

3. Risk Assessment

Update Information

For the purposes of the 2010 LMS update, no new hazards have been identified. The probability of each hazard occurring has been verified from trustworthy sources including the National Weather Service, United States Geological Survey, and the Florida Division of Forestry. Not every hazard was looked at in depth as some hazards have a minute chance of occurring. These hazards that are not analyzed in depth are tsunamis, earthquakes, coastal and riverine erosion, and dam/levee failure.

The previous occurrences for each hazard were updated if possible. If a recorded event occurred within the past five years, it was noted in this LMS update. However, if an event was not noted, that does not indicate a decreased probability of occurrence, simply that the county has managed a streak of inactivity for that hazard.

The vulnerability and impact of each jurisdiction were updated as required if the numbers or information had become outdated since the previous LMS.

The potential dollar loss of vulnerable structures was calculated using a combination of Polk County Property Appraiser data and MEMPHIS data. MEMPHIS (Mapping for Emergency Management, Parallel Hazard Information System) is a web based system that provides information regarding hazard related data.

MEMPHIS provides an estimate of dollar loss per jurisdiction per hazard, though this data is outdated. For this LMS update, the percent loss for hurricane and flood hazards were applied to current Polk County Property Appraiser data and used to come up with a more accurate estimate of dollar losses for those hazards.

For hazards that are not hurricanes or floods, MEMPHIS places sections of each jurisdiction in a zone of probability of that hazard occurring, showing the number of buildings and equivalent dollar value that is exposed. That methodology was applied to current Property Appraiser values to determine the dollar amounts that fall within a probability zone and hence have that given chance of being exposed to the hazard. The tables containing the information for potential dollar losses and exposures for each hazard can be found in Appendix C.

Natural Hazard Analysis

The following natural hazards have been identified by FEMA Region IV, for analysis and possible inclusion in the Polk Local Mitigation Strategy.

Coastal and Riverine Erosion – Polk County is an inland county and therefore not directly subject to coastal erosion hazards. Polk County contains 554 freshwater lakes that occupy approximately 135 square miles, while the Hillsborough, Kissimmee, Palatka, Peace, Alafia, and Withlacoochee rivers wind their way throughout the county. Erosion is not a hazard, and an assessment will be excluded.

Dam/Levee Failure – There are no dams or levees in or near Polk County that can fail and create a flood hazard. An assessment is excluded.

Drought/Heat Wave – A drought is a period of abnormally dry weather which persists long enough to produce serious hydrologic imbalance such as crop damage, water shortage, etc. The severity of the drought depends on the degree of moisture deficiency, the duration and the size of the affected area.

There are 4 ways to define drought:

Meteorological – means a measure of the departure of precipitation from normal. Due to climatic differences, what is considered a drought in one location may not be a drought in another location.

Agricultural – refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.

Hydrological – occurs when surface and subsurface water supplies are below normal.

Socioeconomic – refers to what occurs when physical water shortage begins to affect people.

Earthquakes – The U.S. Geological Survey, National Seismic Mapping Project (website), locates Polk County in the 1%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 our residents and visitors. Therefore, an earthquake assessment will be excluded.

Floods – Floods are the most common and widespread of all natural disaster, except fire. A flood, as defined by the National Flood Insurance Program website is 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.

Hurricanes and Coastal Storms – A hurricane is a severe tropical storm that forms in the southern Atlantic Ocean, Caribbean Sea, or the Gulf of Mexico. Hurricanes develop in warm, tropical waters, where moisture is plentiful, and winds are light. A hurricane can produce violent

winds, incredible waves, torrential rains and floods. Other coastal storms produce similar, yet lesser effects.

Landslides/Sinkholes – According to the USGSA website, Polk County has less than 1.5% susceptibility for a landslide incident. However, sinkholes are a common, naturally occurring geologic phenomenon and one of the predominant landforms in Florida. Many of the lakes in Florida were formed by sinkholes. Sinkholes are depressions or holes in the land surface that occur throughout west central Florida. They can be shallow or deep, small or large, but all are a result of the underlying limestone dissolving. Hydrologic conditions including lack of rainfall, lowered water levels, or conversely, excessive rainfall in a short period of time, can all contribute to sinkhole development. Sinkholes can be classified as geologic hazards, sometimes causing extensive damage to structures and roads, resulting costly repairs. Sinkholes can also threaten water supplies by draining unfiltered water from streams, lakes and wetlands, directly into the aquifer.

