

Chapter 9A—Severe Weather

TABLE OF CONTENTS

OVERVIEW	117
Description of Hazards	117
Responsibilities	122

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*Chapter 9A**Severe Weather*

OVERVIEW

Since 1851, when record keeping began, approximately 110 hurricanes and nearly 200 tropical storms have affected Florida. Forty percent of all hurricanes that strike the U.S. make landfall in the State. More than 76% of the State's 18 million persons reside in one of the State's 35 coastal counties. While all areas within the State are vulnerable to the impacts of high winds and inland flooding from tropical cyclones, coastal counties may experience storm surge as well as inland flooding, posing greater risk to human lives. The official hurricane season lasts from June 1 until November 30.

In addition to hurricanes, Florida's humid subtropical climate creates the potential for severe weather unrelated to tropical activity. With an average of 80 to over 100 thunderstorm days per year, Florida is the nation's leader in the number of thunderstorm occurrences. These storms are accompanied by damaging winds, hail, lightning, torrential rainfall, and tornadoes.

Description of Hazards

Tropical Cyclones: Tropical Cyclones (Hurricanes, Tropical Storms, and Tropical Depressions) generally form in the tropics and are accompanied by thunderstorms and a counterclockwise circulation of winds in the Northern Hemisphere. A hurricane has maximum sustained winds of 74 mph or higher while tropical storm winds range from 39 mph to 73 mph. Tropical depressions have maximum

sustained winds of 38 mph or less. Tropical cyclones can cause tornadoes, storm surge, high winds, and inland flooding. Based upon the storm intensity, the impacts can vary from minor structural damage to catastrophic statewide impacts.

The unique location of Florida in the subtropics makes it vulnerable to tropical storms and hurricanes, and the relatively flat terrain can make it susceptible to flooding. Florida is surrounded by the very warm waters of the Atlantic Ocean and Gulf of Mexico; bodies of water that breed and support tropical cyclones.

Tropical Cyclone Hazards

High Winds: The strongest sustained winds in a tropical cyclone occur close to the center of the storm; however, strong winds do occur in gusts well away from the center.

The intensity of hurricanes is classified using the Saffir-Simpson Hurricane Wind Scale:

Storm Category	Wind Speed (mph)
1	74-95
2	96-110
3	111-129
4	130-156
5	157 +

Although major hurricanes (Category 3 or stronger) produce the most wind-related damage, lower category storms, including tropical storms and depressions, can also produce winds strong enough to cause significant damage.

Inland Flooding: Flooding may result from heavy rainfall associated with tropical cyclone rain bands that cause a nearby river, lake, or stream to overflow its banks, or from standing water, which cannot be properly drained. The intensity of rainfall is not proportional to the intensity of the tropical cyclone itself. In fact, the most prolific rainfall producing tropical cyclones were weaker and slow moving. Tropical Storm Fay (2008) produced between 20 and 30 inches of rain across Florida as it made quadruple landfalls along the State's Gulf and Atlantic coastlines.

Storm Surge: Storm surge is an abnormal rise in water level generated by a tropical cyclone, a level above the predicted astronomical tide. It is produced when strong winds from a tropical cyclone push water toward shore. The height of storm surge along a stretch of coastline is dependent upon wind speed, configuration of the continental shelf (shallow slope or steep slope), and bathymetry (depth of the ocean bottom).

Tornado: Tornadoes accompanying tropical cyclones tend to occur in the outermost rain bands, well away from the center of circulation. These tornadoes are usually short-lived and fast moving. While smaller and generally less intense than tornadoes associated with non-tropical severe weather, tornadoes spawned from a tropical cyclone can and have produced substantial damage and deaths.

Severe Thunderstorm: A thunderstorm is defined by the National Weather Service as any storm that is accompanied by lightning and thunder; however, severe thunderstorms exhibit at least one of the following three characteristics:

- a. winds of at least 58 miles per hour (50 knots),
- b. hail at least 1 inch in diameter, and/or
- c. a tornado.

Although frequent lightning often accompanies severe thunderstorms, it is not a criterion. About 10 percent of the estimated 100,000 thunderstorms that occur each year are classified as severe.

