Hurricanes

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How and Where Hurricanes Form

Counterclockwise winds draw heat and moisture from the tropical ocean, contributing to the formation of an intense and strong tropical cyclone. Hurricane proportions are reached when winds are sustained at 74 miles per hour (mph) or more. This air revolves around a relatively calm 20- to 30-mile-wide eye, spreading outward almost 400 miles. As the storm moves forward at about 15 mph, it releases heavy rains and accelerating winds and causes the ocean to swell. Hurricanes may be preceded by a tornado in the right front quadrant. Losing some intensity as it approaches land, the storm brings severe rains, wind and storm surges that inundate coastal areas. Moving further inland, a hurricane loses strength but continues its outpouring of rain and high winds.

Hurricanes are formed in the North Atlantic, Caribbean Sea, Gulf of Mexico and the Pacific Coast of Mexico. The greatest likelihood of a hurricane striking land areas is along the Gulf Coast and the southeastern seaboard. But hurricanes also have hit central Pennsylvania and the coast of New Jersey, New York and New England.

Over land, hurricanes break up rapidly. Cut off from their oceanic source of energy and with the added effects of frictional drag from land, their circulation rapidly weakens and becomes more disorganized. Torrential rains, however, may continue even after the winds are much diminished. In the southeastern United States, about one-fourth of the annual rainfall comes from dissipating hurricanes.

The Atlantic hurricane season lasts from June through November. August and September are peak months. There is no "season" for Pacific hurricanes. Hurricanes occur north of the equator over the Atlantic and Pacific oceans. Typhoons occur in the South Pacific. Tropical cyclones occur over the Indian Ocean. All of these storms are the same phenomenon.

Why Hurricanes are a Risk to People

Nearly 100 million Americans are at risk from hurricanes. Hurricanes pose three major threats:

1. Wind: Hurricane winds exceed 74 mph. The winds of Hurricane Andrew were measured more than 120 mph. Hurricane winds cause buildings to rip apart, uproot unstable structures or objects, damage utility lines and threaten lives. Wind damage can occur hundreds of miles inland. Heavy rains in mountainous areas can cause flash flooding where there is little warning of this major threat to life and property.

2. Heavy rain: There are "dry" and "wet" hurricanes. A "dry" hurricane moves quickly over land and may drop a total of 5 inches of rain or less. These hurricanes usually do not pose much of a risk from flooding but usually can cause great wind damage. "Wet" hurricanes can drop more than 9 inches of rain per square mile and are slow moving. They can stall, dropping 18 inches or more of rain in some areas.

3. A storm surge is a large dome of water pushed up in advance of a hurricane making landfall. This dome of water can exceed 20 feet, depending on the strength of the hurricane. It's important to differentiate storm surge from a tsunami (incorrectly referred to as a "tidal wave"). A storm surge is a large amount of water, on top of which there is heavy wave action. A storm surge can last for several hours.

The advancing storm surge combines with the normal tide to create the hurricane storm tide. In addition, wind waves 5 to 10 feet high are superimposed on the storm tide. This buildup of water level can cause severe flooding in coastal areas, particularly when the storm surge coincides with normal high tides. In addition to the information you will find in this section also refer to the section on General Family Preparedness.

How to Prepare for a Hurricane

1. Know the risks of the area. If you live in an Atlantic or Gulf Coastal state within 100 miles of the shore, or on Hawaii, Puerto Rico, the U.S. Virgin Islands, Guam American Samoa or Palau, you are subject to devastating effects from hurricanes.

2. Know what a hurricane "watch" and "warning" mean.

   A Hurricane Watch means a hurricane may hit your area.

   A Hurricane Warning means a hurricane is headed for your area. You may be told to move to a shelter or evacuate the area. Do so immediately.

3. Review your family disaster plan. (See the section on General Family Preparedness.)

   Check straps and anchors for manufactured homes, sheds and outbuildings.

   Install hurricane shutters or precut -inch marine plywood for each window of your home. Install anchors for the plywood and predrill holes in it so that you can put up the plywood quickly when a WATCH is issued.

   Make trees more wind resistant by strategically removing branches so that wind can blow through them. Remove diseased or damaged limbs.

4. Refer to the General Family Preparedness section for additional precautions you should take.

Actions During a Hurricane Situation

1. During a watch (24 to 36 hours before landfall):

   Cover ALL windows of your home. If shutters are not installed, use precut plywood. If you do not have plywood, do what you can to protect windows from breaking. Tape does not work. Remove tree limbs, branches, shrubbery and other objects that can break windows.

   Recheck manufactured home tie-downs.

   Listen to the advice of local officials and leave if told to do so.

   Take in lawn furniture, outdoor decorations or ornaments, trash cans, hanging plants and anything else that can be picked up by the wind and become a missile of destruction.

2. During a warning (24 hours before landfall):

   Evacuate if you are advised to do so. See the General Family Preparedness section for steps that should be taken. Also see the Floods section if heavy rains or flooding are present.

   If you are not advised to evacuate, stay indoors and away from windows.

   Be aware of the calm "eye;" the storm is not over. The worst part of the storm will happen when the eye passes over and wind comes from the opposite direction. Trees, shrubs, buildings and other objects damaged by the first winds can be broken or destroyed by the second winds, whose force is opposite the direction of the first winds.

   Be alert for tornadoes. Tornadoes can happen during and after a hurricane passes over. Remain indoors, in the center of your home, in a closet or bathroom without windows. The section on Tornadoes offers additional information you will need if a tornado occurs.

Basic Response After a Hurricane

1. Wait until an area is declared safe before entering.

    Roads may be closed because they have been damaged or are covered by water. Barricades have been placed for your protection. If you come upon a barricade or a flooded road, go another way.