Sever Storm/Tornadoes – Tornadoes are one of nature’s most violent storms. A tornado is a rapidly rotating column of air extending from a thunderstorm to the ground. Tornadoes come in all shapes and sizes, and can occur anywhere in the United States, at any time of the year. In southern states, peak tornado season is March through May.

Tsunamis – According to FEMA 386-2 CD, Florida has a relatively low tsunami risk and The Florida Division of Emergency Management does not require local plans to address tsunamis as a hazard. An assessment will be excluded.

Floods can be slow or fast rising, but generally develop over a period of days.

Wildfires – the National Interagency Fire Center website rates Florida in the low fire damage class. However, as a mostly rural county, much of Polk County remains in the high to moderate probability category for wildfires.

Wildfires can erupt at any time of the year from a variety of causes, including arson, lightning, and debris burning. Florida’s wildfire season normally runs from December to June, with the largest/greatest number of acres burned peaking in May.

In April and May, Florida usually has a dry spell. This is because the frontal passages from the north and west are no longer moving through the state and the summer thunderstorm activity has not yet started.

Winter Storms/Freezes – According to the Department of Agriculture and Consumer Services (DOACS), a moderate freeze may be expected every 1-2 years. Severe freezes may be expected on an average of once every 15 to 20 years. Temperatures in the 20s can last for as long as 6 – 8 hours from December – March causing hard freezes. Freezes pose a major hazard to the agriculture industry in Polk County on a recurring basis, and are a significant threat to the economic vitality of the State’s vital agriculture industry.

Hurricanes and Coastal Storms

Location – Simply being in Florida makes Polk County vulnerable to the affects of hurricanes and tropical storms. However, the geographical location protects residents from storm surges associated with hurricanes, but not the severe winds and flood potential.

Extent - Hurricanes are categorized by the Saffir-Simpson hurricane scale:

Table 3-1 Saffir-Simpson Hurricane Scale

Category	Wind Speed	Storm Surge	Damage
1	74 – 95 mph	4 – 5 feet	Minor
2	96 – 110 mph	6 – 8 feet	Moderate
3	111 – 130 mph	9 – 12 feet	Major
4	131 – 155 mph	13 – 18 feet	Extensive
5	156 mph >	18 feet >	Catastrophic

Previous Occurrences –The most prominent occurrences of hurricane and coastal storms occurred in 2004 when Polk County was directly impacted by two hurricanes, while indirectly affected by two others. Hurricane Charley made landfall on August 13th, Frances on September 4th, Ivan on September 16th, and hurricane Jeanne on September 26th. Total damages in Polk County are still being determined. The population of Polk County at the time was around 510,458 residents. Outside of the 2004 season, hurricanes Erin (1995), Irene (1999), Wilma (2005), and Ernesto (2006), along with Tropical Storms Jerry (1995), Mitch (1998), and Fay (2008) have impacted the county within the last 15 years (Source: Polk County Emergency Operations Center, NOAA). See Appendix B.

Probability of Future Events – According to NOAA’s website, Central Florida has a 50% probability of being struck by a named storm. Recent history indicates that residents can expect a storm to affect Polk County every 2-3 years, and the most likely event will be a Category 3 or lesser storm. The probability of being affected by a storm is low to moderate.

Vulnerability– Polk County has a high vulnerability to the effects of a hurricane. Since 46% of the county is located within a floodplain, there is high potential for damages and loss from heavy rains associated with hurricanes.

All areas and jurisdictions of the county are equally at risk from high winds, and with almost half the county in a floodplain, all jurisdictions are also equally at risk for localized flooding caused by the heavy rains of a hurricane weather pattern.

Impact – A hurricane or coastal storm would have a high impact on the county. Due to the high winds and heavy rains associated with a hurricane many residents will be unable to return to their homes. Over 45,000 residents will need to be accounted for in the event of an evacuation. Many mobile/manufactured homes will be destroyed and repairs to other homes that are uninhabitable may take weeks/months to complete. Some may choose to never return to their homes as was the case following Hurricane Andrew. The economic impact will vary greatly. Many small businesses will close forever while others will prosper. Home repair, carpet and appliance businesses will experience short-term increases in business. Other businesses, particularly those associated with tourism or real estate sales, will suffer.

