HAZARD IDENTIFICATION AND ANALYSIS

44 Code of Federal Regulations
44 CFR §201.6(c)(2)(i): A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Overview

This section identifies and assesses the potential risks facing Hardee County from a variety of hazards. The analysis consists of two components: Hazard Identification and Hazard Profiles.

Hazard Identification is the review of a wide range of hazards, and the identification of hazards that may impact the County. The analysis includes a description of hazards presenting very low or low risk to the County and the rationale indicating why the LMS does not need any further analyses. Hazard Profiles identify how hazards impact the County and jurisdictions.

Hardee County and jurisdictions are vulnerable to natural, technological, and human-caused hazards threatening life, property, and the economy. Upon consideration of the hazards recommended for review by the Federal Emergency Management Agency (FEMA) planning guidance, the LMS Working Group examined: research of past disaster declarations in the County; previous hazard mitigation plans in the County; the 2023 Florida Enhanced State Hazard Mitigation Plan (SHMP); other hazard related documents in the County; and input from the LMS Working Group. The LMS Working Group identified and omitted from the Hazards Profile the hazards having a very low and low probability of impacting Hardee County and jurisdictions. Table III-1 identifies hazards the LMS analyzes further and those that the LMS omits.

Hazard profiles include a description of each hazard, its potential impacts, historical occurrences, and the probability of future occurrences. Historical occurrence information includes Spatial Hazard Events and Losses Database (SHELDUS) data, noteworthy events details, and a listing of events that occurred between 2019 and 2024.

Addressing the needs and challenges of vulnerable populations in Hardee County is essential in mitigation activities to increase the likelihood of improving public health objectives, prevent disaster-related economic costs, and reduce unnecessary loss of life. Vulnerable populations include low-income areas, senior citizens, special needs populations, non-English speaking households, and residents living in manufactured homes.

Hazard Identification

Data below lists the hazards initially identified for consideration. The data includes 25 individual hazards categorized by type: atmospheric; geologic; hydrologic; other natural hazards; and human-caused hazards. Some hazards are interrelated or cascading (i.e., hurricanes can cause flooding and tornadoes); however, for preliminary hazard identification purposes, the LMS considers these hazards separately. Hazards, such as drought or winter storms may impact a large area yet cause minor damage, while other hazards, such as tornadoes, may impact a small area but cause extensive damage. Table III-2 includes a description of the hazards determined to require no further analyses (omitted from the LMS) and the rationale supporting the determination.

INITIALLY IDENTIFIED HAZARDS AND DETERMINATION OF FURTHER ANALYSIS

Atmospheric Hazards

Requires further analysis:

- Extreme Temperatures (Heat and Freezes)
- Hurricanes /Tropical Storms
- Severe Weather (Tornadoes, Hail, Lightning, and Thunderstorms)

Geologic Hazards

Requires further analysis:

- Land Subsidence (Sinkholes)

Hydrologic Hazards

Requires further analysis:

- Drought
- Flood

Does not require further analysis:

- Erosion
- Storm Surge

Other Natural Hazards

Requires further analysis:

- Agricultural Disruptions
- Wildfires

Human-Caused Hazards

Requires further analysis:

- Domestic Security Incident/Civil Disturbances
- Cyber Incidents
- Dam/Levee Failure
- Harmful Algal Blooms
- Hazardous Material Incident/Radiological
- Human Health Incidents
- Transportation Incidents

TABLE III-2:
IDENTIFIED HAZARDS THAT REQUIRE NO FURTHER ANALYSES (OMITTED FROM THE LMS)

Description	Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads, and other hard surfaces. Winter storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life. The LMS addresses extreme cold temperatures under Extreme Temperatures.
Rationale	Snowfall, ice storms, and sleet are very uncommon occurrences in Florida, especially as far south as Hardee County. While winter storms may result in tornadoes, the LMS

	addresses those impacts under tornadoes. The LMS addresses extreme cold temperatures under Extreme Temperatures.
Description	An earthquake is a sudden movement of the Earth's lithosphere (its crust and upper mantle). Such movements occur along faults, which are thin zones of crushed rock separating blocks of crust. When one block suddenly slips and moves relative to the other along a fault, the energy released creates vibrations called seismic waves that radiate up through the crust to the earth's surface, causing the ground to shake. Aftershocks usually follow earthquakes.
Rationale	The U.S. Geological Survey, National Seismic Mapping Project (website), locates Hardee County in the 1% g (0.2 g) peak acceleration area. Because of this very low rating, the Florida Division of Emergency Management does not require local Comprehensive Emergency Management Plans to address earthquakes as a hazard that is likely to affect residents and visitors. The LMS does not include ~~a~~ further evaluation of this hazard related to vulnerability of people, property, critical infrastructure, environment, economy, or response operations.
Description	Landslides include a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors, such as: ~~e~~rosion by rivers, glaciers, or ocean waves creating over-steepened slopes; saturation by snowmelt or heavy rains causing weakened rock and soil slopes; earthquake created stresses causing weak slopes to fail; earthquakes of magnitude 4.0 and greater triggering landslides; volcanic eruptions producing loose ash deposits, heavy rain, and debris flows; and excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from human-built structures that stress weak slopes to failure.
Rationale	Since there has been only one recorded landslide in Florida~~,~~ which occurred over 60 years ago~~,~~ on a very steep slope, and given the low-gradient topography in Hardee County, the LMS does not include ~~a~~ further evaluation of this hazard related to vulnerability to people, property, critical infrastructure, environment, economy, or response operations.
Description	A tsunami is a series of waves generated by an undersea disturbance such as an earthquake. The speed of a tsunami traveling away from its source can range from up to 500 miles per hour in deep water to approximately 20 to 30 miles per hour in shallower areas near coastlines. Tsunamis differ from regular ocean waves in that their currents travel from the water surface all the way down to the sea floor. Wave amplitudes in deep water are typically less than one meter; they are often barely detectable to the human eye. However, as they approach shore, they slow in shallower water, basically causing the waves from behind to effectively "pile up", and wave heights to increase dramatically. As opposed to typical waves that crash at the shoreline, tsunamis bring with them a continuously flowing 'wall of water' with the potential to cause devastation to the immediate shore of coastal areas.

Rationale	Since most tsunamis are associated with major earthquakes, the possibility of a tsunami affecting the Atlantic or Gulf Coasts of Florida is remote. While the Caribbean region has a history of both earthquakes and tsunamis, they do not appear to have affected Florida's coastlines. Due to Hardee County's inland location, the LMS does not include a further evaluation of this hazard related to vulnerability to people, property, critical infrastructure, environment, economy, or response operations.
Description	A storm surge is a large dome of water, often 50 to 100 miles wide, rising anywhere from four to five feet in a Category 1 hurricane, up to more than 30 feet in a Category 5 storm. Storm surge heights and associated waves are dependent upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge, but higher and more powerful storm waves. Storm surge arrives ahead of a storm's actual landfall and the more intense the hurricane, the sooner the surge arrives. Storm surge can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast. Further, water rise caused by storm surge can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas.
Rationale	Hardee County is an inland County with no coastline. The geographical location of Hardee County protects residents from storm surges associated with hurricanes. The LMS omits storm surge since it is not a hazard.
Description	Sea level, also called mean sea level, is the sea surface level midway between mean high and low levels, computed from the records of tidal oscillations over a long period. Relative sea level trends reflect changes in local sea level over time and are typically the most critical sea level trend for many coastal applications, including coastal mapping, marine boundary delineation, coastal zone management, coastal engineering, sustainable habitat restoration design, and public enjoyment of a beach.
Rationale	Hardee County is an inland county with no coastline. NOAA's Sea Level Rise map viewer gives users a way to visualize community-level impacts from coastal flooding or sea level rise (up to 10 feet above average high tides). Hadee County is omitted from the analysis. The LMS omits sea level rise since it is not a hazard.
Description	Mass immigration/migration refers to the migration of large groups of people from one geographical area to another. Mass migration differs from individual or small-scale migration, and from seasonal migration, which may occur on a regular basis. Climate migration is where coastal dwellers look for inland locations with stable infrastructures, schools, and residential areas offering quality of life.
Rationale	Most of Florida's mass immigration/migration events result from its proximity to the Caribbean Basin. Hardee County will most likely not serve as either a debarkation destination for foreign nationals following a Haiti-like earthquake evacuation or as an immigration point of entry because the County does not have a major airport that

	serves international flights or a port to receive international shipping. The LMS omits mass migration/immigration since it is not a hazard. The 2023 Enhanced State Hazar Mitigation Plan recognizes that protection from sea-level rise, freshwater resources, and quality indicators identify areas as hubs for coastal migrants by the end of the century. Hardee County is not one of the areas identified as a hub.
Description	A nuclear incident is a release of nuclear material. It may result from a deliberate act, an accident, or general mismanagement, and may center around different materials or industrial practices
Rationale	The 2023 Enhanced State Hazard Mitigation Plan states that the probability of a nuclear incident is impossible to predict with certainty. Threats that can be anticipated require a large and concentrated effort to mitigate the potential damage. They determined this hazard is "not likely" for the state, so Hardee County is not evaluating it any further.
Description	Space weather is a broad term used to describe atmospheric events that have the potential to adversely affect conditions on Earth. Space Weather events are caused by the interaction of Earth with emissions from the Sun. There are two causes of space weather events, coronal mass ejections (CMEs) and solar flares, which are different incidents that occur on the Sun. CMEs and solar flares can cause three different types of space weather events on Earth: Geomagnetic Storms, Solar Radiation Storms, Radio Blackouts. According to the National Space Weather Strategy and Action Plan, published in March 2019, space weather poses a significant risk to the security of our country, including infrastructure and the economy. This is because our nation is becoming more and more dependent on technology and the failure of one critical infrastructure facility or system could lead to failures in many other systems. For example, communications networks, satellite and airline operations, navigation systems, and the electric power grid could be disrupted, causing severe problems and damage.
Rationale	The Hardee County LMS Working Group has begun monitoring space weather. As information becomes more available, this will be incorporated into the Local Mitigation Strategy.

Climate Change

As stated by the National Oceanic and Atmospheric Administration (NOAA), climate change affects the environment in many different ways, including rising temperatures, sea level rise, drought, flooding, and more. These events affect things that we depend upon and value, like water, energy, transportation, wildlife, agriculture, ecosystems, and human health. According to the Environmental Protection Agency (EPA), climate change refers to any significant change in the measures of climate lasting for an extended period. Climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.

Earth's average temperature has risen by 1.4°F over the past century and may rise another 2°F to 11.5°F over the next hundred years. Small changes in the average temperature of the planet can translate to large shifts in climate and weather. This hazard occurs at a regional geographic level; therefore, climate change is likely to uniformly expose the entire County.

Potential Impacts from Climate Change are addressed under each potential hazard.

Hazard Profile – Atmospheric

Atmospheric Hazards are natural hazards where processes operating in the atmosphere are mainly responsible.

Extreme Temperatures (Heat and Freezes)

Description and Background

The extreme temperature hazard includes extreme heat and extreme cold. Both occur at a regional geographic level, uniformly exposing the entire County to their impacts.

Extreme Heat: As defined in the State Hazard Mitigation plan, extreme heat is defined as a period of high heat and humidity with temperatures above 90 degrees for at least two to three days. Extreme heat includes temperatures that hover 10 degrees or more above the normal summer high temperature and last for several weeks. The normal summer high temperature in Hardee County is 90 degrees. The heat index may reach up to 108 degrees. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground where the temperature and relative humidity combine for a dangerous heat index. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is dangerous. Extreme heat can occur throughout the State but typically occurs in the summer between the months of June and September. Extreme heat impacts humans and agriculture.

Heat Wave: A heat wave is primarily a public health concern. In 1979, meteorologist R.G. Steadman, developed the Heat Index shown in Table III-3 to illustrate the risks associated with extreme summer heat. The listed heat disorders describe the general effect on people in high-risk groups. The Heat Index, also called apparent temperature, is a measure of how hot it really feels upon combining relative humidity and the actual air temperature.

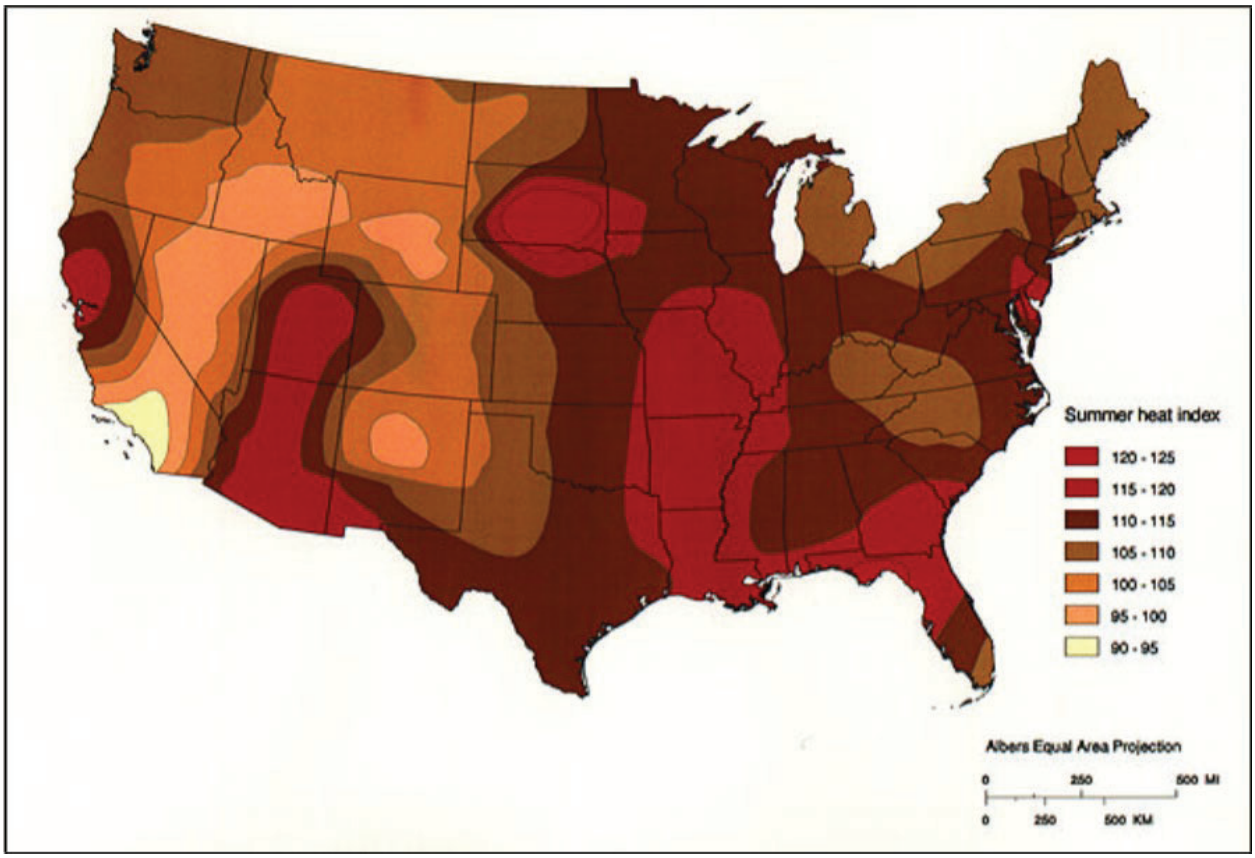


Figure III.1: Severity and areal extent of extreme summer heat; Source: FEMA.gov

TABLE III-3:
HEAT DANGER CATEGORIES (HEAT INDEX)

Danger Category	Heat Disorders	Apparent Temperature (˚F)
I. Caution	Fatigue possible with prolonged exposure and/or physical activity	80-90
II. Extreme Caution	Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activities	90-105
III. Danger	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and/or physical activity	105-130
IV. Extreme Danger	Heatstroke or sunstroke highly likely with continued exposure	>130

Source: NOAA; http://www.srh.noaa.gov/oun/?n=safety-summer-heatindex

Extreme Cold: Extreme Cold includes temperatures at or below freezing for an extended period. Extreme Cold can be a prolonged period of excessively cold weather, and/or a sudden invasion of very cold air over a large area. Along with frost, this hazard can cause damage to agriculture, infrastructure, and property.

Freeze: According to the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service, a freeze occurs when surface air temperatures are at or below 32 degrees Fahrenheit over a widespread area for a climatologically significant period. Freeze warnings are issued during the growing season when meteorologists anticipate surface temperatures will drop below freezing over a large area for an extended period, regardless of whether frost develops. Exposure to temperatures below freezing for extended periods of time may damage or kill crops. Freezes may also cause damage to infrastructure.

Frost, often associated with freezes, is a layer of ice crystals produced by the deposit of water from the air onto a surface that is at or below freezing. A freeze warning is issued to inform public and agricultural interests of anticipated freezing conditions over a large area. Similarly, a hard freeze warning is issued under the same conditions as a freeze warning, but the temperatures is at or below 28˚ F for a duration of four hours or more. Certain agricultural crops in Hardee County are vulnerable to freeze and hard freeze events.

Historical Occurrences

Since 1950, Florida has had at least 12 recorded severe freezes with the most recent occurring December 24 and December 25, 1989. A Presidential Disaster Declaration was issued, and statewide crop losses exceeded $18 million. The freeze affected more than two million acres of

agriculture and citrus products (Florida State Agricultural Stabilization and Conservation Service, 1990). Severe freezes in 1982, 1983, and 1985 destroyed crops and citrus trees in Central Florida counties. Many citrus growers opted not to re-plant the citrus, and instead converted the groves to other uses.

While SHELDUS provided data only up to 2022, the National Centers for Environmental Information (NCEI) reported multiple record high-heat days, including new high-heat daily record temperatures.

Table III-4 includes extreme cold/frost/freeze and heat incidents from 2000 – 2022 as reported by SHELDUS.

TABLE III-4:
EXTREME TEMPERATURE INCIDENTS BY JURISDICTION (2009-2019)

Date	Type	Location	Damages
February 2020	Frost/freeze	Hardee	$129,415.68
January 2021	Frost/freeze	Hardee	$6,655.15
May 2021	Heat	Hardee	$575,404.25
December 2021	Frost/freeze	Hardee	$33,734.71
January 2022	Frost/freeze	Hardee	$6,504,844.70
February 2022	Frost/freeze	Hardee	$3,181.00

Source: SHELDUS

Location

Extreme heat events impact the entire planning area. Most vulnerable to extreme heat are the county's elderly persons and seasonal workers. Extreme heat can affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of the county. While freeze events generally span the entire planning area, they most heavily impact the agricultural sector. As In 2022, Hardee County had 290,694 acres of land used for farming. This included 82,558 acres of cropland, 156,917 acres of pastureland, and 33,300 acres of woodland. Freezes and winter storms can affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of the county.

The Extreme Heat Risk Map shows the average number of days per year with temperatures over 95 degrees. Bowling Green, Wauchula, and Zolfo Springs fall in the areas designated as greater than 21.55 days per year.

