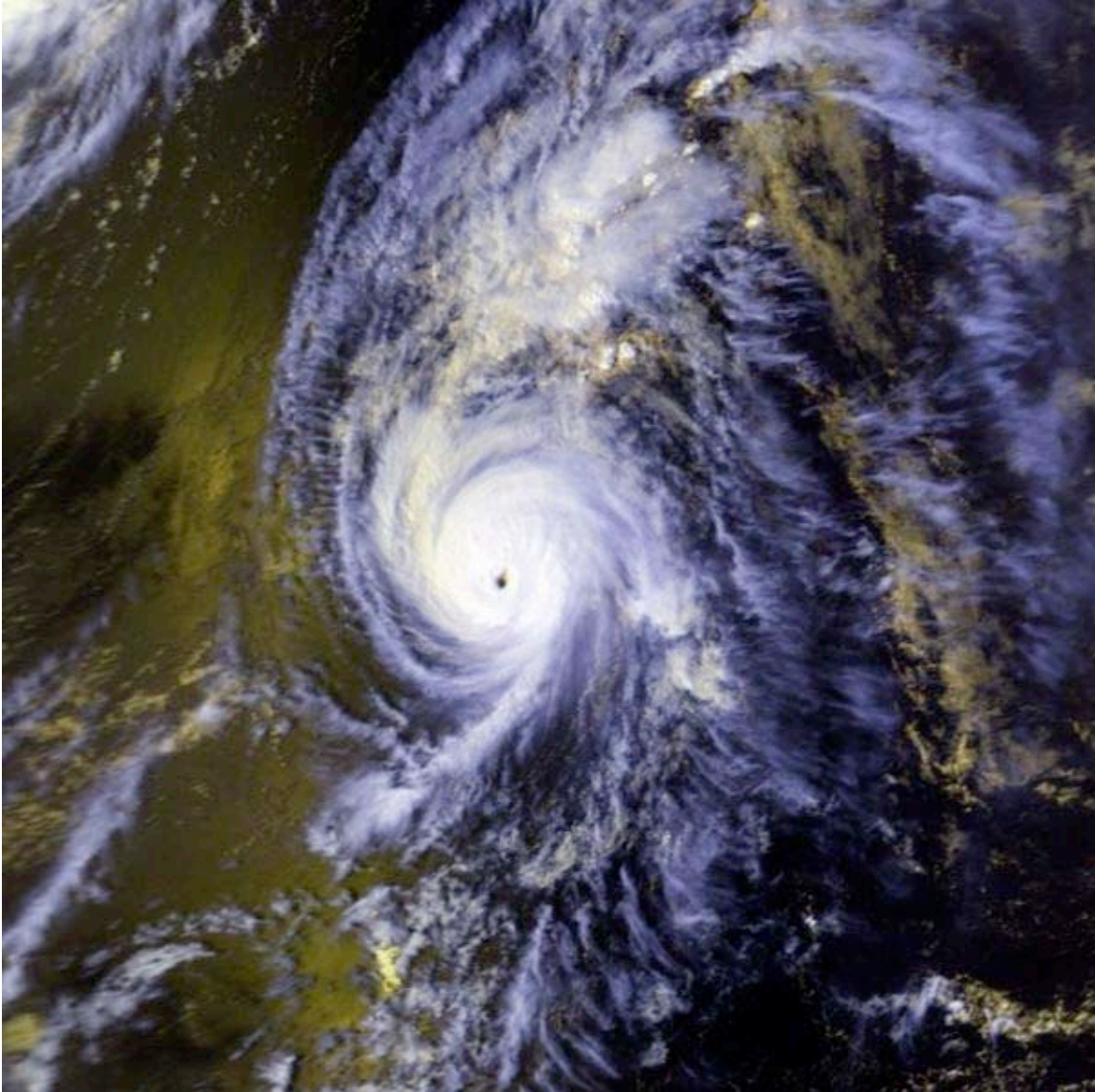
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the offshore water, the higher the surge will be. Along the immediate coastline, storm surge is the greatest threat to life and property.