Severe thunderstorms accompany the passage of cold and warm fronts, especially from late fall through early spring, but they also occur frequently during the summer months as sea breeze boundaries from the Gulf of Mexico and Atlantic Ocean move inland and interact with the warm and humid air mass over land.

Flooding: Florida's flat terrain and natural water-prone ecosystems promote the pooling of water and inhibit drainage. Small streams and rivers may flood because of prolonged rainfall. In the southern regions of the State, drainage is maintained by a complex man-made system of canals and water control systems. Flooding may occur because of failure of these water control systems.

Tornadoes and Waterspouts: A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The average forward speed is 30 mph but may vary from nearly stationary to 70 mph while the maximum winds rotating around the tornado can reach more than 200 mph. Waterspouts are smaller, generally weaker tornadoes which form over warm water, usually during the summer months. They can move onshore and cause damage to coastal areas.

Florida's period of significant tornadic activity occurs from February through April as strong cold fronts move through the State from the northwest, but tornadoes in Florida can occur at any time of the year. During the summer, thunderstorms moving inland along sea breeze boundaries can also spawn tornadoes and waterspouts.

The intensity of tornadoes is classified using the Enhanced Fujita Scale (EF Scale), a set of wind estimates based on damage:

EF Number	Estimated Winds (mph)
EF-0	65-85
EF-1	86-110
EF-2	111-135
EF-3	136-165
EF-4	166-200
EF-5	>200

Most tornadoes that strike Florida are generally in the category of EF-0 to EF-3, with winds between 65 and 165 miles per hour; however, two EF-4 tornadoes have been confirmed in Florida since 1950. Florida's tornado climatology demonstrates that strong to violent tornadoes are just as likely to occur during the overnight hours as they are during daylight. Tornadoes that occur overnight are more dangerous as people are unaware of weather warnings relayed by commercial radio or television networks while they sleep. One hundred of the 152 tornado-related deaths in Florida since 1950 occurred between 9:00 pm and 7:00 am, with 113 of the 152 total deaths occurring in February, March, and April.

Excessive Heat: The average high temperature in Florida during the summer months (June, July, and August) is 84 degrees; however, daytime temperatures can climb into the 90s and even low 100s. Combined with abundant humidity, the Heat Index (a measure of how hot it feels relative to the actual temperature) can reach 105 degrees or higher, increasing the risk for heat-related illnesses. This makes hydration a critical need for all persons—operational, victim, or civilian—in the State of Florida.

Responsibilities

Federal Responsibilities: It is the responsibility of the National Hurricane Center (NHC) to notify the State Watch Office of an impending tropical cyclone risk, which has been identified and classified, and to issue hurricane and tropical storm watches and warnings for coastal areas. In parallel with the NHC, the National Weather Service (NWS) forecast offices will issue tropical storm and hurricane warnings for inland counties. Both the National Hurricane Center and the National Weather Service distribute the warning data via the National Oceanic and Atmospheric Administration's Weather Wire Service, EM Net, the internet, media, and other mechanisms.

Aside from tropical threats, the NWS forecast offices monitor weather conditions 24 hours a day, seven days a week and notify the State Watch Office and county warning points of impending severe weather threats. Watches and warnings may be issued for severe thunderstorms, tornadoes, floods, and excessive heat, among other weather hazards.

State Responsibilities: The State Watch Office (SWO), a 24-hour emergency communications center within the State Emergency Operations Center, is responsible for disseminating information and warnings to federal, state, and local officials regarding any threats to the State. Housed within the SWO, the Meteorological Support Unit provides critical information concerning the effects of weather systems or weather related phenomenon that may threaten the State. They serve as a liaison between the agencies of the National Oceanic and Atmospheric Administration (NOAA) and Florida's emergency management community. During activations of the State EOC, the unit reports to the Planning Section as a Technical Specialist.

Listed below is the notification protocol:

- The National Hurricane Center or National Weather Service issues a watch or warning for severe weather for an area of Florida.
- The State Watch Office and county warning points are notified.
- The State Watch Office ensures that affected counties are notified. The affected counties and the State may activate their respective EOCs if necessary.
- The Meteorology Unit will monitor changes in the weather conditions and provides updates to the SERT. It will also assist with facilitating conference calls and other briefings with the NHC/NWS.

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