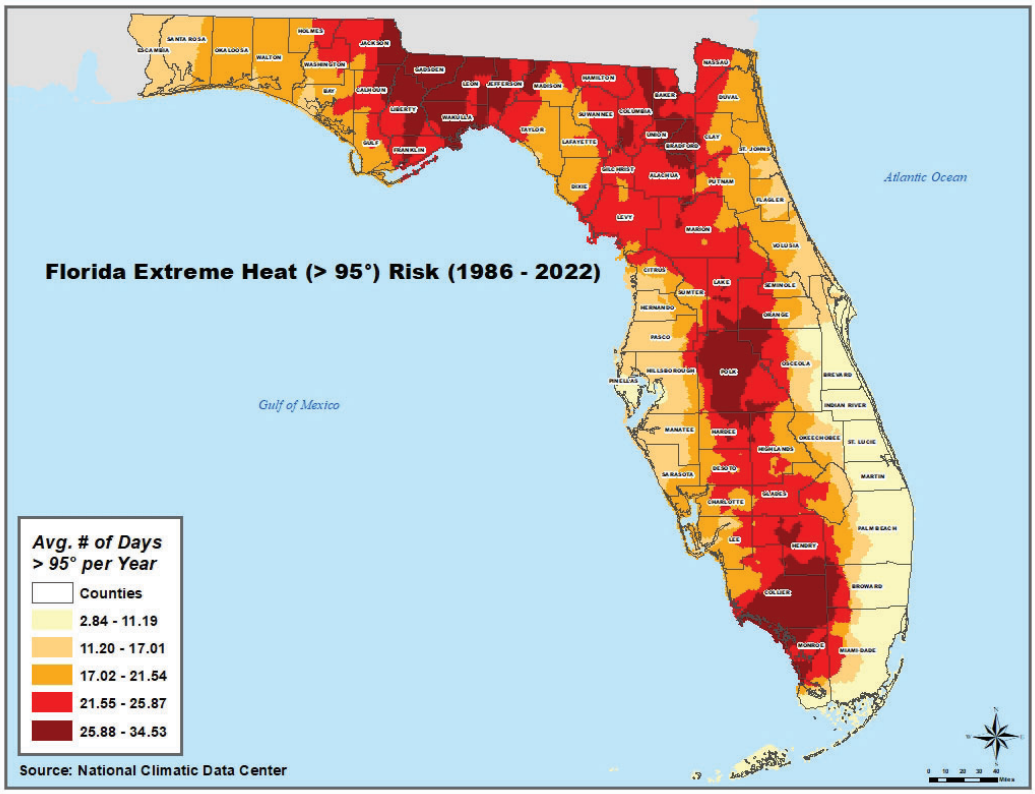


Figure III.2: Florida Extreme Heat Risk Map; Source: SHMP

Potential Impacts

As an inland county, Hardee County is more vulnerable to temperature extremes since it is located further away from the moderating influences of the ocean or an estuary. During extended periods of high temperatures, or high temperatures with high humidity, individuals can suffer heat stroke, heat exhaustion, heat syncope, and heat cramps. Extreme heat can ultimately cause death. Most heat disorders occur because the individual has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and the sick or overweight are more likely to succumb to extreme heat. During extended periods of low temperatures, individuals can suffer hypothermia and frostbite. Those at highest risk are primarily engaged in outdoor activities or are the elderly who are chronically exposed to colder indoor temperatures. Populations vulnerable to temperature extremes include the elderly, the very young, the homeless, and low-income individuals.

Temperatures remaining below the freezing point for four hours or more may severely affect agriculture production. Extreme temperatures may result in total crop loss or destruction of the plants or trees. Freezes are a significant recurring threat to the agriculture industry.

Extreme temperatures can impact power usage and generation; however, this rarely results in structural losses. The demand for water increases during periods of hot weather. In extreme heat waves, people use water to cool bridges and other metal structures susceptible to heat failure. This can result in reduced water supply and water pressure and impact fire suppression in urban and rural

areas. The rise in water temperature during heat waves contributes to the degradation of water quality and negatively impacts fish populations. It can also lead to the death of other organisms in the aquatic ecosystems. Scientists have linked high temperatures to rampant algae growth, causing fish kills in rivers and lakes. Potential losses to agriculture depend on when in the growing season the impact occurred.

Climate Change, Changes in Population, and Changes in Land Use and Development

In the coming decades, rising temperatures are likely to increase the frequency of unpleasantly hot days. As the atmosphere warms, evaporation increases causing a rise in humidity, average rainfall, and the frequency of heavy rainstorms in many places, including Florida. Like other seasons, winters have been getting warmer due to climate change. Overall, climate change is not expected to increase occurrences or magnitude of winter storms and freezes in Florida. However, that does not mean that winter storms and freezes will cease in Florida. Climate variability will continue to influence daily temperature variability, and isolated or prolonged winter freeze events in Florida are expected to continue to occur in the future.

Florida homes often lack adequate heating and insulation. Florida's outdoor lifestyle can lead to danger for those not prepared for freezing temperatures. In addition, freezing temperatures in Hardee County can cause widespread damage to sensitive plants and crops (NWS). Like other seasons, winters have been getting warmer due to climate change. Warmer winters can affect water supplies, energy use, fruit and crop yields and growing seasons, disease-carrying pests, and winter recreation. Overall, climate change is not expected to increase occurrences or magnitude of winter storms and freezes in the County and its jurisdictions. However, that does not mean that winter storms and freezes will not occur. Climate variability will continue to influence daily temperature variability, and isolated or prolonged winter freeze events can be expected to continue to occur in the future. As population and development increase in the County and its jurisdictions, the probability that freezing temperatures will cause environmental damage or human casualties also increases. With more people moving to Hardee County and its jurisdictions, a larger percent of the land and population may become more vulnerable to hazards. The higher standards adopted by Florida's Building Code decrease vulnerability. Changes in development have not increased or decreased the vulnerability to extreme temperatures in Hardee County or its jurisdictions since the 2020 LMS Plan.

Probability of Future Occurrences

Based on previous occurrences, the likelihood that extreme heat and freezes will occur is low (every two to seven years). There are no recorded occurrences of extreme summer heat impacting Hardee County in which jurisdictions have taken response actions beyond public service announcements. The frequency of extreme heat events is likely to occur every two to seven years based on the naturally occurring El Niño/La Niña cycle. In Florida, La Niña years include reduced rainfall and higher temperatures.

Hurricanes and Tropical Storms

Description and Background

Hurricanes and tropical storms (cyclones) are closed circulation systems developing around a low-pressure center in which the winds rotate counterclockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with hurricanes and tropical storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are vulnerable to the additional forces of storm surge, wind-driven waves, and tidal flooding, which can be more destructive than cyclone wind.

The energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Tropical cyclone_formation requires: a low-pressure disturbance; warm sea surface temperature; rotational force from the spinning of the earth; and the absence of wind shear in the lowest 50,000 feet of the atmosphere. Most hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The Atlantic hurricane season peaks in early to mid-September, and the average number of storms that reach hurricane intensity per year is approximately six.

As a hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, tropical depressions may form. When maximum sustained winds reach or exceed 39 miles per hour, the system becomes a named tropical storm, and the National Hurricane Center in Miami, Florida closely monitors it. When sustained winds reach or exceed 74 miles per hour the storm is classified as a hurricane. The Saffir-Simpson Scale further classifies Hurricane intensity on a scale of 1 to 5, with 5 being the most intense. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential, which estimate potential damage.

According to the National Oceanic and Atmospheric Association, the Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based only on a hurricane's maximum sustained wind speed. This scale does not take into account other potentially deadly hazards such as storm surge, rainfall flooding, and tornadoes.

The Saffir-Simpson Hurricane Wind Scale estimates potential property damage. While all hurricanes produce life-threatening winds, hurricanes rated Category 3 and higher are known as major hurricanes*. Major hurricanes can cause devastating to catastrophic wind damage and significant loss of life simply due to the strength of their winds. Hurricanes of all categories can produce deadly storm surge, rain-induced floods, and tornadoes. These hazards require people to take protective action, including evacuating from areas vulnerable to storm surge.

TABLE IV-3d:

SPECIAL HIGH TABLE III: SAFFIR-SIMPSON HURRICANE WIND SCALE

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129 mph (major)	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156 mph (major)	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	157 mph or higher (major)	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: https://www.nhc.noaa.gov/aboutsshws.php

Historical Occurrences

According to SHELDUS, 26 hurricane/tropical storm events occurred from 1960 through 2022, resulting in 48 injuries, 5 fatality, approximately $67.5M in adjusted crop damage, and approximately $46.3M in adjusted property damage. Table III-5 includes hurricane and tropical storm events between 2009 to 2024, as indicated by NOAA.

TABLE III-5:
HURRICANE/TROPICAL STORM INCIDENTS BY JURISDICTION (2009-2024)

Year	Event	Magnitude	Damage
2001	Tropical Storm Gabrielle	Tropical Storm	Indirect impacts of 5-7" of heavy rainfall and winds 45-55 mph gusts. This resulted in flooding of homes & businesses. Damage to Hardee & Desoto counties estimated at $5 million
2004	Hurricane Charley	Cat 4	Direct hit with catastrophic impacts and wind gusts up to 109 mph and one tornado. Resulted in 6 injuries, and $750 million in damages. 1400 homes were destroyed, 3600 home with minor to major damages. Lengthy power outages and citrus groves damaged.
2004	Hurricane Francis	Cat 2	Indirect impacts of 6-8" of rain that caused record flooding for Peace River at that time.
2004	Hurricane Jean	Cat 3	Indirect impacts that resulted in flooding.
2005	Hurricane Wilma	Cat 2	Tropical storm force winds of 53 mph and 3-4" of rain. Insurance claims of $31,000.
2008	Tropical Storm Faye	Tropical Storm	Not direct hit, but produced 42 mph wind recorded at EOC. Some damage reported in Zolfo Springs, roof, water.
2016	Tropical Storm Colin	Tropical Storm	Indirect impacts caused minor damage to several homes. Not a direct hit, but strong winds knocked a tree and power lines onto a house in Wauchula, causing minor fire damage. Another tree fell on a house in Wauchula, causing minor damage to a tin roof.
2017	Hurricane Irma	Cat 1	Direct hit with Cat 1. Large wind field that extended out 80 miles from center. Resulted in several days of power outage. Most of damage was from flooding and winds. Direct impact resulted in 100% power outages. One bridge washed away. Damages in excess of $3 million.
2021	Hurricane Elsa	Tropical Storm	Indirect impacts. Rainfall estimated 2-4 inches. No significant property damages. SR 64 flooded and closed in Ona near the railroad crossing and Hickory Creek. River Road along the Peace River north of Zolfo Springs flooded. Alton Carlton Road near Troublesome Creek southwest Wauchula flooded. Intersection of Lost Acres Drive and Old Bradenton Road near Hob Branch north of Wauchula flooded.
2022	Hurricane Ian	Cat 4	Some parts of Hardee received up to 20" inches of rain, causing widespread, catastrophic flooding. The Peace River at Zolfo Springs reached a new height of over 26 feet.

2024	Hurricane Milton	Cat 2	Rainfall estimates up to 6 inches fell in the northwest part of the County. Wind gusts are estimated to be up to 80mph. Peace River at US 17 at Zolfo Springs registered a height of 18.73 feet.

Source: Hardee County Public SHELDUS, FEMA, Hardee County 2020 LMS, NHC.NOAA.gov

Location

Because of the nature and size of these storms, the entire County and all its jurisdictions are subject to the effects of tropical storms and hurricanes. The historical track map located in Appendix B shows the historical paths of storms over Hardee County. Tropical cyclones are random in distribution, so there is no specific region of Florida that is more at risk than another.

Potential Impacts

From 1851 to 2022, Florida has been hit by 120 total hurricanes. That is the most in recorded history — nearly twice as many as Texas, which has sustained the second-highest number of hurricanes in recorded history, which began in 1851 with the establishment of the Saffir/Simpson category. The most hurricane activity, from June through July, and again in late October, is in the Gulf of Mexico and western Caribbean. Hardee County may experience high winds and inland flooding generated from hurricane activity. Tornadoes associated with tropical storms are most frequent in September and October when the incidence of tropical storms is greatest. Inland flooding is likely during any hurricane due to the low elevation of much of the County. Hurricane force winds can destroy tall structures, like cell towers; as mobile homes; and other vulnerable structures.

Climate Change, Changes in Population Patterns, and Changes in Land Use and Development

Climate change is significantly impacting hurricanes by making them more intense, with higher wind speeds and increased rainfall due to warmer ocean temperatures, leading to more destructive storm surges when they make landfall, while also potentially causing them to move slower, increasing the duration of their impacts; essentially, climate change is making hurricanes more powerful and dangerous overall. More intense hurricanes may cause an increase in property damage, agricultural damage, displacement of residents, and loss of life. Socioeconomically disadvantaged and the unhoused populations within the County (Section I) are vulnerable to tropical cyclone hazards due to their living environment, poverty, and lack of insurance coverage. As more land is converted from open space/agriculture to residential development, the impacts will be increased.

Changes in development have not increased or decreased the vulnerability to extreme temperatures in Hardee County or its jurisdictions since the 2020 LMS Plan.

Probability of Future Occurrences

The probability that hurricanes and tropical storms will pass through the county is very high based on previous occurrences. The frequency that hurricanes or tropical storms will pass directly over the county is approximately once every 10 years. However, hurricanes and tropical storms passing nearby impact our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of Hardee County almost annually.

Severe Weather (Tornadoes, Hail, Lightning, and Thunderstorms)

Severe weather includes elements such as tornadoes, hail, lightning, and thunderstorms. While each element is related, they can occur independently of each other. This section includes a discussion of each of the components.

Description and Background

A tornado is a violently rotating column of air that contacts the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. Tornadoes frequently generate from thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size, and duration of the storm. In general, the tornadoes that occur in Florida are less intense than those that occur in the Great Plains but can produce substantial damage (see Table III-12, Enhanced Fujita Intensity Scale).

Most tornadoes (70 percent) are weak and fall into the EF0-EF2 categories. Approximately 30 percent of all tornadoes are strong and can last 20 minutes or longer. Approximately 2 percent of all tornadoes fall into the EF-4 and EF-5 categories. Supercell thunderstorms spawn the most powerful tornadoes. Under the right conditions, horizontal wind shears (winds moving in different directions at different altitudes) impact these storms. The wind shears cause horizontal columns of air to rotate. This horizontal rotation may tilt vertically from violent updrafts, and the rotation radius can shrink, forming a vertical column of fast swirling air. This rotating air can eventually reach the ground, forming a tornado. At present, there is no way to predict exactly which storms will spawn tornadoes or where the tornadoes will touch down. Doppler radar systems have greatly improved the forecaster's warning capability, but the technology usually provides lead times from only a few minutes up to about 30 minutes. Consequently, early warning systems and preparedness actions are critical.

The Enhanced Fujita Intensity Scale (Enhanced F-scale) is a set of wind estimates (not measurements) based on damage (Table III-12). It uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage. These estimates vary with height and exposure. The three second gust is not the same wind as in standard surface observations. Weather stations take standard measurements in open exposures, using a directly measured "one-minute mile" speed.

TABLE III-12:
THE ENHANCED FUJITA INTENSITY SCALE

Category	Wind Speed	Potential Damage
EF-0	65 – 85 mph	**Light damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF-1	86 – 110 mph	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	111 – 135 mph	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	136 – 165 mph	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF-4	166 – 200 mph	**Devastating damage.** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF-5	> 200 mph	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yd); high-rise buildings have significant structural deformation; incredible phenomena will occur

Sources: https://weather.com/storms/tornado/news/2024-05-03-enhanced-fujita-scale-tornado-explained

Hail frequently accompanies thunderstorms and has the potential to cause substantial damage. Early in the developmental stages of hail, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop sufficient weight to fall as precipitation. Hail precipitation falls in sphere or irregularly shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size. Hailstones grow when the storm repeatedly blows the frozen droplet into the higher elevations. The hailstone ascends if the updraft velocity is high enough to hold the hailstone. As soon as the size and weight of the hailstone overcome the lifting capacity of updraft, it begins to fall freely under the influence of gravity. A cold downdraft of air accompanies falling hailstones under thunderstorm conditions. Table III-7 illustrates the Torro Hailstorm Intensity Scale which outlines the typical damage impacts based on hail intensity.

Thunderstorms, which have no geographical imitations to the area they affect, may produce hail. Therefore, all of Hardee County is uniformly at risk to a hail event. Impacts typically include downed power lines and trees and damage to vehicles and mobile homes.

Hailstorms are an outgrowth of severe thunderstorms and cause nearly $1 billion in damage to property and crops on an annual basis in the United States. Typical thunderstorms can be 3 miles wide at the base, rise to 40,000 to 60,000 feet in the troposphere, and contain half a million tons of condensed water. Hailstorms are violent and spectacular phenomena of atmospheric convection, always associated with heavy rain, gusty winds, thunderstorms, and lightning.

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder, which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall.

The greater Central Florida region is one of the most lightning prone area in the United States with about 90 thunderstorm days a year. Because of this, Florida has more lightning deaths than any other state. Lightning kills more people in Florida than all other weather hazards combined. Florida's thunderstorm season has two general periods. Early May to early October is known as the wet season. Conversely, October through May is known as the dry season. Historically, the most dangerous months are June, July, and August due to an abundance of moisture, atmospheric instability, and storm triggering sea breezes. Moisture is almost always prevalent in the summer because Florida is a peninsula between the Gulf of Mexico to the west and the warm Atlantic Gulfstream to the east. Instability is a function of surface heat and cool air aloft that is present for most of the summer season. Thunderstorms need a trigger to start. The sea breeze that forms daily on the Atlantic and Gulf coasts may become the trigger. As a sea breeze forms, it typically moves inland (from the Atlantic or Gulf of Mexico) and dramatically aids thunderstorm formation. Surface winds also play a big part in determining which areas get the most lightning and at what time. With westerly morning winds across the peninsula, afternoon thunderstorms tend to accumulate on the east coast. If the morning winds are from the east, afternoon thunderstorms will cluster on the west coast.

Lightning seeks the path of least resistance on its way to and through the ground. The human body is a good conductor because of its large water content. Metal is a better conductor than most objects so lightning can travel easily through metal objects such as fences or railroad tracks, which can conduct electricity for long distances.

Hardee County is in a region of the country that is particularly susceptible to lightning. Figure III.20 shows a lightning flash density per square mile map for the years 2022 based upon data provided by AEM.com 2022 United States Lightning Report. Lightning occurs randomly and is, therefore, impossible to predict where it will strike. The LMS assumes that lightning, which strikes in very small, specific geographic areas, uniformly impacts all of Hardee County.