If the storm surge arrives at the same time as the high tide, the water height will be even greater.



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Hurricane 'Iniki – 1 September 1992

Heavy Rains/Floods

Widespread torrential rains often in excess of six inches can produce deadly and destructive floods. This can be a major threat to areas well inland.

Winds

Hurricane-force winds, 74 mph or greater, can destroy poorly constructed buildings. Signs, roofing materials, siding and small items left outside become flying missiles in hurricanes.

WEB RESOURCES:

Oahu Civil Defense Agency, www.oahucivildefense.com

Red Cross, Masters of Disaster Lessons - Meeting National Education Standards Science 6-8 - http://www.redcross.org/disaster/masters/modlesson_sc68.html

Federal Emergency Management Administration www.fema.org

Maui County Civil Defense Agency

PRINT RESOURCES

Oahu Civil Defense Agency, *Preparing for Hurricanes & Tropical Storms*, brochure.

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STUDENT ACTIVITY WORKSHEET

1. Describe the hazards that can cause damage and injuries in a hurricane.

2. What environmental damage might result from a hurricane and from the related storm surge?

A. Impact on the natural environment.

B. Damage to habitats and organisms

C. Pollution

D. Fishing

E. Would there be any benefits from a hurricane?

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3. Building a Family Disaster Kit
Contents for a survival kit?

Where is the closest shelter to your home? Your school? Your parents' workplaces?

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REFERENCE MATERIAL

Disaster Preparedness

Disaster Preparedness is an individual and family responsibility. The two most important precautions you need to take are develop a **Personal Preparation Plan** and assemble an **Emergency Survival Kit**.

1. Personal Preparation Plan

Emergencies and disasters can occur anytime. Some allow for certain preparations; others occur without warning. Residents and visitors in Hawai'i must be prepared for emergencies that could arise from natural or technological disasters. Planning ahead and making provisions for your family's needs can make a big difference in your ability to cope with emergencies.

Be prepared. Make sure all family members know what to do in case of emergency.

Decide where the family will meet if separated, where you will seek shelter, and what you will take with you if you must evacuate.

If an emergency occurs, remain calm. Follow your plan. Listen to the radio or television for instructions and information.

Know warning signals and shelter locations.

2. Assemble an Emergency Survival Kit

Prepare a survival kit for home use or to take to a shelter. Use the following list as a guideline.

- A four-week supply of prescription medicines
- A five-day supply of non-perishable food
- Non-perishable special dietary foods, if necessary
- Ice chest
- Water, minimum of 2 quarts per person per day
- Pet food
- Candles
- Matches
- Fuel for stoves, hibachis, or lanterns
- Pillows, blankets, sleeping bags, or air mattresses
- Flashlights, batteries and extra bulbs
- Portable radio and extra batteries
- Extra clothing, eye glasses

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- Masking tape for windows and glass doors
- Personal hygiene items such as toothbrush, toothpaste, deodorant, etc.
- Special items for infants, elderly or family members with special needs
- Quiet games, books, playing cards, and favorite toys for children
- Important papers including driver's license, special medical information, insurance policies, and property inventories (written or videotaped)
- First aid kit and water purification kit (tablets or chlorine available at drug stores)

Warning Sirens And Procedures

A monthly test of the EAS and warning sirens is conducted at 11:45 a.m. on the first state work day of each month. This consists of a 45-second solid tone. During a disaster, a steady three-minute siren tone is the attention alert signal. When the siren is heard, tune your radio or television to any local station and listen for emergency information and instructions.

Listen to Emergency Alert System broadcasts for further instructions and the all-clear announcement.

Information Access

The Emergency Alert System (EAS) will provide you with the information you need. Civil Defense instructions are broadcast over radio, television, and cable TV systems. Tune to your local station when you hear the warning sirens. do not use the telephone except for serious emergencies.

Weather Information Sources

NOAA Weather Radio Broadcasts on following frequencies:

162.550 MHZ

162.400 MHZ