    Keep listening to the radio for news about what to do, where to go or places to avoid.

2. If you must walk or drive in areas that have been affected by the hurricane, stay on firm ground. Moving water only 6 inches deep can sweep you off your feet. Standing water may be electrically charged from underground or downed power lines.

3. Check gas, water and electrical lines and appliances for damage.

    Use a flashlight to inspect for damage.

    If necessary, turn off main gas valves and electrical switches or fuses. Have these services restored by a professional.

4. Use the telephone to report life-threatening emergencies only.

5. If you need assistance, visit your local Red Cross service center or chapter facility. State and federal agencies often provide assistance to individuals, families and businesses after larger storms. Listen to the radio for information on how to obtain governmental assistance.

6. Hurricanes bring a variety of associated problems. Refer to the Floods, Tornadoes and General Family Preparedness sections for information on various hazard responses.

Special Considerations for Agricultural Producers

In addition to the precautions and responses covered in the previous pages, the agricultural producer will want to consider the following measures.

Turf Grass Recovery After a Storm Surge

The surge of salt water brought inland by a hurricane can damage turf grasses on lawns, golf courses, sod farms, parks, playgrounds, sports fields and leisure-recreation sites.

1. Irrigation with clean, sodium-free, fresh water is probably the most important practice to follow when rinsing accumulated salts from turf leaf surfaces and leaching salts from root zones of soils.

    Test all irrigation water sources for salinity.

    If the irrigation lake has been flooded with salt water, pump it out and fill with clean river or well water.

    You also can irrigate from a well or river if not contaminated with salt.

2. Bermuda, zoysia, creeping bent and St. Augustine turf grasses have good relative salinity tolerance.

    Tall fescue and perennial ryegrass have medium salinity tolerance.

    Red fescue, Kentucky bluegrass, and centipede grass have poor relative salinity tolerance.

3. Repeated irrigation with water containing 1200 parts per million (ppm) total soluble salts will be harmful to the turf unless followed by sufficient rainfall or fresh irrigation water. Even irrigation water containing 500 to 600 ppm total soluble salts, when used repeatedly without being flushed with fresh water from rainfall or irrigation, can create a problem by allowing salts to accumulate in the root zone of the soil.

4. If it is over seeding time, remember that turf-type perennial ryegrasses have only medium tolerance to salinity. Test the soils for salinity before over seeding to avoid a loss in stand of winter cover.

5. Use gypsum (calcium sulfate, 18 percent sulfur, 20 percent calcium) to help leach salt from the soil. Gypsum works best when incorporated into the soil but it can be broadcast on the turf. Gypsum is not very soluble in water but it is more soluble than limestone.

    Irrigate after gypsum application to move it into the soil surface and root zone of the turf. Allow a period of time for the chemical reaction, and then continue irrigation to leach the salts into soil below the root zone.

    Poorly drained soils will be difficult to leach. Water logging the soil for extended periods of time can be as harmful to the turf as excess soluble salts. Core aerification or deep tine aerification, preferably with coring tines, can greatly assist with improving infiltration and percolation of water and salts through the soil and below the root zone.

Recovering Small Fruits

Storm damage to small fruits shows itself in different ways, depending on crop growth habit as well as proximity to the storm. In addition to wind, too much water, in some instances salt water, can adversely impact crops.

The following suggestions will help fruit growers evaluate damage and take corrective action.

1. Where wind damage is significant, pruning should be as light as possible. However, if large areas of cambium are exposed, the plant probably will not survive without attention. Make clean cuts to minimize the exposed cambium area. If the plant can be saved, several growing seasons may be needed to retrain.

2. Many plants that are leaning or uprooted can be reset if the root ball is intact. Once reset, secure with stakes to immobilize them.

3. Reshape altered dikes, terraces or raised planting beds to protect the area, cover exposed roots or provide a medium for new root growth. Use the smallest equipment possible to accomplish the job to minimize compaction and reduce further root damage.

4. If strawberry plants can be secured in the next 10 days, most plastic- culture plantings should be replanted. The most expensive inputs, irrigation, plastic mulch and fumigation, are still intact, while plant costs are relatively small compared to these. 5. Premature defoliation caused by tremendous wind speeds will weaken fruits. Defoliation coupled with root damage cause additional stress because the root system serves as a storage reservoir for carbohydrates manufactured by the leaves.

Without this reservoir of carbohydrates to call on for energy during the winter, the plants may be saved in the short run only to be killed during the winter.

Once the top damage has been pruned out and after the first freeze, apply nitrogen in a complete fertilizer at the rate of 30 pounds actual N per acre. This will help the plant start new root growth, which will continue during the winter as long as the soil temperature is above 45øF.

6. Soil concentrations of 3,000 ppm soluble salt will make fruit culture very difficult. However, some fruits are much more salt tolerant than others.

Grapes, figs, pomegranates and pecans are examples of fruits that will not be hurt by increased salt concentrations as readily as blueberries, strawberries and blackberries.

If the soil salt concentration is high, irrigate frequently to help reduce the buildup of salt following evaporation.

Test all irrigation water for salinity. If irrigation ponds have been contaminated, pump them out and fill with clean river or well water.

Rainfall, while complicating other cleanup activities, aids in flushing the soil. If the sodium content is 250 ppm or more, internal drainage problems will occur. This can be corrected somewhat by the use of gypsum as a soil additive. Apply at the rate of 2 ounces (2 tons per acre) of gypsum per square foot of area and immediately irrigate to move the material into the soil profile.

Information in this document was compiled by the Texas Agricultural Extension Service and Hazard Reduction and Recovery Center