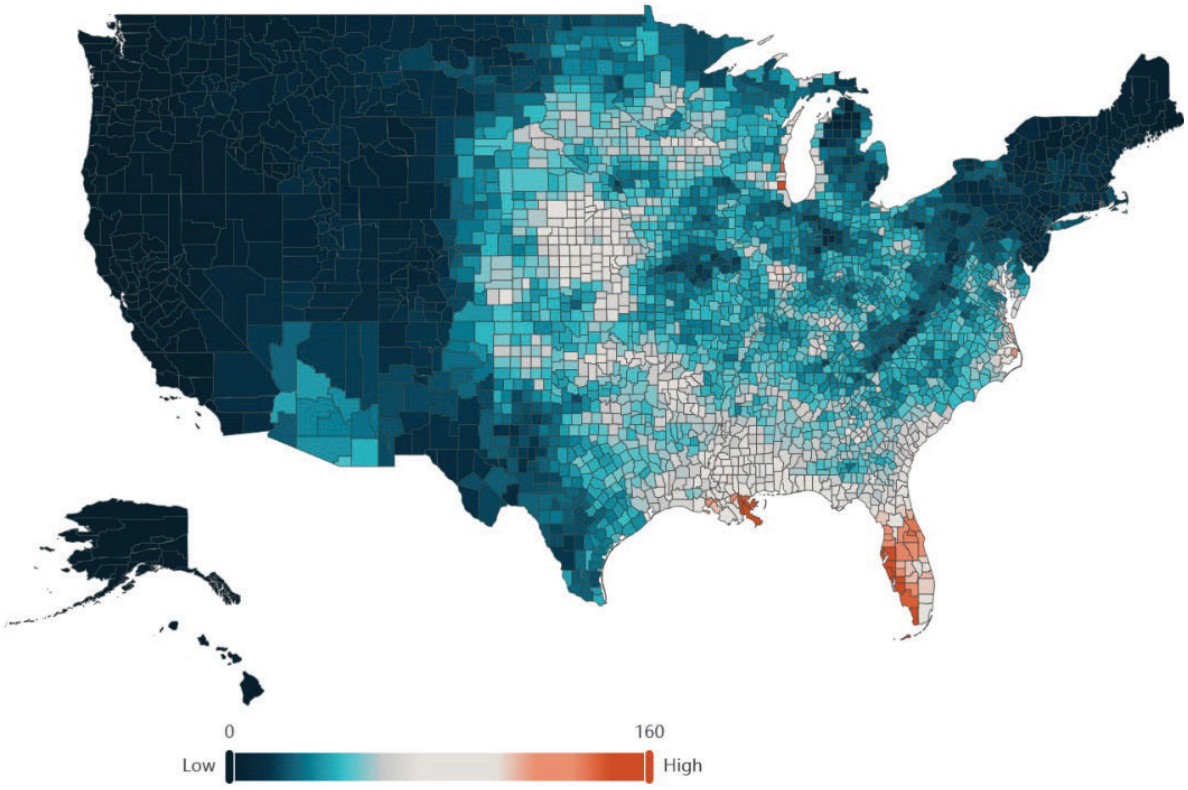


Figure III.3: Flash density per square mile 2022; Source: AEM.com

Even though it is generally located within the area of the lightning capital of the United States, Hardee County's risk for lighting strikes is lower than counties to the north and west. According to hazards.FEMA.gov/nri/map Hardee County's lightning risk is considered to be Relatively Moderate.

Air masses of varying temperatures meeting in the atmosphere cause thunderstorms. Rapidly rising warm moist air fuels the formation of thunderstorms. Thunderstorms may occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours.

Thunderstorms are common throughout Florida and occur throughout the year. Although thunderstorms generally affect a small area, they are dangerous given their ability to produce accompanying hazards including high winds, hail, and lightning, which all may cause serious injury or death, in addition to property damage. According to the National Weather Service, more than 100,000 thunderstorms occur each year, though approximately 10 percent of these storms are classified as "severe." A severe thunderstorm occurs when the storm produces one of three elements: 1) hail of three-quarters of an inch; 2) tornado; or 3) winds of at least 58 miles per hour.

Thunderstorms need three conditions to form: 1) moisture must form clouds and rain; 2) unstable air, such as warm air that can rise rapidly (which officials refer to as the "engine" of the storm); and 3) lift which in the form of cold or warm fronts, sea breezes, mountains, or the sun's heat. Air masses of varying temperatures then meet, forming a thunderstorm. These storm events can occur

singularly, in lines, or in clusters. Thunderstorms can move through an area quickly or linger for several hours.

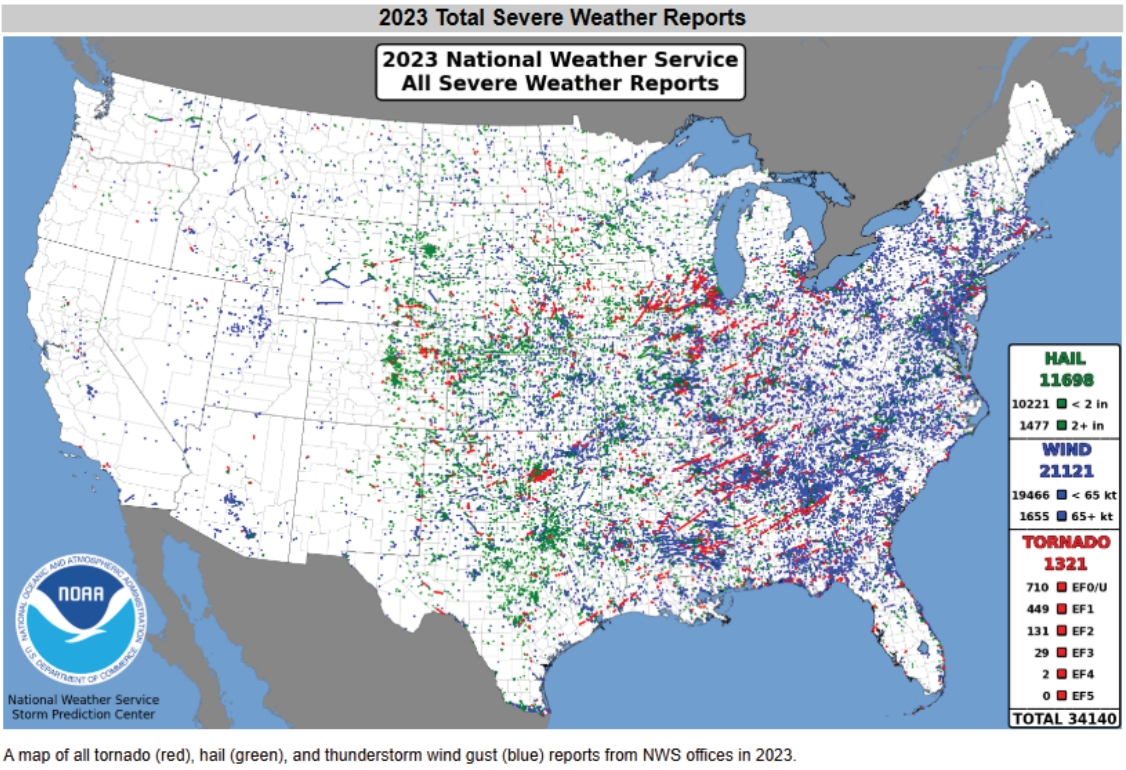


Figure III.4: 2023 National Weather Service, All Severe Weather Reports; Source: www.spc.noaa.gov

Table III-10 illustrates the Beaufort Wind Force Scale's effects on land, which is an empirical measure of related wind speed to observed conditions at sea or on land.

TABLE III-10:
THE BEAUFORT WIND FORCE SCALE – EFFECTS ON LAND

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects on Land
0	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Dust, leaves, and loose paper lifted; small tree branches move
5	17-21	Fresh Breeze	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Whole trees moving, resistance felt walking against wind

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects on Land
8	34-40	Gale	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Seldom experienced on land, trees broken or uprooted
11	56-63	Violent Storm	Widespread damage
12	64+	Hurricane	Structural damage

Geographical boundaries do not confine severe thunderstorms (typically widespread events) and their related hazardous elements (including lightning, hail, and straight-line winds). While thunderstorms can occur in all regions of the United States, they are most common in the central and southern states because atmospheric conditions in those regions are favorable for generating these powerful storms. The LMS assumes severe storms uniformly impact the entire County and that the spatial extent is large.

Historical Occurrences

History of Tornado Events

Year	Location	Occurrence
1961 – 1988	Hardee County	6 tornadoes are recorded. However, no further information with them.
1988	Steve Roberts Special	In a rural, semi-wooded swamp and grassland area. The tornado produced “EF-1” damage, leaving downed power lines and trees and causing damage to mobile home roofs. The tornado continued its path into Highlands Co.
4/5/93	Harvey St. / Pennsylvania Av	Report of EF-0 tornado, with no further information
10/7/1996	Hardee County	Report of tornado, with no further information
3/9/98	Steve Roberts special area	An EF-1 tornado reported, with no further information
3/19/98	Steve Robert Special / Justamere Trail	Report of EF-0 tornado, with no further information
4/3/02	Rural Zolfo Springs around Alligator Branch	Report of EF-0 tornado, with no further information
5/19/03	Maude Road area	An EF-0 tornado reported, with no further information
6/4/04	State Road 62 / Baptist Church Road	In June, an EF-1 tornado caused moderate damage to seven homes, destroyed several buildings at CF Industries, and destroyed part of

		an orange grove.
8/13/04	Crewsville Road area	In August, shows an EF-0 tornado, with no further information
7/9/05	Hardee County	An EF-0 tornado resulting from Hurricane Dennis destroyed a wood frame home valued at $50,000
10/23/05	Rural Zolfo Springs	Report of EF-0 tornado with no further information
12/18/09	East of CR663 Ona area	An EF-0 tornado shown, with no further information
1/25/11	Ona area	An EF-0 tornado shown, with no further information
1/25/11	Sweetwater area	An EF-0 tornado reported, with no further information
6/24/12	Sweetwater area	An EF-0 tornado reported, with no further information
9/10/17	Hwy 17, just south of Walmart	Report of EF-1 tornado with no further information. Tornado during Hurricane Irma.
4/19/21	Southeastern Hardee County (Sweetwater and Crewsville areas)	National Weather Service radar indicated tornado with no further information
4/4/22	East of Wauchula (Griffins Corner area)	An EF-0 reported, law enforcement related web cam capture of the small, short-lived rope tornado. Reported power lines down in the area. Estimated $20,000 in damages.
8/30/23	Eastern Hardee County	National Weather Service radar indicated tornado with no further information

According to SHELDUS, 59 sever weather events occurred from 1969 through 2022, resulting in 5 injuries, 3 fatality, approximately $287K in adjusted crop damage, and approximately $49M in adjusted property damage. Table III-13 includes severe weather events between 1993 to 2022, as indicated by NOAA.

Date	Location	Event Type	Reported Damages	Estimated Damage Totals
January 16, 1993	Wauchula (Airport area)	Thunderstorm	Downed trees, damaged an aircraft at the municipal airport, and blew a vehicle off the road.	$50,000
August 3, 1993	Hardee County	Thunderstorm	Damaged the roof of a local restaurant	$5,000
June 14, 1994	Hardee County	Thunderstorm	Roof damage to local business, downed power lines, and tree limbs	$100,000
December 25, 1997	Hardee County	Thunderstorm, Tornado, Rainfall	Throughout the County. Disaster declaration was approved.	
August 2, 1999	Bowling Green and Wauchula	Thunderstorm, High Winds	Destroyed a barn, downed trees and power lines, roof damages to homes. Wauchula Municipal Airport sustained damages to the hanger doors.	$150,000
August 9, 2001	Bowling Green	Thunderstorm, High Winds	Toppled a travel trailer, trees were downed	$35,000
July 6, 2002	Hardee County	Thunderstorm	Roof damage to three homes and downed several trees	$10,000
May 19, 2003	Zolfo Springs	Thunderstorm, High Winds	Wind gusts over 50mph, 10 homes sustained damages	$35,000
June 27, 2004	Wauchula	Thunderstorm, High Winds	Downed numerous trees, homes and vehicles damaged on South Road and Knollwood Circle Area	No estimate available
December 18, 2009	Hardee County Westside	Thunderstorm, High Winds	Damaged three buildings 15 vehicles, uprooted trees	No estimate available
September 15, 2013	Hardee County	Thunderstorm	No details available	$1,000
August 18, 2017	Hardee County	Thunderstorm	No details available	$113,000
March 20, 2018	Hardee County	Thunderstorm	No details available	$16,000
April 10, 2018	Hardee County	Thunderstorm	No details available	$2,000
May 5, 2018	Wauchula	Lightning	Lightning struck a tower at a Hardee County facilities complex causing damage to equipment inside.	$20,000

June 8, 2019	Hardee County	Thunderstorm	Wind damage on Doss Road to a pole barn, trees, and vehicles	$27,000
June 25, 2019	Hardee County	Thunderstorm, Hail	Minor wind damage to trees east of Zolfo Springs. Dime sized hail was reported.	$1,000
February 6, 2020	Hardee County	High Winds	Power Poles were snapped near the intersection of SR 62 and SR 37.	$10,000
April 11, 2021	Wauchula	Hail	One report of two inch hail near Wauchula. One report of one inch hail just east of Wauchula.	Not reported
June 18, 2022	Zolfo Springs	Thunderstorm	Tree debris covering SR 64	$2,000
July 13, 2022	Zolfo Springs	Thunderstorm	Downed power lines along SR 64	$2,000
November 2, 2022	Hardee County (Gardner Area)	Hail	Golf ball sized hail reported along US 17	Not reported

Source: National Oceanic and Atmospheric Association; www.ncdc.noaa.gov and SHELDUS.

Potential Impacts

Based on historic data, tornadoes occur throughout Florida at a rate of 1 to 10 confirmed touchdowns per 1,000 square miles. Florida tornadoes typically impact a relatively small area; however, events are completely random and it is not possible to predict specific areas that are more susceptible to a tornado strike over time. The LMS assumes that tornadoes uniformly impact all of Hardee County. April, May, and June are considered the peak months for tornadoes in Florida.

Hail can damage structures, vehicles, and crops. The larger the hail, the more damage it can cause. Information provided by the NOAA Storm Prediction Center indicates hail events have occurred within in the jurisdictions and the County. The larges hail sizes recorded were less than two inches in diameter.

Lightning occurs randomly and is impossible to predict when and where it will strike. The LMS assumes lightning strikes can occur anywhere in Hardee County. Impacts from lightning have included deaths and injuries, damage to electrical systems, and fires that have destroyed residential and commercial property.

According to FEMA, lightning injures an average of 300 people and kills an average of 80 people in the United States each year. Direct lightning strikes can also cause significant damage to buildings, electrical systems, critical facilities, and infrastructure. Lightning is responsible for igniting wildfires that can result in widespread damages to property before firefighters can contain and suppress the resultant fire. The Hazard Vulnerability and Risk Assessment Section (Section VI) includes a discussion of the impacts to specific assets.

Severe storms are localized events that can impact the entire County and affect residents, visitors, transportation routes, utilities, businesses, crops, and livestock. Thunderstorms can cause flooding, property damage, and disruption of utility services such as power, telephones, or cable. Lightning strikes can ignite wildfires or structure fires. The damage from severe storms depend on when and where they occur and can vary based on wind and weather patterns. Generally, severe storms injure people because of exposure to objects and debris propelled by high winds, exposure to lightning strikes, flash flooding, and localized inundations. The Hazard Vulnerability and Risk Assessment Section (Section IV) includes a discussion of the impacts to specific assets.

Climate Change, Changes in Population Patterns, Changes in Land Use and Development

According to a fact sheet produced by NOAA, severe thunderstorm and tornado activity is dependent on two things: the strength of atmospheric instability and vertical wind shear. Additionally, natural climate variations, like El Nino and La Nina, have the potential to alter the environment necessary for tornado formation. As such, an assessment of the potential impact to these factors can highlight how climate change may impact severe storms and tornadoes in the future. In general, it is expected that climate change will increase instability in the atmosphere, especially with the higher temperatures and increased humidity associated with the changing climate. Additionally, a weakening vertical wind shear is expected through a reduction in the surface pole-to-equator temperature gradient. The combination of the increased atmospheric instability and weakening vertical wind shear may increase the likelihood of more severe storm events, including tornadoes. The population and number of structures have increased in Hardee County and its jurisdictions since the 2020 LMS Plan, which puts more structures and people at risk for severe storms. As population and development increase in the County and its jurisdictions, the probability that severe thunderstorms and lightning will cause property damage or human casualties will also increase. The higher standards adopted by Florida's Building Code decrease vulnerability.

Probability of Future Occurrences

The probability that tornadoes will occur within the planning area is high and could affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of Hardee County in the future. Weaker tornadoes (F0-F1) will likely occur somewhere within the county annually.

The probability of hail events is moderate. The County can expect to experience an average of 1.8 hail incidents per year.

The probability of occurrence for future lightning events is relatively moderate annually countywide, but given the regular frequency of occurrence, future lightning events will continue to threaten life and property throughout Hardee County.

The probability that severe thunderstorms will occur somewhere in the county is very high based on previous occurrences. The frequency that these events may occur is annually.

Hazard Profile – Geologic

A geologic hazard is one of several types of adverse geologic conditions capable of causing damage or loss of property and life.

Land Subsidence (Sinkholes)

Description and Background

Sinkholes are a common, natural geologic feature of Florida's landscape. According to the Florida Department of Environmental Protection (FDEP), sinkholes are closed depressions in areas underlain by soluble rock such as limestone and dolostone, which form the Floridan aquifer system, and gypsum or salt. Sinkholes form when surface sediments sink, or subside, into underground voids created by the dissolving action of groundwater in the underlying bedrock. Sinkholes can form from dissolution of near surface rocks or by roof collapse of underground channels and caverns. Other events that can cause holes, depressions, or subsidence of the land surface that may mimic sinkhole activity include:

- Removal of water leading to the compression of subsurface expansive clay or organic layers,
- Collapsed or broken sewer and drain pipes;
- Broken septic tanks;
- Improperly compacted soil after excavation work; and
- Buried trash, logs, and other debris.

Sinkholes are one of many kinds of karst landforms, which include caves, disappearing streams, springs, and underground drainage systems, all of which occur in Florida. Karst is a generic term which refers to the characteristic terrain produced by erosional processes associated with the chemical weathering and dissolution of limestone or dolomite, the two most common carbonate rocks in Florida. Dissolution of carbonate rocks begins with exposure to acidic water. Most rainwater is slightly acidic and usually becomes more acidic as it moves through decaying plant debris.

The Florida Geological Survey developed a Sinkhole Type Area Map to depict the State's favorability to sinkhole formation based on natural dynamics in Florida's geology. The Sinkhole Type Area Map includes four distinct areas. The entire County is located in Area IV.

- Area I: Region of exposed or thinly-covered carbonate rocks. Broad, shallow solution sinkholes dominate, with less common collapse sinkholes in areas with thicker overburden sediments.

- Area II: Region of incohesive, permeable sand ranging from 30 to 200 feet thick. Small cover subsidence sinkholes dominate, with less-common collapse sinkholes forming in areas with clayey overburden sediments.

- Area III: Region of cohesive, low-permeability clayey sediments ranging from 30 to 200 feet thick. Abruptly-forming collapse sinkholes dominate. The size of these sinkholes depends upon the thickness and bearing properties of the overburden sediments

- Area IV: Region of deeply-buried carbonate rocks. Overburden sediments are primarily cohesive clayey sands and interbedded carbonates in excess of 200 feet thick. Sinkholes are

uncommon, but rare deep collapse types and small subsidence sinkholes formed in shallow shell beds or carbonate lenses are possible.

Three types of sinkholes are common in Florida: dissolution; cover-subsidence; and cover-collapse sinkholes. Sinkholes develop from dissolution and suffusion. Dissolution is the ultimate cause of all sinkholes, but the thickness and type of overburden materials and the local hydrology also control the type of sinkhole. Although it is convenient to divide sinkholes into three distinct types, sinkholes can be a combination of types, or may form in several phases.

Dissolution of limestone or dolomite is most intensive where water first contacts the rock surface. Aggressive dissolution also occurs where water flow focuses on pre-existing openings in the rock, such as along joints, fractures, and bedding planes, and in the zone of water-table fluctuation where ground water is in contact with the atmosphere. Cover subsidence sinkholes tend to develop gradually where the covering sediments are permeable and contain sand. Cover-collapse sinkholes may develop abruptly (over a period of hours) and cause catastrophic damages. They occur where the covering sediments contain a significant amount of clay (www.sinkholes.com).

Under natural conditions, sinkholes form slowly and expand gradually. However, activities such as dredging, constructing reservoirs, diverting surface water, and pumping groundwater can accelerate the rate of sinkhole expansions, resulting in the abrupt formation of collapse type sinkholes, some of which are spectacular.

Officials measure sinkholes in length, width, and depth. The largest recorded sinkhole in Hardee County was 15 feet in diameter and up to 12 feet in depth (Appendix B).

Historical Occurrences

The Florida Geological Survey maintains and provides a downloadable database of reported subsidence incidents statewide. A subsidence incident is a reported depression, which a Licensed Professional Geologist may or may verify by to be a true sinkhole, and the cause of the subsidence is unknown. The Subsidence Incident Report is the source for the information for the LMS.