Potential Dollar Losses to Structures – The risk assessment data for wind-related damage in Polk County are based on data developed for the MEMPHIS, which was developed by the FDEM. Wind-related damage in either a 100-year or 50 year event could cause light damage to structures in Polk County. A 25-year event could lightly damage one-third of the structures in Polk County, and a 10-year event should cause no damage. The tables in Appendix C indicate the value of buildings exposed during a given event in each jurisdiction, the percent loss, and the estimate amount lost.

Floods

Location– Fresh water flooding has the highest potential along the five rivers and around the 554 lakes that dot the county. Floods regularly affect few homes and roads every few years.

Extent – The extent of a flood is generally measured in water levels and amount of damage done. Polk County is highly subject to river flooding due to heavy rains. They are categorized using the following:

100-year flood (1% chance per year)

50-year flood (2% chance per year)

25-year flood (4% chance per year)

10-year flood (10% chance per year)

These categories indicate a probability of occurrence (a 100-year flood has a 1% chance of occurrence in one year). The smaller percent chance of occurrence the more devastating the flood is.

Previous Occurrences – In the past 50 years, several minor flooding events have occurred causing almost \$3 million in damages. The most significant event occurred on September 15, 1994. Two synoptic-scale systems, one tropical and one non-tropical brought heavy rain to most of peninsular Florida the last half of September. Rivers and streams, particularly in the west central counties of Citrus, Polk, Hillsborough, Sarasota, Hardee, Desoto and Manatee Counties, overflowed, flooding roadways and inundating or isolating residential areas. Other sections of Florida, particularly the northeast and east central, experienced urban flooding which closed roads and flooded schools and homes in Duval County and flooded subdivisions in Flagler, Volusia, St. Johns and Brevard counties as well as in Wakulla County in northwest Florida. In southern interior Florida, flooding of swampy areas around Lake Okeechobee damaged some roadways in Hendry County and isolated houses in Glades and western Palm Beach Counties. Damages totaled \$500,000. (Source: National Weather Service website)

Probability of Future Events – Heavy rains and fresh water flooding occur in cycles that many now attribute to the “El Nino”. There is a long history of flooding in Polk County and most of central Florida. This trend is expected to continue. There is a moderate probability of heavy flooding occurring. See Appendix B.

Vulnerability – For the relatively few people who live along the banks of the various rivers and the numerous lakes, or other low-lying areas, vulnerability is higher than normal and the impact potentially great. However, for the County as a whole, vulnerability is moderate.

Table 3-2 Polk County Flood Vulnerability

Area of the County	Level of Risk
Unincorporated Areas of the County	Moderate
City of Auburndale	Low
City of Bartow	Low
City of Davenport	Low
City of Dundee	Low
City of Eagle Lake	Low - Moderate
City of Fort Meade	Low
City of Frostproof	Low
City of Haines City	Low
Village of Highland Park	Low
Town of Hillcrest Heights	Low
City of Lakeland	Low - Moderate
Town of Lake Alfred	Low - Moderate
Town of Lake Hamilton	Low - Moderate
City of Lake Wales	Low - Moderate
City of Mulberry	Low
Town of Polk City	Low
City of Winter Haven	Low

Impact – To the victims of a flood, the impacts are moderate to high. Most cannot return to/live in their homes until repairs and clean-up are completed. Even with flood insurance, the cost to the homeowner can be in the thousands. Conversely, floods are often profitable for some businesses, such as those specializing in flooring, appliances and furniture.

Potential Dollar Losses to Structures – These dollar loss figures do not include the long term lost revenue from impacted businesses. The tables in Appendix C indicate the value of buildings exposed during a given event in each jurisdiction, the percent loss, and the estimate amount lost.

Sinkholes

Location – The entire county has potential for the formation of a sinkhole. Maps show that sinkholes tend to develop near areas of high population.

Extent – There are three types of sinkholes that can affect Polk County.