Subsidence, including sinkholes, can occur all over the County.

The United States Geological Survey (USGS) recorded 8 subsidence incidents in Hardee County between 2010 and 2024. The USGS list is dependent on the reporting of incidents meaning it is not a complete list of incidents since not all sinkholes are reported to USGS.

Table III-14 includes a summary of subsidence incidents, by location, since 1960.

TABLE III-14:
SUBSIDENCE INCIDENTS BY JURISDICTION (1960-2024)

Year	Jurisdiction	Location	Occurrence
1960	Hardee County (north of Wauchula)	Old Bradenton/Smith Rd.	No information other than a sinkhole
1989	Hardee County	Sweetwater area	Reports suggest it was caused by the construction of a new well
2000	Hardee County	Clifton Bryan Road	The diameter of the sinkhole was 5' and depth was 3'
2000	Hardee County	Johnston Rd. orange grove	Diameter was 15' and depth of 12'. Reportedly swallowed some orange trees
2002	Hardee County (west of Zolfo Springs)	Broadus Williams / Merle Langford Roads	Approximately 1' by 1'. Was repaired by Hardee County Road & Bridge Dept.
2004	Wauchula	Magnolia Drive	No other information
2004	Hardee County (west of Bowling Green)	Methodist Church Road	2 small sinkholes. No further information
2005	Hardee County (east of Zolfo Springs)	Gilliard Farms Road	Sinkhole appeared near a driveway and did not impact any

According to the USGS and FDEP no additional reports occurred after the 2005 incident.

Sinkholes may also be associated with phosphate mining. Please refer to the subsection on phosphate mining for further discussion.

Location

Although the entire state of Florida is susceptible to sinkholes, some areas experience more sinkholes than others do. Hardee County is located within the type IV area (Appendix B) where cover is more than 200 feet thick consisting of cohesive sediments interlayered with discontinuous carbonate beds. This area has few sinkholes but occasionally some large-diameter, deep sinkholes occur. These sinkholes are generally cover-collapse sinkholes where cohesive layers of sediment collapse into underground cavities.

As mentioned above, the entire county including Bowling Green, Wauchula, Zolfo Springs, lies within an area that rarely experiences sinkholes, but where some large-diameter, deep sinkholes are possible. The location of future sinkholes is difficult to estimate. However, using reported sinkhole data from the Florida Geological Survey, county staff have identified the areas within a one-half mile radius of the eight previously identified sinkholes as vulnerable to this hazard. Sinkholes can affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of the county.

The locations of previous sinkholes are provided in a map in Appendix B.

Potential Impacts

The impacts to Wauchula, Bowling Green and the Town of Zolfo Springs are minimal. The history of sinkholes have mostly been in the rural areas of the county, which includes pasture and wooded areas. The greatest concern would be impacts to the environment; sinkholes can affect the environment by threatening water supplies by draining water from streams, lakes, and wetlands directly into the aquifer; this could affect wildlife habitats.

While generally not life-threatening, sinkholes may develop suddenly and cause property damage. Additional hazards associated with sinkholes include flooding, when water exceeds the natural capacity of the subsurface conduit, and pollutants on the land surface can potentially move rapidly into the underlying aquifer. Depending on the location of the sinkhole, severe damage can occur to individual properties or to roads and other infrastructure. In addition to structures and infrastructure, sinkholes may impact water supplies and environmental elements.

Climate Change, Changes in Population Patterns, Changes in Land Use and Development

Severe storm events and associated flooding or extended periods of drought both increase the number of sinkholes incidences. With the potential for more prolonged and intense periods of drought, as well as greater intensity and frequency of rainfall and inland flooding, it is likely that incidences of sinkholes will increase in the coming century.

A report published in the Natural Hazards and Earth System Sciences Journal shows that in general, the number of sinkholes in Florida increases by one to three percent for every 0.1 degree Celsius rise in global temperature. Rising temperatures can increase the dissolution of bedrock, causing soil collapse and increasing the intensity and frequency of sinkhole occurrence. Sinkhole prevalence will be further exacerbated as Florida's population continues to rise and development increases in favorable sinkhole areas. Each of these factors may make sinkholes a more costly hazard in Florida in the future.

The depletion of the water table from development potential pressures may increase the occurrences of sinkholes. The population and number of structures have increased in Hardee County and its jurisdictions since the 2020 LMS Plan, may put more structures and people at risk for sinkholes.

Probability of Future Occurrences

The probability that future sinkholes will occur somewhere within the planning area is high based on historical data. However, the frequency that sinkholes occur is low, particularly sinkholes of geologic significance. Only two previously recorded sinkholes were deeper than 5 feet and most were very small in diameter but could still affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of Hardee County in the future.

Hazard Profile – Hydrologic

Hydrological (water) processes cause hydrologic hazards.

Drought

Description and Background

FEMA defines droughts as a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. The Florida State Hazard Mitigation Plan defines droughts as "A drought is a deficiency in precipitation over an extended period." A drought is a prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period, usually a season or more in length. High temperatures, high winds, and low humidity can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts. Officials classify droughts into one of three types:

- Meteorological: The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Hydrologic: The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- Agricultural: Soil moisture deficiencies relative to water demands of plant life, usually crops.

Droughts are slow-onset hazards, but over time can have very damaging effects on crops, municipal water supplies, recreational uses, and wildlife. If droughts extend over several years, the direct and indirect economic impact can be significant.

Historical Occurrences

Minor droughts occur every few years. They are usually associated with a "La Nina" event. The last occurrence was from 1999 to 2001. According to the National Weather Service website, the most serious event occurred in South Florida from May 2000 to May 2001. Below normal rains caused $100 million in crop damage.

- Hardee County, along with much of the State of Florida, has experienced moderate to severe drought conditions for many years. Recently, during the crop years 2017 and 2023 Hardee County had a Secretarial Drought Designation assigned to it.

While officials have not declared a drought for Hardee County during 2024, Hardee County and jurisdictions have been on year-round watering restrictions for several years.

General drought conditions were present throughout Florida in 1981, 1985, 1998-1999, 2000, and 2001. As explained byt the Florida Department of Agriculture, the Keetch Byram Drought Index is a continuous reference scale for estimating the dryness of the soil and duff layers. The index increases for each day without rain (the amount of increase depends on the daily high temperature) and decreases when it rains. The scale ranges from 0 (no moisture deficit) to 800. The range of the index

is determined by assuming that there is 8 inches of moisture in a saturated soil that is readily available to the vegetation. It is a numerical scale that ranges from 0 (no moisture content) to 800(0-800) that measures the amount of moisture in the soil. A zero indicates wet, full saturation conditions while an 800 represents extreme drought conditions. High values of the KBDI are an indication that conditions are favorable for the occurrence and spread of wildfires, but drought is not by itself a prerequisite for wildfires. Other weather factors, such as wind, temperature, relative humidity and atmospheric stability, play a major role in determining the actual fire danger.

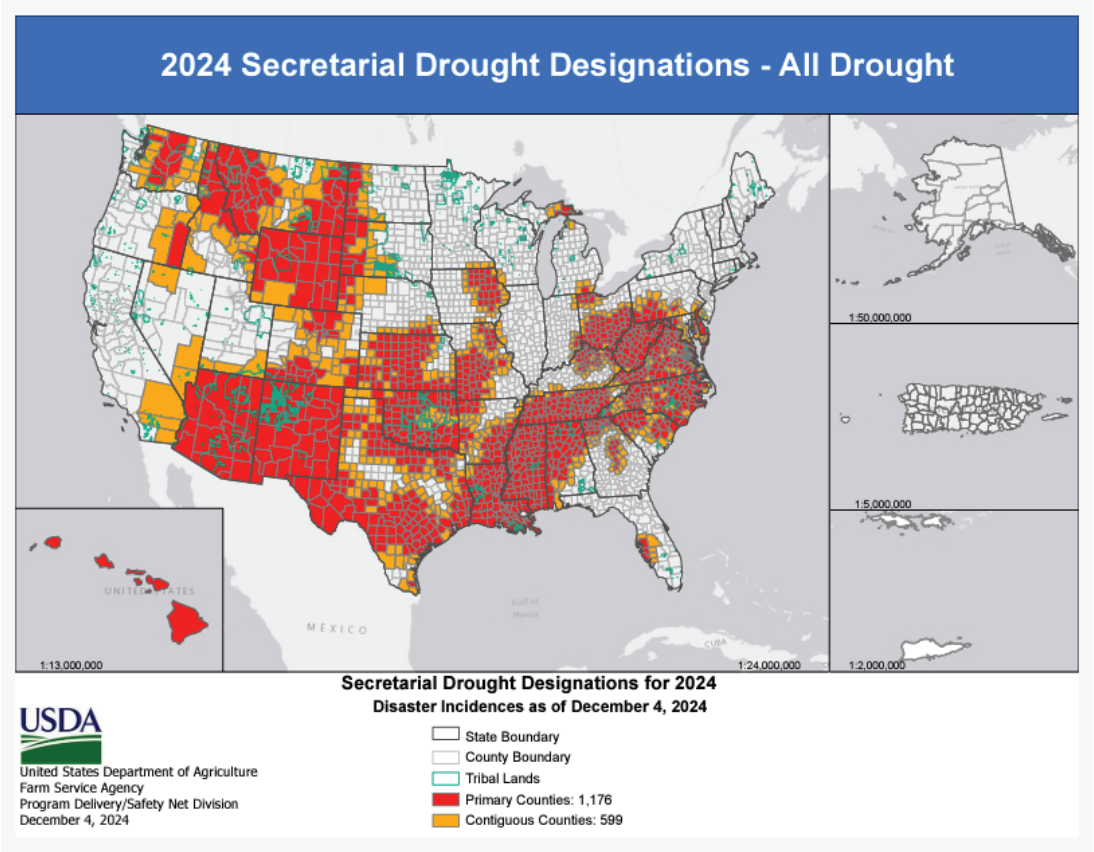


Figure III.5: 2024 Secretarial Drought Designations; Source: USDA Farm Service Agency 12/04/2024

Location

According to the State Hazard Mitigation Plan, the State of Florida experiences cyclical drought on a regular basis. Analyzing past events, as well as the current drought conditions, has proven that the conditions have been variable over the years, affecting all regions of Florida randomly and somewhat equally. As shown in the figure below, the east and northwest portions of the County experience 10.01 to 11.00 weeks of drought per year. Wauchula and Zolfo Springs are located in the portion of the County identified as 9.01 to 10.00 weeks of drought per year.

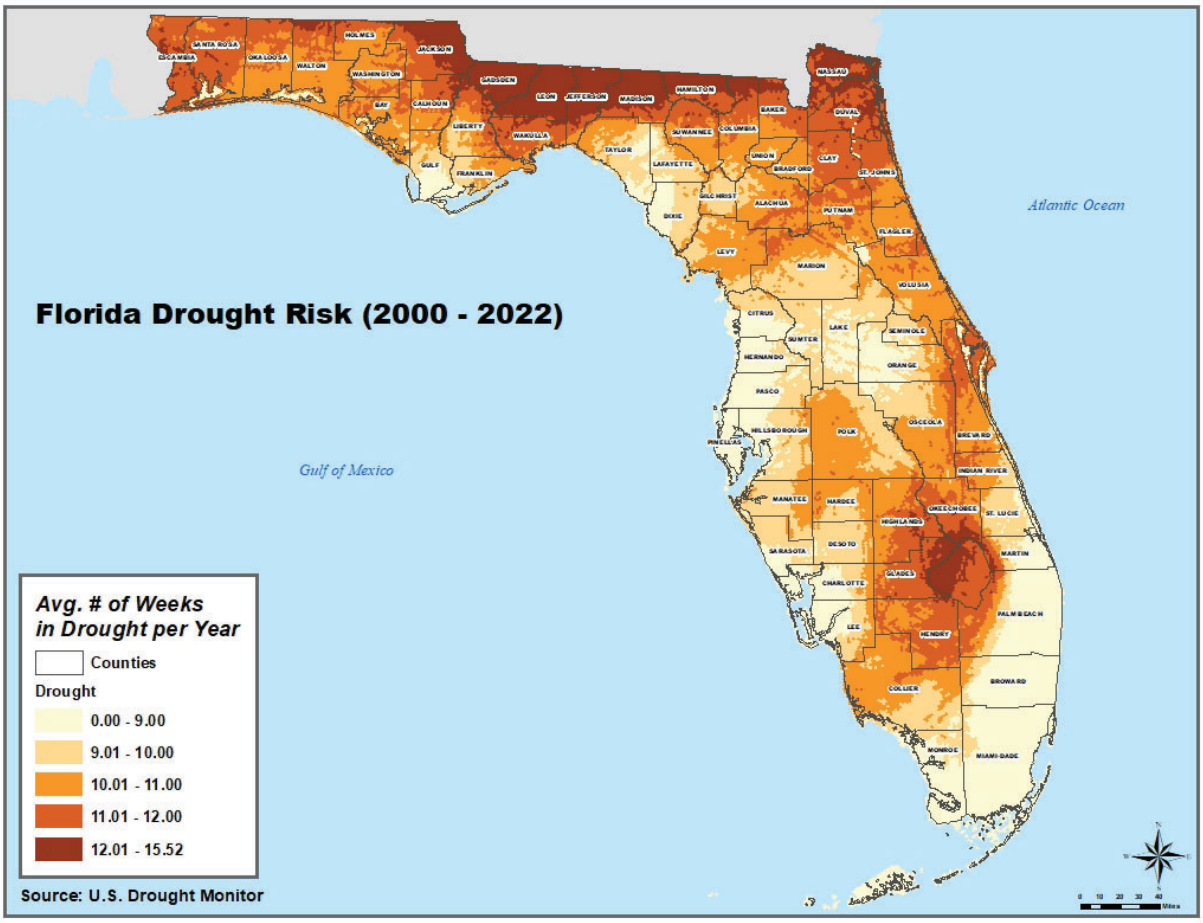


Figure III.6: Florida Drought Risk; Source: State Hazard Mitigation Plan

Potential Impacts

Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. High temperatures, high winds, and low humidity can worsen drought conditions and make areas more susceptible to wildfire. Human demands and actions can hasten or mitigate drought-related impacts on local communities.

Drought typically covers a large area that geographic or political boundaries cannot contain. According to the Palmer Drought Severity Index, Florida has a relatively low risk for drought hazard. However, local areas may experience much more severe and/or frequent drought events than what the Palmer Drought Severity Index map represents. Periods of drought can exacerbate the ignition of wildfires that can damage the natural and built environment.

The County's agricultural industry is at highest risk to drought. Drought can impact crops and livestock. Droughts also decrease the water supply, increase wildland fire danger, and increase the potential for sinkhole development for the entire County.

Climate Change, Changes in Population Patterns, Changes in Land Use and Development

Climate change is significantly increasing the frequency, intensity, and duration of droughts around the world, primarily by causing higher temperatures which lead to increased evaporation from soil and water bodies, making existing dry periods even drier, and altering precipitation patterns to produce less rain in many regions; essentially, making droughts more severe and widespread. Increased development places more pressure on water supply, which is negatively impacted by climate change. Changes in land use and development since the 2020 plan have not created an increase in vulnerability to drought.

Probability of Future Occurrences

The LMS assumes that exposure to drought is uniform in Hardee County, making the spatial extent potentially widespread. Drought may affect some areas of the County more severely than others. Given the frequency of previous events, warm temperatures, and average rainfall, the probability of future drought events is low to medium. As the County population continues to trend upwards water demands intensify, and demands related to agriculture and livestock increase, drought conditions may begin to have a profound impact on the County. There is a medium probability that cycles of reduced rains will continue to cause hydrological droughts in the future. Hardee County can expect a minor drought once every 2 to 3 years.

Flood

Description and Background

The National Flood Insurance Program (NFIP) website defines a flood as a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area, or of two or more properties from:

- Overflow of inland or tidal waters;
- Unusual and rapid accumulation or runoff of surface waters from land source; or
- A mudflow.

The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. Floods are categorized as: riverine; coastal; or shallow flooding (where shallow flooding refers to sheet flow, ponding, and urban drainage).

Flooding is the most frequent and costly natural hazard in the United States and has caused more than 10,000 deaths since 1900. Nearly 90 percent of presidential disaster declarations result from natural events where flooding was a major component.

Figure III.7: Flooded Streets in Wauchula from September 29, 2022 WFTS ABC Action News Website

Floods generally result from excessive precipitation and are classified as: general floods which include precipitation over a given river basin for a long period of time along with storm-induced wave or tidal action; or flash floods which are the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is typically determined by a combination of factors including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface.

A general flood is usually a long-term event that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves and heavy rainfall produced by hurricanes, tropical storms, and other large coastal storms. Urban flooding occurs where manmade development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Flash flooding is caused by slow-moving thunderstorms or by heavy rains associated with hurricanes and tropical storms. Flash flooding events may also occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by a retention basin or other stormwater control facility. Although flash flooding occurs most often along mountain streams, it is also common in urbanized areas where impervious surfaces cover much of the ground.

The periodic flooding of lands adjacent to rivers, streams, and shorelines (land known as floodplain) is a natural and inevitable occurrence that takes place based upon established recurrence intervals. FEMA designates floodplains by the frequency of the flood that is large enough to cover them. The frequency of flood events, such as the 1 percent annual chance flood, is determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular intensity. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 1 percent annual chance flood refers to area in the 100-year floodplain that has a 1 percent chance of flooding in any given year. Similarly, the 0.2 percent annual chance flood in the area of the 500-year floodplain has a 0.2 percent change of flooding in any given year. The recurrence interval of a flood is the average time

interval, in years, expected between a flood event equaling, or exceeding, a specified magnitude. Flood magnitude increases with increasing recurrence interval.

Hardee County FIRM

Many areas of Hardee County are susceptible to riverine and urban (stormwater) flooding. Figures III.34 through III.37 and maps in Appendix B illustrate the location and extent of the Flood Insurance Rate Map.

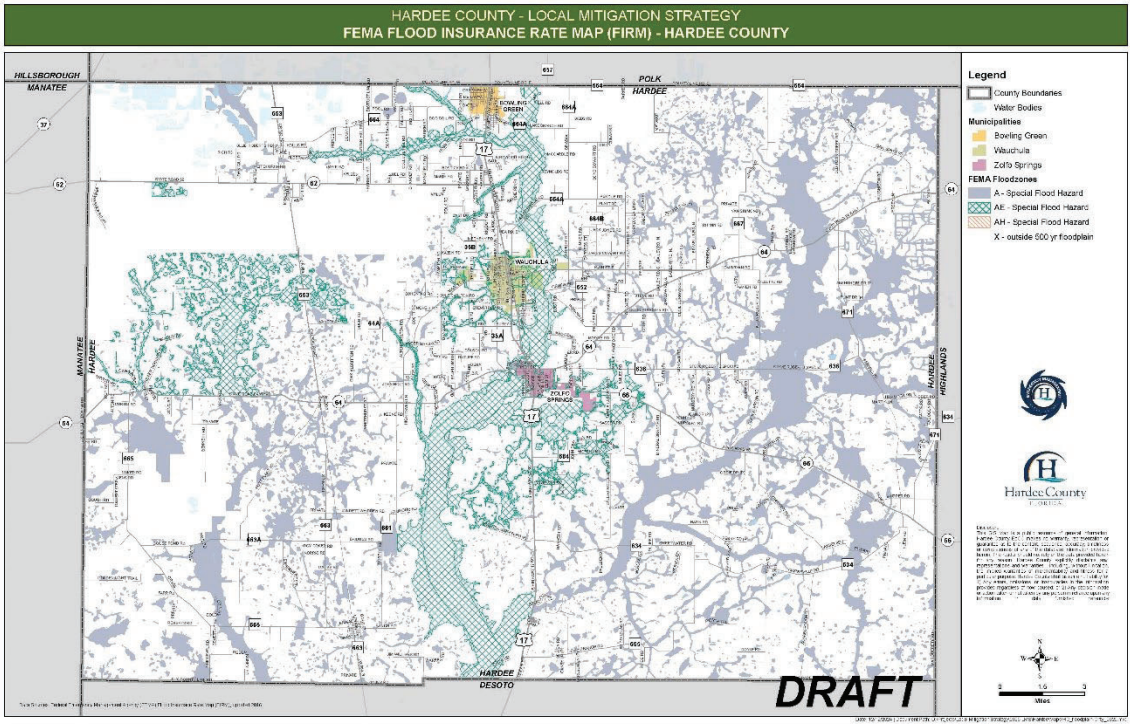


Figure III.8: FEMA Flood Insurance Rate Map – Hardee County Source: FEMA and Hardee County

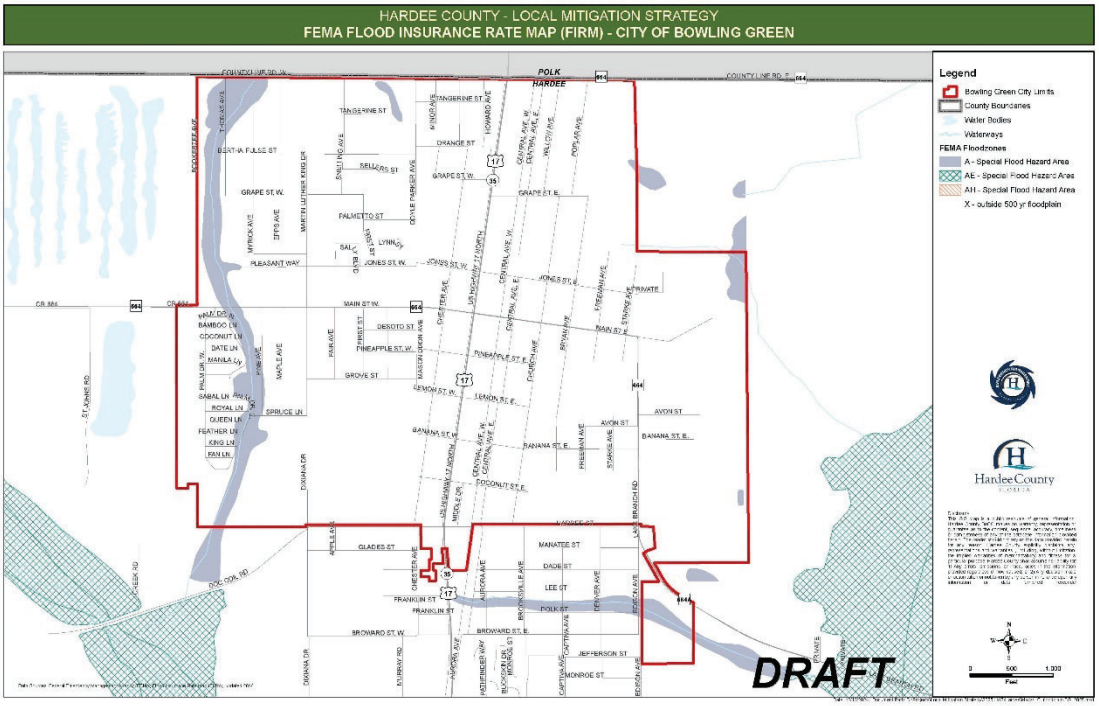


Figure III.9: FEMA Flood Insurance Rate Map – City of Bowling Green Source: FEMA and Hardee County

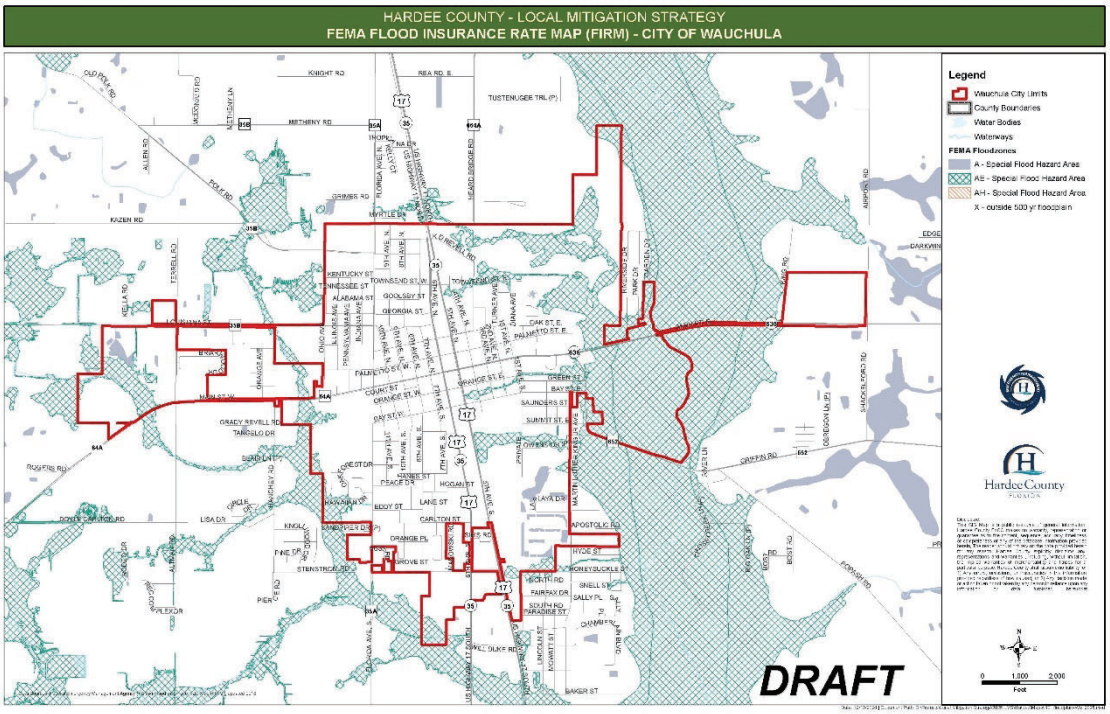


Figure III.10: FEMA Flood Insurance Rate Map – City of Wauchula Source: FEMA and Hardee County

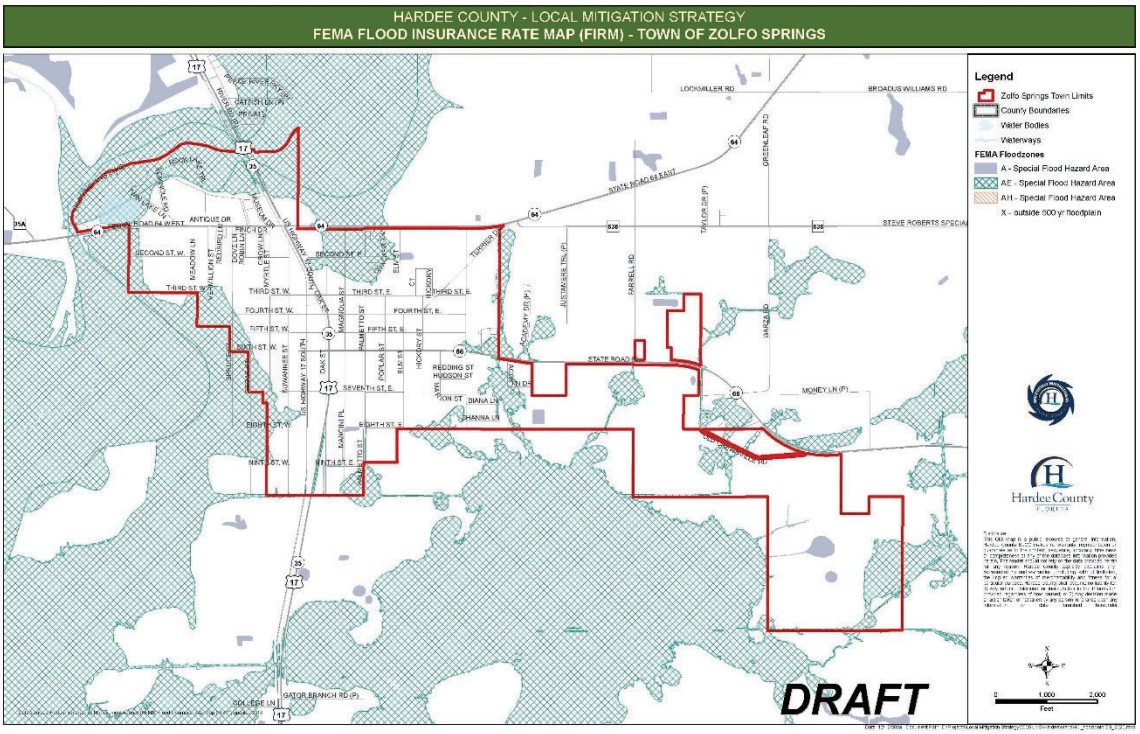


Figure III.11: FEMA Flood Insurance Rate Map – City of Zolfo Springs Source: FEMA and Hardee

Natural Floodplain Functions

Floodplains left intact perform many natural functions including proving flood and erosion control, recharging our aquifers, improving surface water quality, and protecting ecologically sensitive areas. They support diverse populations of flora and fauna, providing outdoor areas to educate residents on the importance of protecting this valuable natural resource. In addition, they provide recreation and economic benefits to the community. There are several beneficial resources and functions of natural floodplains

Natural Flood Storage and Erosion Control

Floodplains provide areas to spread water out and temporarily store floodwater. This helps to reduce peak flood stages. In addition, the broad storage area diminishes the velocity of water flow, thus reducing erosion caused by fast moving water. In urbanized areas, natural floodplains can provide storage and/or result in less runoff that can be carried overland and lead to flooding in streets and neighborhoods.

Flood attenuation is particularly important in low-lying areas that can experience flooding during even relatively small storms. One acre of floodplain flooded a foot deep holds 330,000 gallons of water. Vegetated floodplains are especially advantageous due to the plants' structure hindering water movement, thus slowing the rate of flow that reaches the main water body. The diminished velocity provides erosion protection and stability to the banks of channels and lakes. Vegetation also reduces coastal shoreline erosion.

Water Quality and Aquifer Recharge

Natural floodplains not only provide runoff storage, but also serve to improve water quality by reducing the amount of contaminants including chemicals and unnatural levels of nutrients from reaching the main water bodies. In the process of suppression of water flow, vegetative floodplains allow sediments and debris to sink and settle within the floodplain. In natural floodplain areas outside of a main channel system, the water flow slows, giving more time to seep into the ground where it can help replenish the groundwater. As the water slowly seeps into the soil, natural purification of the water takes place as well.

Fish and Wildlife Habitat

Natural Floodplains support a wide variety of plants and animals. Natural floodplain habitats vary in vegetation, with some having aquatic grasses and others being forested. What they have in common is that they are ephemeral, meaning there is a wet and dry period. The length of period in which they are wet also fluctuates. Floodplains and associated wetlands provide food and cover for both terrestrial and aquatic wildlife. The areas where water and land converge are generally more biologically diverse than the surrounding uplands. Natural floodplains are a critical habitat for several imperiled species such as the wood stork.

Recreation

Several of the natural floodplains and surrounding natural areas of Hardee County provide recreational opportunities including hiking, bicycling, fishing, boating, and wildlife viewing.

Economic Benefit

Natural floodplains have an economic value in the reduction of flood and storm damage to infrastructure. They also provide an economic benefit from the ecotourism dollars generated from people visiting the area for recreational activities and great birding opportunities

Protecting Our Natural Floodplains

Poor planning and development in floodplains can result in degradation of water quality, loss of habitats, loss of valuable property, erosion, and increase in severity and frequency of flood losses. Hardee County and the three municipalities' comprehensive plans provide strategies to address the protection of natural floodplains. Water Quality Management Plans identify locations and projects on public lands that enhance natural systems, including natural floodplains. These enhancements provide a diversity of benefits, such as increasing wildlife habitat quality, attenuating stormwater flows, enhancing downstream water quality, and reducing erosion and sediment loading. The County and municipalities implement these measures through a variety of ways, including development of water quality management plans, policies intended to protect environmentally sensitive lands, as well as regulations aimed at protecting wetlands.

Historical Occurrences

According to SHELDUS, from 1979 through 2021, 19 flooding events occurred. They resulted in one injury, 0 fatalities, approximately $9K in adjusted crop damage, and approximately $8.4 million in property damage. Table III-15 includes the flooding incidents from 2017- 2024 as reported by NOAA.

Date	Location	Type	Estimated Property Damage ($)	Estimated Crop Damage ($)	Damages
September 2017	Countywide	Flood (Hurricane Irma)	$1.8M	Not reported	Hurricane Irma was recorded at 9.0" of rain. Due to the massive amount of rain during the storm, the Peace River rose to height of 23.85 on Sept. 13, 2017. Major flooding occurred throughout Hardee County with some residents being displaced.
July 2021	Countywide	Flood (Hurricane Elsa)	$10K	Not reported	Indirect impacts. Rainfall estimated 2-4 inches. No significant property damages. SR 64 flooded and closed in Ona near the railroad crossing and Hickory Creek. River Road along the Peace River north of Zolfo Springs flooded. Alton Carlton Road near Troublesome Creek southwest Wauchula flooded. Intersection of Lost Acres Drive and Old Bradenton Road near Hob Branch north of Wauchula flooded.
September 2022	Countywide	Flood (Hurricane Ian)	$38M	$230M	Some parts of Hardee received up to 20" inches of rain, causing widespread, catastrophic flooding. The Peace River at Zolfo Springs reached a new height of over 26 feet.
October 2024	Countywide	Flood (Hurricane Milton)	County data not available at this time	County data not available at this time	Rainfall estimates up to 6 inches fell in the northwest part of the County. Wind gusts are estimated to be up to

					80mph. Peace River at US 17 at Zolfo Springs registered a height of 18.73 feet.

Source: NOAA

Repetitive Loss Properties

Note: The County has requested Repetitive Loss information. The information will be added to the LMS Plan upon receipt.

FEMA defines a repetitive loss property as any insurable building for which the NFIP paid two or more claims of more than $1,000 within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP.

The actual database of repetitive loss properties will not be provided in the LMS plan because of the specific address and personal information that is associated with the data. However, specific information may be requested from any of the appropriate jurisdictions directly through the NFIP at FEMA. To eliminate or reduce the risk of future flooding, each jurisdiction with repetitive loss properties uses a variety of outreach methods to inform the community about mitigation techniques. The County recognizes six repetitive loss properties. With their most recent date of loss ranging from 1998 to 204. All six properties are residential. Hardee County reviews and updates the list of repetitive loss properties, describes the causes of the losses, and coordinates outreach to those areas each year.

FEMA provides information relating to the structures that have had multiple National Flood Insurance (NFIP) claims across the history of the program. The data contains NFIP-insured structures that fall within the four categories of Repetitive Loss and Severe Repetitive Loss that FEMA tracks. A snipit from FEMA's ArcGIS Online platform located https://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=872bbaf7dfbb48cb88d244c7123e4d9d is located below.

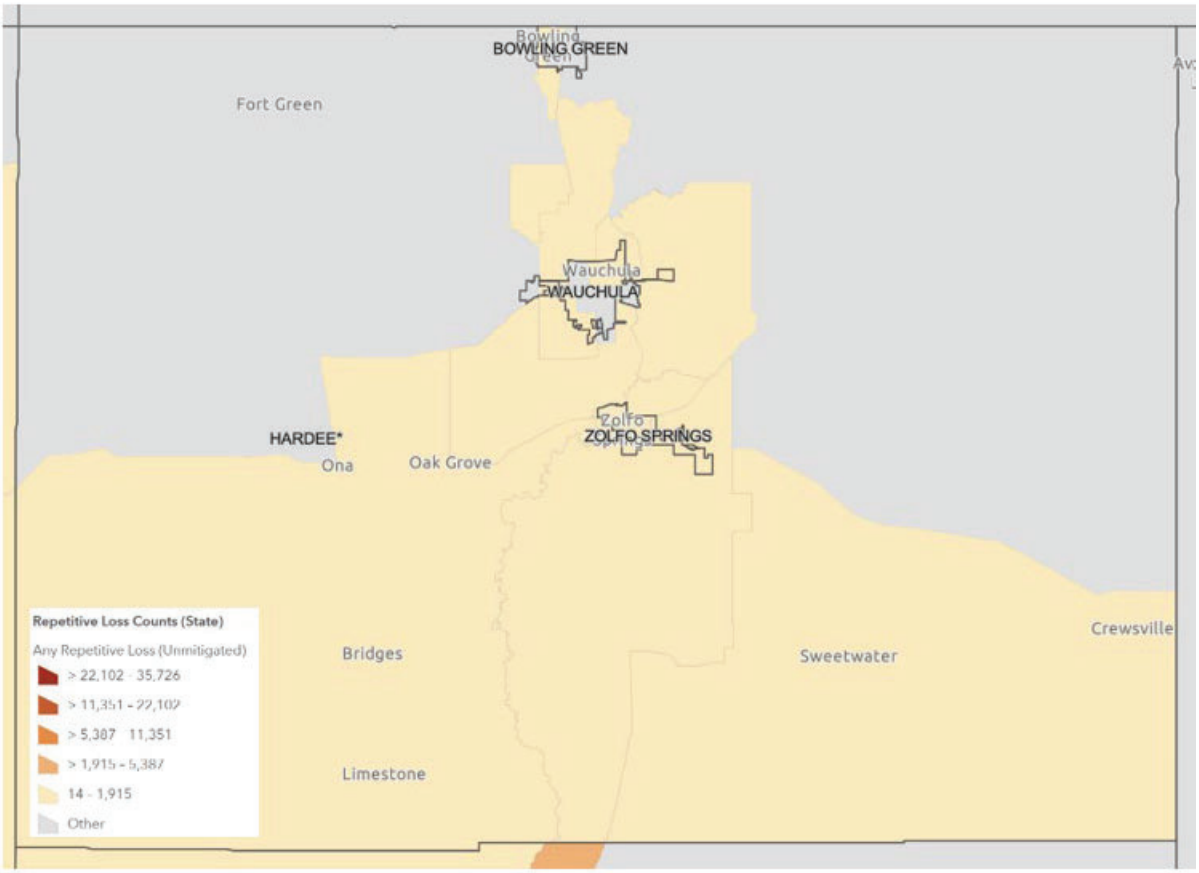


Figure III.12: Repetitive Loss Properties Source: FEMA
https://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=872bbaf7dfbb48cb88d244c7123e4d9d

Location

Areas within the 100-year floodplain are vulnerable to flooding. These areas generally lie along the major waterways within the county, including the Peace River, Horse Creek and Charlie Creek. In addition, the residential community along Bronco Drive in the southern portion of unincorporated Hardee County and the Riverview Heights subdivision east of the City of Wauchula in unincorporated Hardee County are identified as areas that may be vulnerable to flooding based on repetitive flood claim information. Approximately 107,443 acres of land and waterways are vulnerable to flooding throughout the entire county. Flooding can affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of the county.

Potential Impacts

Floods can have devastating consequences and can impact the economy, environment, structures, and people. Floods, especially flash floods, may destroy roads, bridges, farms, houses, and automobiles. People may become homeless, and water supply and electricity service may be disrupted. Emergency responses are ordered to address impacts. It may take years for affected communities to re-build and business to return to normalcy. Chemicals and other hazardous substances may contaminate the water bodies. Flooding kills animals, introduces insects to affected areas, and may distort the natural balance of the ecosystem.

The Hardee County Hydrography map (figure below) shows the locations of the different water bodies in the County. The water bodies crisscross the entire county, including all three jurisdictions. The locations of the water bodies provide sources for riverine flooding.

Figure III.13: Hardee County Hydrography
Source: Florida Center for Instructional Technology, (Tampa, FL: University of South Florida, 2008)
Map Credit: Courtesy of the Florida Center for Instructional Technology

CLIMATE CHANGE, CHANGES IN POPULATION PATTERNS, CHANGES IN LAND USE AND DEVELOPMENT

As the climate continues to change, warmer temperatures and shifting rainfall patterns will be the result and will contribute to increases in rainfall severity and frequency. Continued development of land may also contribute to flooding as less areas remain available for water recharge. Consequences of increased flooding include health and safety of residents and responders, impacts to property, facilities, and infrastructure. The population and number of structures have increased in Hardee County and its jurisdictions since the 2020 LMS Plan, which results in more people exposed to potential impacts from flooding. The County and all three jurisdictions participate in the NFIP and have requirements relating to construction within wetlands and floodplains, which help mitigate the increased development in the County.

Probability of Future Occurrences

The probability that flooding will occur somewhere within the county is very high based on historical information. The frequency that severe flooding may occur is annually. Localized flooding may occur even more frequently and could affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of Hardee County in the future.

Hazard Profile – Other Natural Hazards

Other Natural Hazards are natural hazards that are not categorized as atmospheric, geological, or hydrologic.

Agricultural Disruption

Description and Background

Agricultural disruption refers to a significant disruption in the normal operations and productivity of farming practices, often caused by factors like extreme weather events, pests, diseases, climate change, economic instability, or technological shifts, leading to reduced crop yields, livestock losses, and potential food insecurity in affected regions; it can also encompass disruptions to the supply chain, impacting the distribution and availability of agricultural products.

Historical Occurrences

In 2007, citrus greening disease was discovered in Hardee County.

In 2018, Florida's citrus production was down more than 80% (45 million boxes) from the 1997-98 season where 244 million boxes of citrus were produced. Abandoned citrus acreage in Hardee County increased from 2,399 acres in 2015 to 2,708 acres in 2016 (USDA). While productive citrus acreage decreases, the cost of production increases suggesting a path of diminishing returns and eventual collapse of a significant portion of the industry.

In 2022, Hurricane Ian devastated fruit and vegetable farms. In some citrus groves, as much as 80 percent of the citrus fruits were lost.

Potential Impacts

Agricultural disruption could lead to potential impacts like food shortages, price increases, economic instability, environmental degradation, malnutrition, social unrest, loss of biodiversity, and disruptions to rural communities, as a result of reduced food production and disrupted supply chains due to disruptions in farming activities. With 12.8 percent of the County's industry in agriculture, agricultural disruptions can lead to potential loss of employment.

Probability of Future Occurrences

The 2023 Enhanced State Hazard Mitigation Plan describes the probability of Future Occurrences as the following: "While specific disease and pest prediction is challenging, weather threats can be

anticipated, but require large and concentrated mitigation efforts against the potential damage to the agricultural industry, sometimes the damage being unavoidable. The introduction of unknown or long-absent diseases and pests will remain a threat to Florida with open international trade and tourism. The sub-tropical environment of Florida creates an ideal environment for agriculture to thrive. This climate also brings disruptive hazards for production. If the weather is too hot or too cold, crops struggle to thrive. Most of Florida's fruit and vegetables are harvested in winter months, increasing their vulnerability to freezing and cold temperatures. During the summer months, the humidity and warm air allows pests and diseases to thrive through agricultural production, allowing them to spread throughout Florida."

"All counties in the state are at risk, with the southern central counties at an elevated risk due to the large agricultural farmlands. While there are human health implications from infected food supply, it is likely the economic consequences of an agricultural disruption will be the most significant."

Wildfires

Description and Background

The Florida Forest Service (FFS) defines wildfire as any fire that does not meet management objectives or is out of control. Wildfires occur in Florida every year and are part of the natural cycle of fire-adapted ecosystems. Suppression of many of these fires occur before they can damage property. Many conservation and ranch properties across the State utilize prescribed or controlled fires to replace the natural benefits that wildfires provide. Despite the advancements of fire management across the State, many large and destructive wildfires occur during severe droughts. Nationally, negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires start over 80 percent of forest fires. The second most common cause for wildfire is lightning.

According to the Florida Enhanced State Mitigation Plan, there are four types of wildfires.

- Surface Fires: Fires that burn along the forest floor consuming the litter layer and small branches on or near the ground.

- Ground Fires: Fires that smolder or creep slowly underground. These fires usually occur during periods of prolonged drought and may burn for weeks or months until sufficient rainfall extinguishes the fire, or it runs out of fuel.

- Crown Fires: Fires that spread rapidly by the wind, moving through the tops of the trees.

- Wildland/Urban Interface (WUI) Fires: Fires occurring within the WUI in areas where structures and other human developments meet or intermingle with wildlands or vegetative fuels. Homes and other flammable structures can become fuel for WUI fires.

Both public and private lands across the State utilize prescribed or controlled fires to replace the natural benefits that wildfires can provide. Prescribed burns help reduce the amount of flammable vegetation in an area, which lessens the intensity of a wildfire that may occur in that same area.

Firefighters then have an opportunity to suppress the fire while it is small and easier to control. Humans cause approximately 70 percent to 80 percent of all wildfires in Florida.

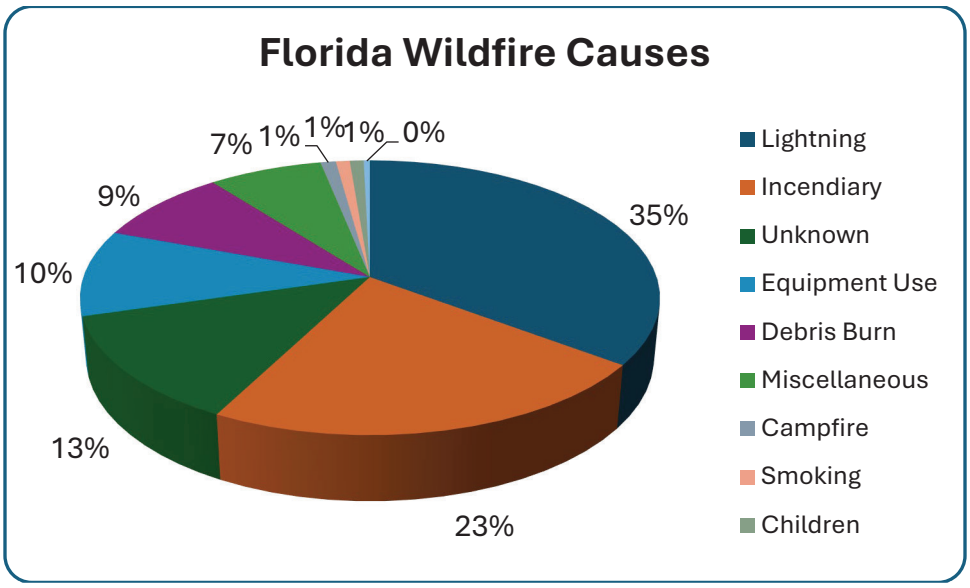


Figure III.14: Florida wildfire causes

The type and amount of fuel, as well as its burning qualities and level of moisture, affect wildfire potential and behavior. The continuity of fuels, expressed in horizontal and vertical components, is a factor because it expresses the pattern of vegetative growth and open areas. Topography affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Temperature, humidity, and wind (both short- and long-term) affect the severity and duration of wildfires.

The wildland/urban interface is the line, area, or zone where structures and other development meet or intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially ingresses the risk from wildfire.

Historical Occurrences

According to Firststreet.org, there have been 32 wildfires recorded near Hardee County between 1984 and 2021. In March, 2011, one building in Hardee County was impacted by a wildfire. This fire covered 3 square miles.

According to SHELDUS, 1 wildfire event occurred from 1960 through 2022. May 31, 1998 event resulted in two injuries and approximately $4.9 million in property damages.

TABLE III-17:
WILDFIRE INCIDENTS BY JURISDICTION (2009-2024)

Year	Location	Acres	Description
2000	Murphy Road Area	700	brush fire burned 4.5 hours requiring mutual aid from five agencies. The fire was fueled by grass with palm head crowning.
2004	Vandolah Road Area	125	Fire broke out for unknown reasons
2006	SE Rural section of the County	105	Fire broke out after an authorized acreage burn got out of control
2008	SE portion of Bowling Green	100	Fire broke out for unknown reasons
2008	Limestone Area	150	Fire broke out after an authorized acreage burn got out of control
2009	Ona Area	150	Fire broke out for unknown reasons
2009	Southwest of Zolfo Springs	470	Cause of fire was determined to be a campfire that was not properly extinguished.
2009	Ona	600	Fire broke out for unknown reasons
2010-2018	Hardee County	2,634	According to Florida Forestry Service, Hardee County had 161 wildfires during this time period that burned 2,634.4 acres.

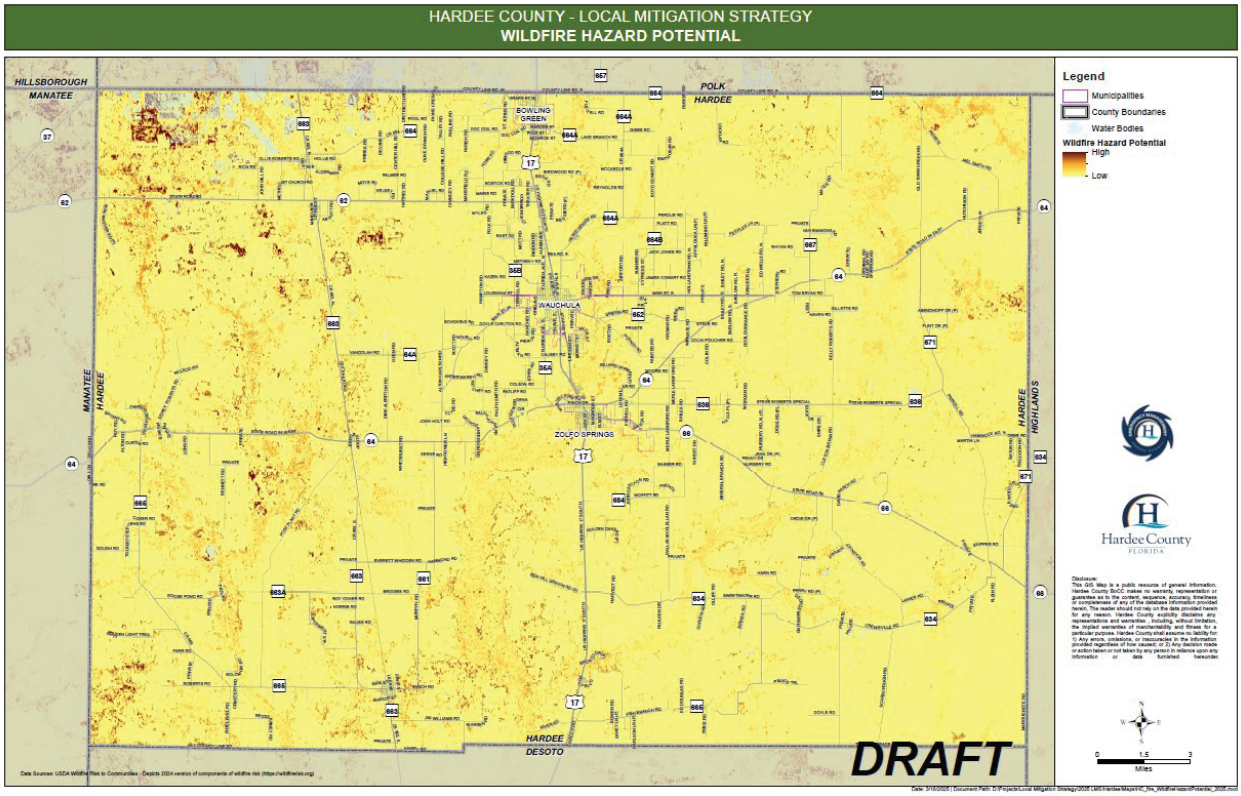
No additional data was available after 2018 from the Florida Forestry Service
Source: National Oceanic and Atmospheric Association; www.ncdc.noaa.gov; Florida Forestry Service

Location

Because Hardee County is rural with much open space, wildfires are possible virtually anywhere within the county that has adequate fuels. Rural and large tracts of unimproved lands are susceptible to brush and forest fires capable of threatening life, safety, and property loss in adjacent developed areas if not effectively controlled. Wildfires can affect our jurisdictions in Wauchula, Bowling Green, Town of Zolfo and unincorporated portions of the county.

Potential Impacts

Wildfires may affect all jurisdictions in the County since the area consists of agricultural and conservation lands. Wildfires can result in severe economic losses. Businesses that depend on timber, such as paper mills and lumber companies, experience losses that they often pass along to consumers through higher prices. They also may experience job losses. The high cost of responding to and recovering from wildfires can deplete State and County resources and increase insurance rates. The tourism industry may also be impacted by wildfires if wildfires close roads and tourist attractions due to health and safety concerns. Housing displacement as a result from property loss can impact residents of the cities and counties. Smoke that results from wildfires may cause health issues, especially with elderly and young populations.



Climate Change, Changes in Population Patterns, Changes in Land Use and Development

Climate change significantly increases the risk and severity of wildfires by creating hotter, drier conditions which lead to longer fire seasons, more flammable vegetation, and overall increased frequency and intensity of wildfires globally; essentially, rising temperatures and altered precipitation patterns make it easier for fires to ignite and spread rapidly. Changing climate can increase frequency or intensity of extreme heat or drought events, in addition to increasing existing fuel flammability, could affect wildfire behavior. Reducing moisture of living vegetation, soils, and decomposing organic matter during drought or extreme heat events is associated with increased incidence of wildfires. Furthermore, changes over time in vegetation types could change the mixture and flammability of fuels. As these transitions occur, wildfire occurrences and severity could increase with the introduction of more flammable vegetation types or decrease with the introduction of more fire-resistant species. Hardee Beach County has weather patterns that lead to both dry and wet periods each year. Climate change may cause one or the other, or both to increase in occurrence and magnitude. As population and development increases in the County and its jurisdictions, the probability that wildfires will cause property damage or human casualties will also increase. As land uses transition from agriculture to residential or non-residential uses, a larger percent of the land and population may become more vulnerable to hazards. The higher standards adopted by Florida's Building Code decrease vulnerability. Changes in land use and development since the 2020 plan have not created an increase in vulnerability to wildfire.

Probability of Future Occurrences

Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural hazards, such as tornadoes, hurricanes, etc., increase the probability of wildfires by producing fuel in urban and rural settings. Forest damage from hurricanes and tornadoes may block interior access roads and firebreaks, down overhead power lines, or damage pavement and underground utilities. There is a high probability of future wildfire events in Hardee County, especially during drought cycles and abnormally dry conditions, based on prior occurrence.

Hazard Profile – Human-Caused Hazards

Human-caused hazards can result in human-caused disasters. Human-caused hazards have an element of human intent, negligence, or error, or involve a failure of a human-caused system. This is as opposed to natural hazards that cause natural disasters.

Domestic Security Incident/Civil Disturbance

Description and Background

According to FEMA, civil disturbance, sometimes referred to as civil unrest, is an activity such as a demonstration, riot, or strike that disrupts a community and requires intervention to maintain public safety. Crowd dynamics and how people act when they are part of a crowd are complex topics. Crowds provide a sense of anonymity and therefore a sense of invulnerability and anyone in a crowd is susceptible to behaving contrary to their normal behavior. Emotional contagion is a serious psychological factor of crowd dynamics, which provides a temporary bond of unity and can push a simple organized crowd into a mob.

Most protestors are law abiding citizens who intend their protest to be nonviolent; however, sometimes these situations become highly emotional and tense which can turn a peaceful crowd into a violent riot. Although violent riots or mobs are a serious concern, nonviolent crowds can be considered a civil disturbance too. Nonviolent actions can be disruptive if they are in direct conflict with instructions from authorities. Examples of disruptive nonviolent actions are refusing to leave when instructed, locking arms, and sitting in areas that authorities are attempting to clear (Source: 2023 Enhanced State hazard Mitigation Plan).

Historical Occurrences

In September 2022, a Hardee County schools student was arrested and charged with making written threats to conduct a mass shooting.

On June 30, 2024, a riot occurred at the Velencia Gardens Apartments, which resulted in several subjects being battered and one subject receiving 14 stab wounds (Wauchula Polce Department July 10, 2024 Facebook post)

In September 2024, a Hardee Junior High School student was arrested in connection to a threat to conduct a mass shooting.

Potential Impacts

Civil disturbances can have an overwhelming direct and indirect impact on a population. Direct costs are associated with the hardening of structures and the addition of security personnel to work to prevent potential events.

Probability of Future Occurrences

The probability of future occurrences is low based on Hardee County's history. However mass shootings have occurred in neighboring and nearby counties.

Cyber Incident

Description and Background

A cyber incident is an assault launched by cybercriminals using one or more computers against single or multiple computers or networks. A cyber incident can maliciously disable computers, steal data, or use a breached computer as a launch point for other attacks. Cyber incidents are also infamous for attacking computer infrastructure and personal computers.

In addition to cybercrime, cyber incidents can also be associated with cyberwarfare or cyberterrorism, particularly in instances when the attackers are State actors, groups, or affiliated organizations. The most frequent types of cybercrimes include personal data breaches, non-payment/non-delivery scams, and extortion.

Historical Occurrences

Specific events in Hardee County are not identified. However, according to Central Florida Lifestyle Magazine, "a recent study conducted by TorGuard, an online protection company, has identified Florida as the ninth most vulnerable state to cybercrimes in 2023".

Potential Impacts

Critical infrastructure, financial components, government, and private citizens are targets of cyber incidents. Cyber incidents cause financial impacts as government, business, and private citizens pay money for protective measures and potentially suffer losses to identity theft.

Probability of Future Occurrences

The probability of future occurrences is high as this is an underreported hazard that potentially touches each individual, company, and level of government. As more jurisdictions and businesses provide services through digital formats, the potential for cyber incidents increases.

Dam/Levee Failure

Description and Background

A dam is a barrier constructed to hold back water and raise its level while a levee is a structure designed to prevent or control a flood. The LMS uses the terms interchangeably. The National Inventory of Dams defines any "major dam" as being 50 feet (15 m) tall with a storage capacity of at least 5,000-acre feet (6,200,000 m^3), or of any height with a storage capacity of 25,000-acre feet (31,000,000 m^3). Water control structures help provide flood protection, manage lake water levels, and prevent salt water from flowing into freshwater streams and creeks. The term "Dam" makes most people think only of structures associated with the impounding of rivers for use as drinking water reservoirs, the production of electricity, or flood control. In Florida, the term can take on an additional meaning, that of impounding clay settling ponds or phosphogypsum stacks associated with the mining and processing of phosphate. Both types of dams occur within Hardee County.

According to FEMA, dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam;
- Deliberate acts of sabotage;
- Structural failure of materials used in dam construction;
- Movement and/or failure of the foundation supporting the dam;
- Settlement and cracking of concrete or embankment dams;
- Piping and internal erosion of soil in embankment dams; or
- Inadequate maintenance and upkeep

A flood event may also trigger dam/levee failure. The dam impounds water in the reservoir, or upstream area. Officials measure the amount of water impounded in acre-feet. Dam failures are not routine but the impacts can be significant. Two factors influence the potential severity of a dam failure: (1) the amount of water impounded and (2) the density, type, and value of the development downstream.

Location

According to the U.S. Army Corps of Engineers National Inventory of Dams, there are 24 dams in Hardee County, all of which are located in unincorporated Hardee County. The U.S. Army Corps of Engineers National Inventory of Dams identifies each of the dams by their hazard risk of low, significant, and high.

The Figure below illustrates general locations of structures in Hardee County identified through the National Inventory of Dams. Most dams occur in the northwest portion of the County. None of the dams are located in Bowling Green, Wauchula, or Zolfo Springs. According to the National Inventory of Dams, all 24 dams are privately owned tailings dams. The average age of the dams is 30 years and 100 percent of the dams are state regulated. As shown on the figure, 10 of the dams are classified as significant hazard. There are no high hazard dams in the County.

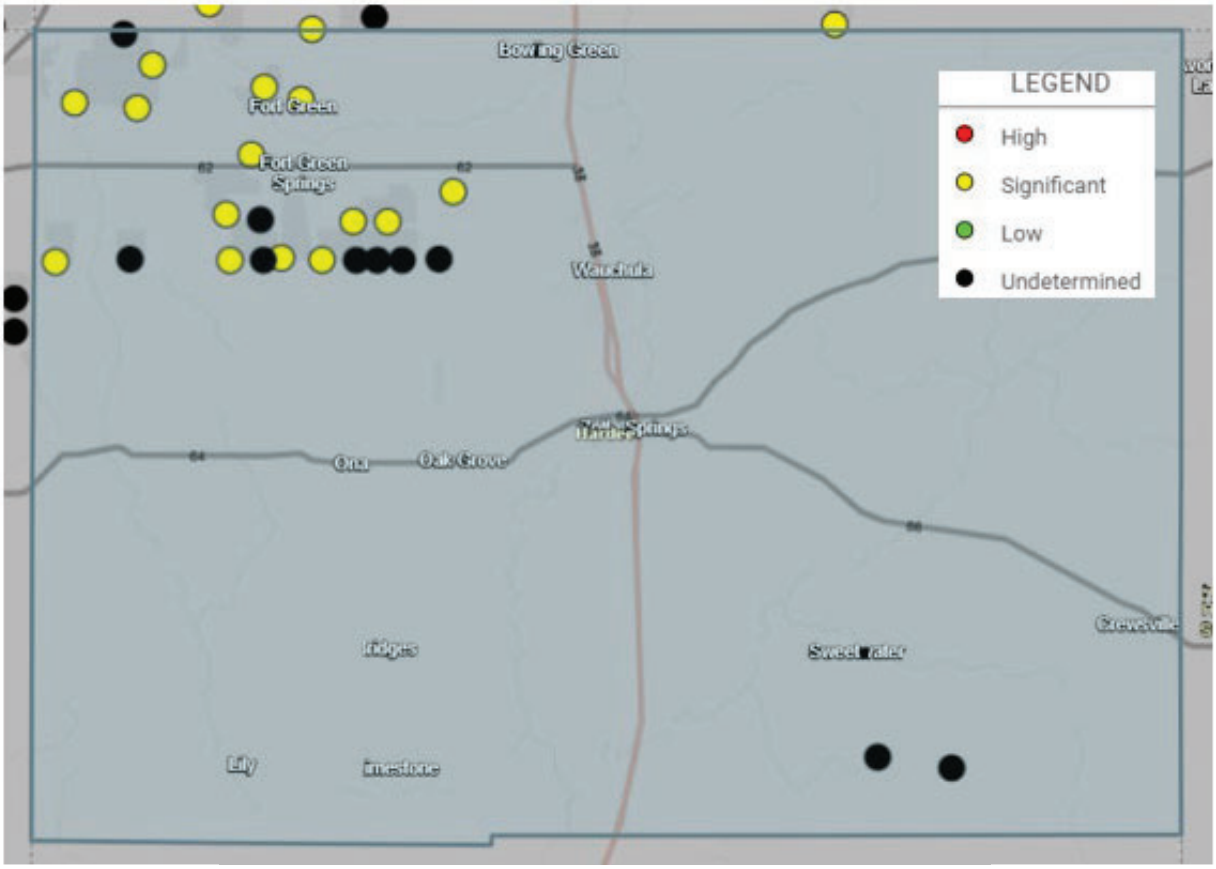


Figure III.15: Hardee County dam location map; Source: USACE, National Inventory of Dams https://nid.sec.usace.army.mil/#/

Potential Impacts

Dam and levee failures could have severe consequences due to its low-lying terrain and proximity to major waterways like the Peace River. Such failures would likely result in significant flooding, threatening homes, infrastructure, and agricultural lands, which are vital to the county's economy. The impacts could also include road closures, disruptions to emergency services, and contamination of water supplies, exacerbating public health and safety concerns

Climate Change, Changes in Population Patters, Changes in Land Use and Development

Climate change may significantly increase the risk of failure for tailings dams due to more extreme weather events like intense rainfall, which can overwhelm the dam's capacity, leading to potential breaches and large-scale environmental damage; this is because most existing tailings dams were not designed to handle such drastic changes in precipitation patterns. Failure of a phosphate mining dam could have severe environmental impacts, including large-scale water pollution with high levels of phosphorus, heavy metals like uranium and radium, and other chemicals from the mining waste, leading to harmful algal blooms, fish kills, disruption of aquatic ecosystems, and potential contamination of drinking water sources downstream from the dam breach; further impacts could include land degradation, erosion, and damage to infrastructure in the affected area depending on

the volume and flow of the released waste. Changes in land use and development since the 2020 plan have not created an increase in vulnerability to dam/levee failure.

Historical Occurrences

There have been no mining dam breaches in the 2020 to 2025 LMS Planning Period.

Probability of Future Occurrences

The probability that future dam and levee failures will occur somewhere within the planning area is low (ten years) based on data provided. However, such an occurrence cannot be excluded and could affect unincorporated portions of Hardee County and Bowling Green areas in the future. Depending on the severity of the breach, impacts may be felt into Wauchula and Zolfo Springs.

Harmful Algal Blooms

Description and Background

The National Oceanic and Atmospheric Administration (NOAA) provides the following information on harmful algal blooms. "Harmful algal blooms, or HABs, occur when colonies of algae — simple plants that live in the sea and freshwater — grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals and birds.

Potential Impacts

The human illnesses caused by HABs, though rare, can be debilitating or even fatal. Ranging from microscopic, single-celled organisms to large seaweeds, algae are simple plants that form the base of food webs. Sometimes, however, their roles are more sinister. Under the right conditions, algae may grow out of control — and a few of these "blooms" produce toxins that can kill fish, mammals and birds, and may cause human illness or even death in extreme cases. Other algae are nontoxic, but eat up all of the oxygen in the water as they decay, clog the gills of fish and invertebrates, or smother corals and submerged aquatic vegetation. Still others discolor water, form huge, smelly piles on beaches or contaminate drinking water. Collectively, these events are called harmful algal blooms, or HABs."

Historical Occurrences

According to the Florida Fish and Wildlife Conservation Commission's HAB Monitoring and Past Florida events no incidents of HAB have occurred in Hardee County.
https://myfwc.com/research/redtide/monitoring/historical-events

TABLE III-18:
BLUE-GREEN ALGAE INCIDENTS (2022-2025)

Date	Agency Notice	Location	Description
7/30/2024	FDOH	Wauchula	FDOH issued a press release to caution the public for the presence of blue-green algae in the Peace River in Wauchula at the Pioneer Park Boat Ramp.
7/17/2024	FDOH	Hardee County	FDOH issued a press release to caution the public for the presence of blue-green algae in Lake Hardee off John Gill Road

Source: FL-DOH: https://www.floridahealth.gov/environmental-health/aquatic-toxins/where-are-habs.html

Probability of Future Occurrences

According to NOAA, every U.S. Coastal and Great Lakes state experiences HABs. These blooms are a national concern because they affect not only the health of people and marine ecosystems, but also the "health" of our economy — especially coastal communities dependent on the income of jobs generated through fishing and tourism. Climate change and increasing nutrient pollution have the potential to cause HABs to occur more often and in locations not previously affected.

Hazardous Materials Incidents/Radiological

This section includes hazardous materials, phosphate mining, pipelines, and radiological incidents.

Description and Background

Hazardous Materials (HazMat) are hazardous substances, petroleum, natural gas, synthetic gas, and acutely toxic chemicals. Title III of the Superfund Amendments and Reauthorization Act of 1986 uses the term Extremely Hazardous Substance (EHS) to refer to those chemicals that may cause serious health effects following short-term exposure from accidental releases.

Small Quantity Generator of Hazardous Waste (SQG) are facilities that generate hazardous waste as a product or byproduct of their normal business function. The Central Florida Local Emergency Planning Committee (LEPC) inspects these facilities. According to the Florida Department of Environmental Protection, there are 80 facilities within Hardee County that are actively generating small quantities of hazardous waste. Classic examples of SQGs include:

- Auto Paint & Body Shops (paints and solvents, anti-freeze);
- Doctor/Dentist offices that use wet read x-rays versus digital (photographic silver);
- Auto mechanic shops (oils, solvents, anti-freeze); and
- Pesticide applicators (plastic containers).

Sites termed as 302 sites are facilities that use/consume EHS in the normal process of business. Generally, there will be large amounts of these substances stored on site and used as needed. An EHS is a substance that has the potential to kill or cause serious health issues to a person. According

to the Florida Division of Emergency Management Tier II filing web application, EPlan, on average, Hardee County has 14 EHS facilities within its boundaries. Some of the classic examples of EHS include:

- Chemicals for citrus groves (paraquat dichloride, temmic);
- Large battery back-up systems for telephone communications (sulfuric acid & lead);
- Manual blood pressure cuffs (mercury);
- Refrigerants (anhydrous ammonia); and
- Chlorine – vs – Sodium Hypochlorite (used for water purification).

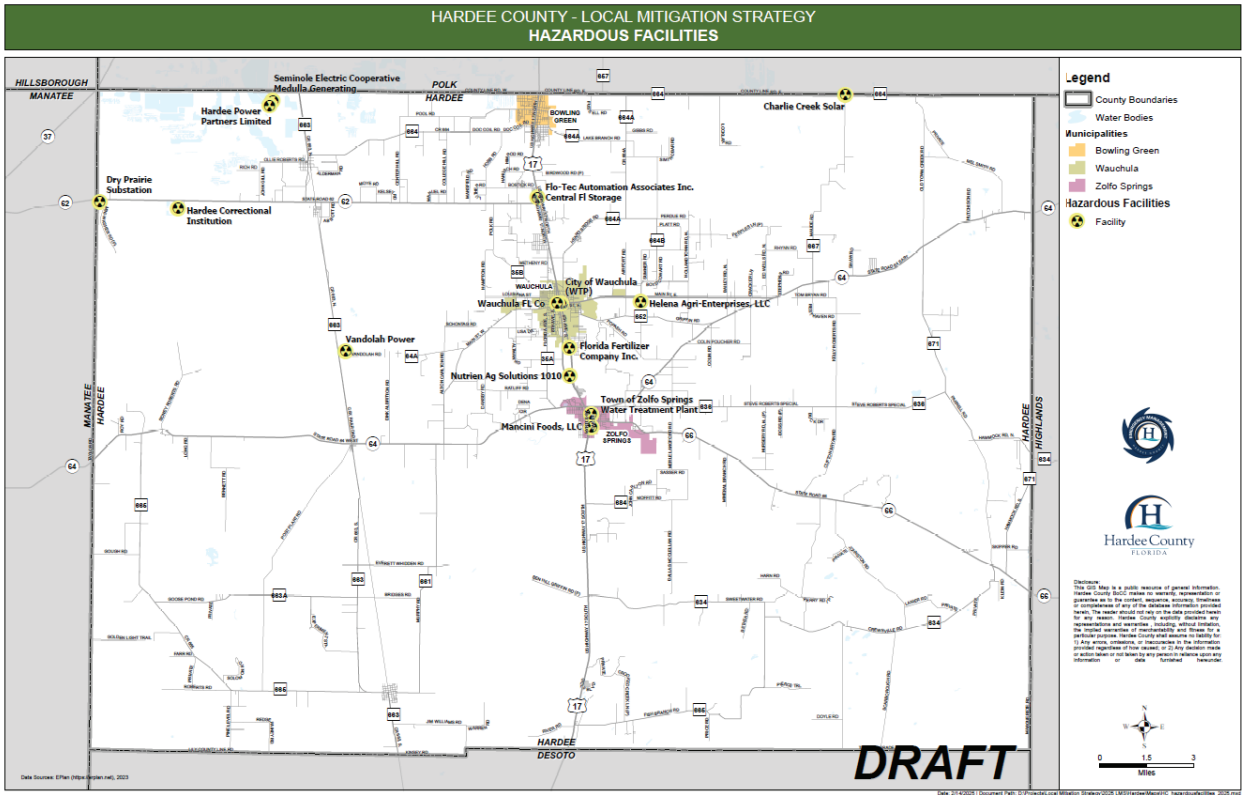


Figure III.16: Hazardous Facilities Locations

Hazardous material incidents can occur during production, storage, transportation, use, or disposal. Communities are at risk when companies or individuals use chemicals unsafely or release harmful amounts into the environment. Hardee County and jurisdictions participate in the Central Florida Local Emergency Planning Committee (LEPC) whose responsibilities include collecting information about hazardous materials in the community, making this information available to the public upon request, and developing an emergency plan to prepare for and respond to chemical emergencies in the community. The LEPC's emergency plan identifies means in which to notify the public, and actions the public must take in the event of a release.

According to the National Pipeline Mapping System, there are 60.76 miles of gas transmission pipelines and 0 miles of hazardous liquid pipelines in Hardee County. Figure III.46 illustrates the location of the pipelines.

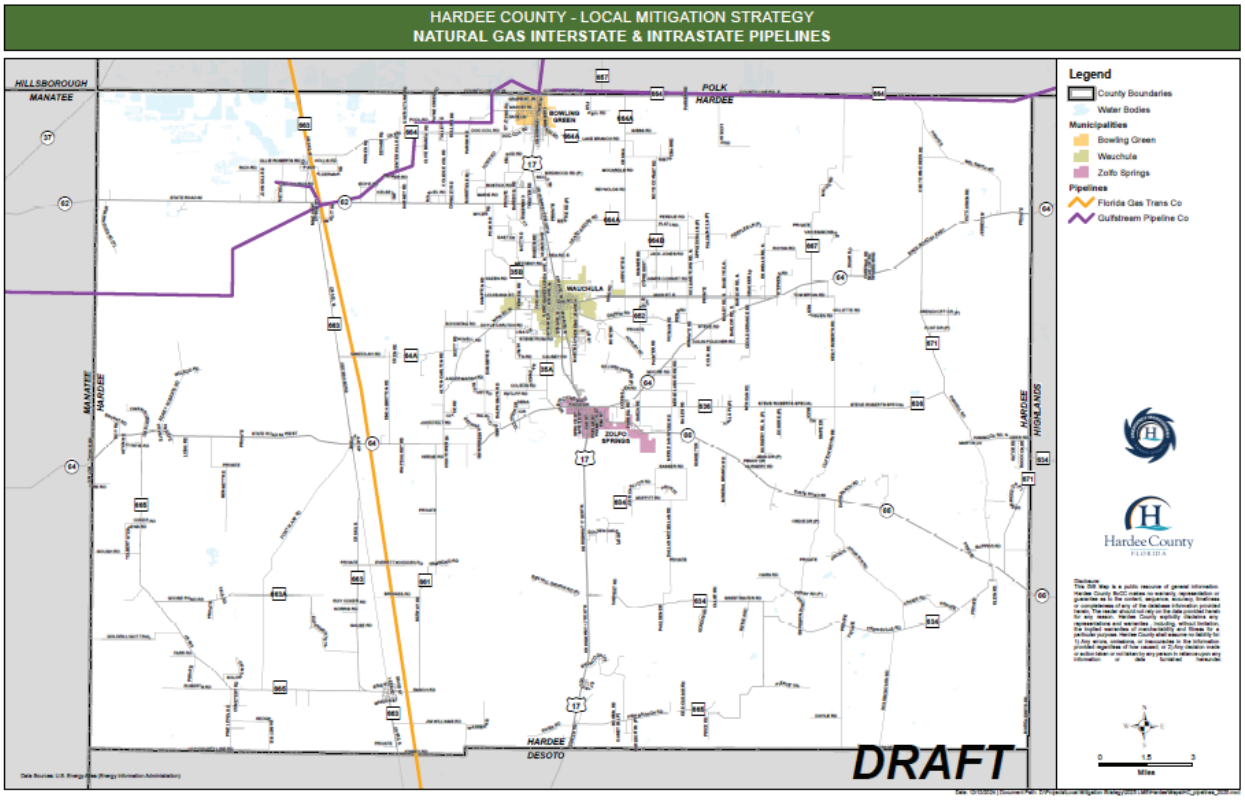


Figure III.17: Pipeline Locations

Historical Occurrences

According to the Florida Division of Emergency Management, Hardee County had 26 reported hazardous material incidents from 2020 to Jan 2025.

19 of the 26 incidents were related to transportation, while the other seven ranged from tank failures, equipment failures, propane release, and flood damage from Hurricane Ian. Two traffic accidents related to one injury a piece, while one of those traffic accidents related in one fatality.

June 9, 2020	Caller advises that all lanes of State Road 64 are closed in Avon Park due to a vehicle accident. There are no injuries or fatalities. Approximately 50 gallons of diesel fuel and oil have released and no storm drains or waterways were impacted. Hardee County SO and FR are on-scene. This occurred near the Highlands/Hardee border and Hardee County is handling the crash and resulting release.
June 28, 2020	Caller reports the release of approximately 84 gallons of diesel fuel due to a broken valve on a fuel truck in Bowling Green. The release did not enter any storm drains or bodies of water. The release has been contained and clean up actions are underway.

August 24, 2020	Caller reports a hydraulic oil release of 100 gallons from a vehicle south of Zolfo Springs due to unknown reasons. Caller states the release has been sitting in the drainage ditch next to US 17 for almost 3 weeks. Caller requests a callback from DEP OER.
November 12, 2020	Hardee County EM reports a petroleum release in Wauchula. An unknown amount of an unknown oil was released onto the roadway. No storm drains or waterways were impacted. Hardee County FR is on-scene.
December 2, 2020	Hardee County EM advised of the potential release of up to 100 gallons of diesel fuel from 2 semi-trucks involved in a collision near Zolfo Springs. Caller stated that both trucks are on the shoulder of SR-66 and may be leaking from their saddle tanks. Reporting party requests a call from DEP OER.
January 22, 2021	Mosaic reports a diesel release of approximately 30 gallons from a vehicle in Bowling Green due to operator error. The release was contained onsite with no waterways impacted. A contractor was hired to conduct clean-up.
February 22, 2021	Hardee County EM reports a diesel release due to an overturned semi-truck in Zolfo Springs. The semi-truck holds approximately 75 gallons of diesel, and it is unknown how much it has been released at this time. No storm drains or waterways were reported as impacted. No injuries were reported. Hardee County EM is enroute. Hardee County EM advises that all lanes of SR 64 are closed at the address. Approximately 10 gallons of diesel have been released, and the spill has been contained.
July 7, 2021	Hardee County EM reports a diesel release of approximately 205 gallons in Wauchula. The release occurred from an underground pipe at a fleet maintenance facility. No storm drains or waterways have been impacted. The release is contained on site, and ACT is planning cleanup actions.
September 17, 2021	8,000 to 10,000 gallons of petroleum-based oil (Citrusilm) released to the property in Wauchula due to a tank failure. The release was discovered this morning when employees arrived for work. The release is to the parking lot and soil on the property. No offsite impact reported. Clean-up will be conducted by ACT out of Bartow. Per Helena Agri-Enterprises, this is a Soy OIL base used to bond other chemicals together for spraying for spray applicator. CS 9/21/21

February 15, 2022	Hardee County reports a petroleum release of an unknown amount as a result of a traffic crash in Wauchula. An unknown amount of fuel has been released onto the ground, no waterways or storm drains have been impacted. Chief #2 can be reached to provide further information.
March 2, 2022	All lanes of SR-66 are closed, just west of Oak Hill Ranches Road southeast of Zolfo Springs, due to a multi-vehicle traffic crash. One tractor-trailer has overturned. No injuries or fatalities reported. Small diesel spill reported (5 to 6 gallons) from the overturned tractor-trailer. A larger spill is possible during the recovery process with the vehicle.
April 12, 2022	Hardee County Dispatch reports a propane release in Wauchula due to a contractor error. Caller states that a contractor struck a 2-inch pike releasing an unknown amount of propane. There are no injuries, fatalities, or evacuations at this time. Hardee County FR and Wauchula PD are on-scene. The gas company has been notified, and no state assistance is requested.
April 19, 2022	Hardee County SO reports a road closure of CR-663, approximately 2 miles south of Ona, due to a vehicle crash involving a semi. As a result of the crash, the semi is blocking the railroad crossing on CR-663. No injuries were reported. Approximately 50 gallons of diesel were released. It is unknown if any storm drains or waterways were impacted. Hardee County FR and SO are on-scene. CSX Railroad has been notified.
July 10, 2022	Hardee County SO reports a potential propane release in Zolfo Springs. No injuries or evacuations are reported. Hardee County FR is on scene and Suburban Propane is enroute
July 19, 2022	All lanes of SR-70 are closed in Desoto due to a vehicle accident. An unknown amount of diesel has entered an unnamed swamp. No injuries or fatalities are reported. DeSoto SO and FR are on scene. Per John Yanc via email; "OER (John Yanc) (Johnny Seay) responded to scene and found a MVA involving 2 tractor trailers which one was on its side in a wetland complex approx. 25 feet from and canal, OER contacted ACT for a crew to come on scene for cleanup, after the tractor and trailer was removed from wetland OER deployed approx. 100â€™ of boom in impacted area to stabilize site, approx. 100+ gallons of diesel and an unknown amount of oil was discharged. ACT will be on scene 7/20/2022 in the morning to start the remediation

	process. No further OER assistance is needed at this time and OER is departing."
August 24, 2022	Mosaic reported a hydraulic fluid release of approximately 50 gallons from a excavator near Bowling Green due to equipment failure. No storm drains or waterways were impacted. Clean-up was completed.
October 7, 2022	City of Wauchula called to advise of the release of up to 200 gallons of mixed oil. This mix of oil consisted of but was not limited to various motor oils and hydraulic fluids. Caller stated that following Hurricane Ian the machine shop flooded carrying away many containers as well as knocking over tanks. Clean up actions have been taken by the responsible party.
February 16, 2023	Approximately 575 gallons of liquid fertilizer were released due to a loose hose on a semi-truck in Zolfo Springs. No clean-up actions were reported at this time. ACT is being notified.
February 23, 2023	Hardee County EM advises that one eastbound lane of SR-62 is closed at North County Road 663 near Bowling Green due to a vehicle accident. One transport injury was reported. Approximately 25 gallons of diesel were released as a report. No storm drains or waterways impacted. The towing company has completed clean up actions.
March 1, 2023	OER (John Yanc) contacted RP and confirmed a commercial vehicle hit debris on the roadway and punctured a saddle tank, approx. 50 gallons of diesel was released at the time of the incident which impacted impervious and soil, it is unknown at this time how much diesel impacted the soil. ERTS has dispatched AOTC to remediate the site. OER will continue to follow up with AOTC. No further OER assistance is needed at this time. Per follow up from ERTS 20 gallons of Diesel Fuel were released. CS 6/29/23
March 7, 2023	A release of 2 gallons of Chevron Biodegradable Clarity Oil due to equipment failure in Ona. The release impacted Horse Creek. No storm drains were impacted. Clean-up actions are in progress.
April 11, 2023	All lanes of SR-66 are closed at Grass Valley Ranch due to an overturned tractor-trailer. No injuries reported. Up to 240 gallons of diesel and motor oil spilled. No waterways affected. No clean-up actions reported Hardee County SO and FR are on scene.

April 21, 2023	Per Heidi Hoffman with DEP OER (Heidi.Hoffman@FloridaDEP.gov): OER (H. Hoffman) contacted the Reporting Party, who confirmed that 50 gallons of diesel released from the 80-gallon saddle tank of a jack-knifed semi at the intersection of US-17 and College Lane, per the responding Hardee County FR engine. The impacts affected the grass median on US-17 and no clean-up actions have been taken. FR has already left the scene and HCSO was still onsite waiting for the tow company. HCSO was able to provide the Responsible Party information (Nero Transport) and OER contacted the company owner and informed him of remediation requirements. He has been provided with a list of remediation contractors and OER will follow up to ensure the site is remediated appropriately. No impacts to waterways or storm drains have occurred. No OER response is required at this time.
April 25, 2023	Hardee County SO advises that all lanes of CR 663 are closed at SR 62 near Bowling Green due to a vehicle crash. One unconfirmed fatality and one injury of an unknown severity were reported. There are no fuel spills or fires at this time. Hardee County SO and FR are on scene. Per FHP via call: The westbound lane is still closed while the eastbound lane is being used to alternate traffic. Update 2 - 04/25/2023-13:19 / DEM-Perkins Per Hardee County SO via call: The roadway is still closed. Update 1 - 04/25/2023-08:21 / DEM-Perkins Per Hardee County EM via call: There is a release of 25 gallons of diesel. No storm drains or waterways impacted. Axis has been hired for clean-up.
September 15, 2023	Hardee County SO reported a fuel release of approximately 15-20 gallons of either diesel or gasoline from a secondary tank on a vehicle near Zolfo Springs due to a traffic crash. No injuries or road closures were reported. No storm drains or waterways were reported as impacted. Hardee County FR, SO, and FHP are on-scene.
November 26, 2024	Seminole Electric is reporting a 25-gallon petroleum release from a crane due to ongoing maintenance in Bowling Green. No storm drains or waterways were impacted. Cleanup actions are underway. Per Justin Gostnell with Seminole Electric: Final total is a 20-gallon spill. All cleanup actions have been completed.

Potential Impacts

There may be significant potential impacts to people and property caused by a major hazardous materials release.

Probability of Future Occurrences

Hardee County programs help reduce the amount of hazardous materials and future hazmat occurrences and are listed below.

1) Through the Small Quantity Generator Program, the County provides businesses with information about methods of hazardous waste recycling and disposal. The State mandates Hardee County to monitor all businesses on the handling of hazardous waste.

2) FDOH-Hardee accepts used sharps collection containers from the public. Once these containers are received, they are disposed of with the bio-medical waste generated from our clinic and seven school clinics. The Fire Department also collects sharps containers from the public.

3) The County hosts a Household Hazardous Waste collection four times per year.

The probability of future occurrences for hazardous materials events is medium. There is a low probability of future occurrences relating to pipeline incidents. Public education regarding pipelines such as “Call before you dig” is important to overall public safety. Many local governments in the County disseminate information about pipelines.

Human Health Incidents

Description and Background

As stated in the 2023 Enhanced State Hazard Mitigation Plan, human health can be threatened by biological hazards which turn into biological incidents. There are several examples throughout this profile that cause biological incidents. A biological incident can refer to many different types of incidents, involving bacteria, viruses, or toxins, all of which can be harmful or deadly to humans and animals. These various bacteria, viruses and toxins are referred to as biological agents.

An epidemic is a sudden, widespread occurrence of an undesirable phenomenon. Epidemics frequently refer to infectious diseases, but also include agricultural diseases and exotic pests, and social activities such as drug use.

- Infectious Disease
  Infectious diseases are illnesses caused by the presence and activity of one or more pathogenic agents including viruses, bacteria, fungi, protozoa, multicellular parasites, and abnormal proteins called prions. Transmittal occurs through a variety of means including direct or indirect contact; ingestion (in water or food); transmission of body fluids; inhalation of airborne particles and droplets; transmission by vectors such as mosquitoes, fleas, and ticks; and others.

- Social Activities
  Social activities, such as drug use, can reach epidemic proportions. Prescription narcotic abuse has been a problem in Hardee County.

The spread of infectious disease depends on pre-existing levels of the disease, ecological changes resulting from disaster, population displacement, changes in population density, disruption of public utilities, interruption of basic public health services, and compromises to sanitation and hygiene. The risk that epidemics of infectious disease will occur is proportional to the population density and displacement. A true epidemic can occur in susceptible populations in the presence or impending introduction of a disease agent compounded by the presence of a mechanism that facilitates large-scale transmission.

Historical Occurrences

According to the Florida Department of Health there have been zero rabies alerts issued for the entire County since 2020.
https://www.floridahealth.gov/diseases-and-conditions/rabies/rabies-surveillance.html

April 2020, the Florida Department of Health announced the first positive case of COVID-19 in Hardee County. During the peak COVID-19 outbreak, Hardee County had approximately 4,000 cases in 2021. An approximate total of 10,300 COVID-19 cases were reported in Hardee County of which 45 deaths were reported, according to USA Facts.org. The County, municipalities, and Hardee County Public Schools implemented social distancing measures including closing schools and businesses, holding virtual public meetings, and implementing safer-at-home policies when possible.

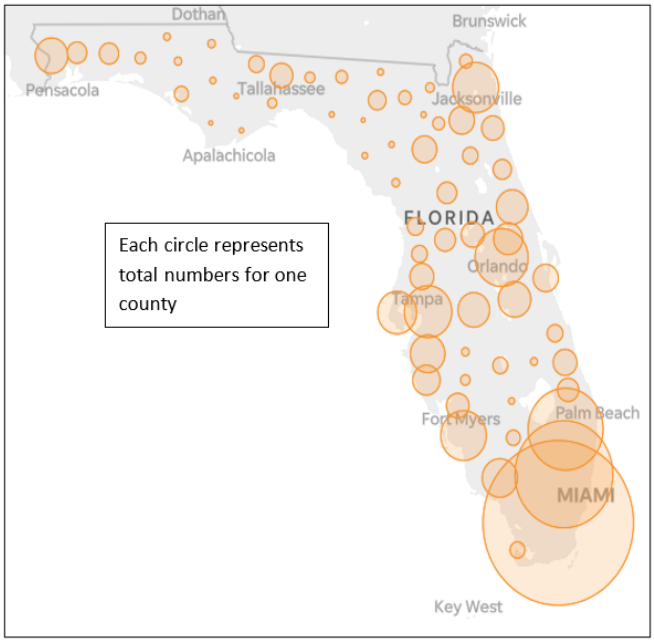


Figure III.18: Corona virus cases in Florida April 27, 2020; Source: The Ledger – Johns Hopkins University; local and state health agencies; USA TODAY research

According to the Florida Department of Law Enforcement's Drugs Identified in Deceased Persons by Florida Medical Examiners 2017 annual report, prescription drugs (benzodiazepines, carisoprodol/meprobamate, zolpidem, and all opioids, excluding heroin and fentanyl analogs), continued to be found more often than illicit drugs, both as the cause of death and present at death.

Not including ethyl alcohol, prescription drugs account for 58 percent of all drug occurrences in this report. People produce fentanyl illicitly, and currently many fentanyl occurrences represent the ingestion of illicit fentanyl rather than pharmaceutically manufactured fentanyl.

Potential Impacts

Epidemics have an overwhelming impact on a population both directly and indirectly. The economic costs encompass hospitalizations, insurance premiums, outpatient visits, and even death. Social epidemics such as drug use impact social, economic, and political aspects of the community.

Probability of Future Occurrences

According to the University of Florida Institute of Food and Agricultural Sciences extension, some emerging infectious diseases (EIDs) such as AIDS, antibiotic resistant bacteria, tuberculosis, and others are already a threat to Florida and the United States. Others, such as dengue and dengue hemorrhagic fever, pose a credible threat to certain areas of the continental United States such as Florida and Texas, and there have been outbreaks in Hawaii and Puerto Rico. Another group of EIDs may present a hazard to travelers visiting or working in foreign locations where these diseases are endemic. The use of disease organisms such as *Bacillus anthracis* (anthrax), *Francisella tularemia* (tularemia), smallpox and ebola viruses, and others in bioterrorist attacks is now a threat in many countries including the United States.

The probability of future occurrences is even across Hardee County.

Transportation Incidents

Description and Background

The movement of people and materials throughout the County has increased. Accompanying this movement is the increased risk of disaster incidents involving rail, bridges, vehicles, pedestrians, and bicyclists.

Historical Occurrences

The Table below indicates injuries and fatalities associated with vehicle accidents from 2020 to 2024.

TABLE III-20:
2018 FATALITIES AND INJURIES ASSOCIATED WITH VEHICLE ACCIDENTS

Performance Measure	5 Year Total	Average Annual Value
Fatalities	48	9.6
Serious Injuries	109	21.8
Non-motorized Fatalities and Serious Injuries	16	3.2

Performance Measure	5 Year Total	Average Annual Value
Rate of Fatalities per 100 Million Vehicle Mile Traveled (VMT)	NA	0.084
Rate of Serious Injuries per 100 Million VMT	NA	0.19

Source: Signal 4 analytics (Oct 2020-Oct 2024); FDOT

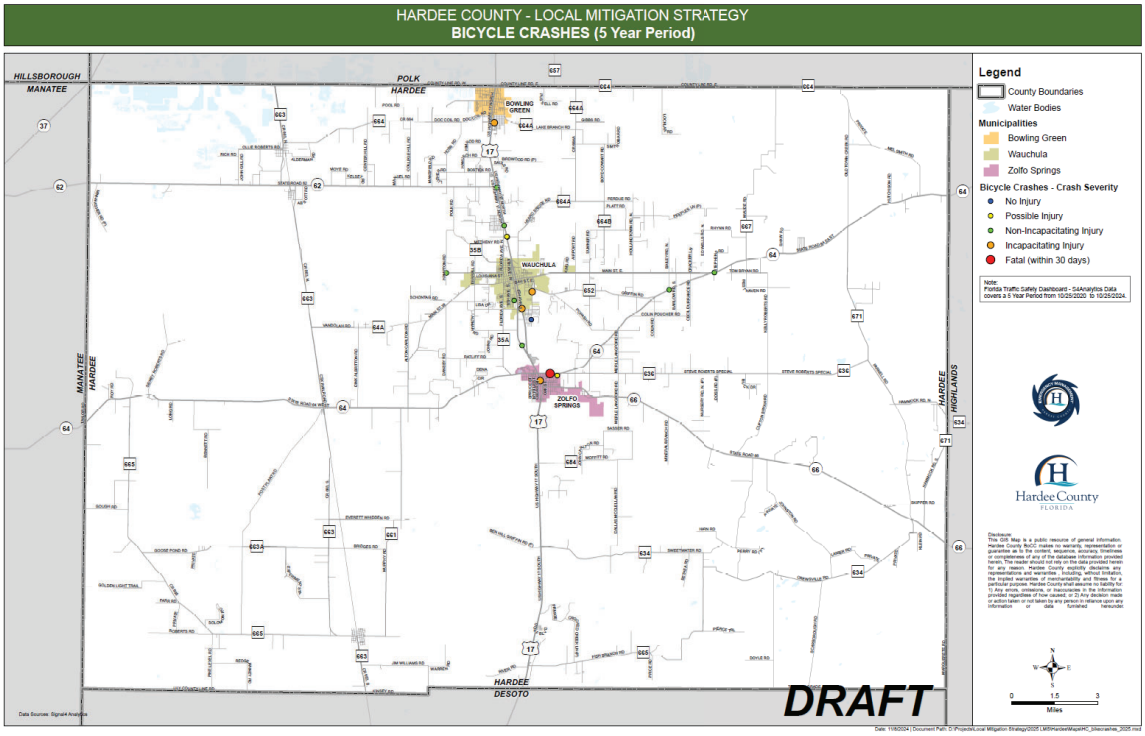


Figure III.19: Bicycle Crashes (5-Year Period); Source: HRTPO

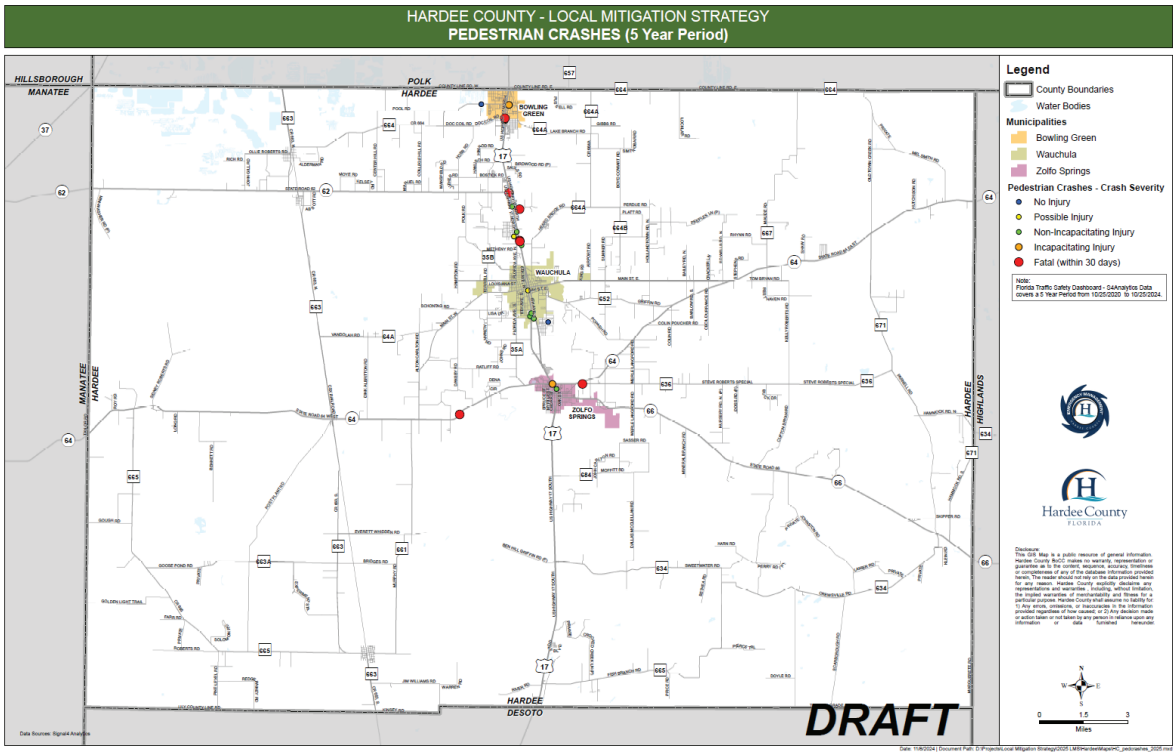


Figure III.20: Pedestrian Crashes (5-Year Period); Source: HRTPO

Potential Impacts

Pedestrian and bicycle accidents may result in serious injury or death. These accidents may cause officials to close roads for periods of time, which may cause a loss of time and/or income for people who utilize the road network. The extent of damages the County may suffer from train accidents depends on the type of train (passenger or freight) and/or its load (i.e. hazardous materials).

Probability of Future Occurrences

The probability of a potential transportation incident is high in the County, Bowling Green, Wauchula, and Zolfo Springs.