Table 3-3 Polk County Sinkhole Types and Locations

Sinkhole Type	Characteristics	Polk County Location
Solution Sinkholes	<ul style="list-style-type: none"> • Bowl shaped • Shallow, broad • Gradual development 	North
Cover-Collapse Sinkholes	<ul style="list-style-type: none"> • Abrupt collapse development • Vertical or overhanging walls • Circular shape • Varying sizes and depths 	Central, Southwest
Cover-Subsidence Sinkholes	<ul style="list-style-type: none"> • Shallow depth • Small diameter • Gradual development 	Southeast

Previous Occurrences – The most recent occurrence reported by the United States Geological Survey (USGS) of a sinkhole occurring in Polk County was June 15, 2006 in the city of Mulberry that damaged a house and concrete boat landing. The USGS has recorded 17 other occurrences between 2000 and 2002. Other sinkholes occur but are not reported to the USGS. Red Cross responded to a sinkhole in the City of Lake Wales on October 26, 2008.

Probability of Future Events – There is a likelihood that sinkholes will continue to occur. Periods of drought and heavy rain have created suitable conditions for the formation of sinkholes. There is a low to moderate probability of a future occurrence. See Appendix B

Vulnerability– The entire county and all jurisdictions have a low to moderate vulnerability level. The amount of people adversely affected by a sinkhole is small, but there is still an increased likelihood of occurrence.

Impact –Sinkholes have a moderate impact on Polk County. If sinkholes were to occur in Polk County, their impact could range from minor damage to a home or road, to an entire city block. The impact could potentially increase significantly if municipalities were affected. Many of the homes vulnerable to sinkholes are owned by retirees. With the average annual income per capita in the \$25,000 to \$30,000 range, most residents do not have sufficient insurance and are unable to pay for major repairs. Sinkholes could affect the economy in several ways:

- Reduced real estate sales and profits
- Provided a boom in business for sinkhole stabilization companies
- Created new businesses that by homes at bargain prices for repair and resale/rent

Potential Dollar Losses to Structures – According to LRE, a local ground service company that repairs dozens of homes for insurance companies in central Florida each year, the average cost to stabilize a home due to sinkhole damage is \$50,000 and repairs average \$2,500. Most homes are insured, however, uninsured losses may become more frequent as affordable insurance becomes less available.

Every part of the county and each jurisdiction have the possibility of being affected by a sinkhole. The tables in Appendix C show the dollar amounts for each building type that is within a zone of low, medium, high, very high, extreme, or adjacent (adjacent being next to a zone, but not within one). The dollar values indicate the total amount that is exposed, but a dollar estimate is impossible to project because of the localization of the sinkhole hazard.

Wildfires

Location – Being a predominately rural county, most of the area, with the exception of several municipalities, is vulnerable to the affects of wildfires. Based on mapping by the Florida Division of Forestry, the entire unincorporated area of the county is at low to moderate risk due to dense underbrush and the high number of wooded areas.

Extent – The extent of wildfires is categorized by the fuel source which the fire draws from. They are divided into 9 levels depending on the potential and intensity of a fire. Level 1 indicates lower probability and lower intensity, while level 9 indicates higher probability with greater intensity.

Previous Occurrences –In 2001 a large wildfire burned over 11,000 acres of mainly grass, scrub trees and shrubs along and north of the Interstate 4 corridor over mainly rural portions of northern Polk County. A ten mile stretch of Interstate 4 was closed between Polk City and Lakeland due to the wildfire for nearly ten days. The variable smoke plume produced by the wildfire occasionally reduced visibility to between one half and two miles as far west as St. Petersburg in Pinellas County. Also, ash from the smoke plume was deposited as far southwest as Ft. Myers in Lee county of Southwest Florida. From 2005-2009, the Florida Division of Forestry has reported 5 large fires, burning a combined 10,750 acres.

Probability of Future Events – Controlled/prescribed burns are an effort to control outbreaks of wildfires by burning the underbrush, which would contribute significantly to fueling flames. Because of these regularly scheduled burns, the likelihood of a major wildfire is normally low to medium. During periods of drought the probability increases from moderate to high. See Appendix B.

Vulnerability– Because much of the County is undeveloped green space vulnerability is moderate to high. If a major wildfire were to occur, the biggest impact would be the loss of the green space itself. Most populated areas can be protected at the cost of the forest. Each jurisdiction is at risk of a wildfire as indicated in the following table.

Table 3-4 Polk County Wildfire Vulnerability

Area of the County	Level of Risk
Unincorporated Areas of the County	Low - Moderate
City of Auburndale	Moderate – High
City of Bartow	Low – Moderate
City of Davenport	Moderate – High
City of Dundee	Low – Moderate
City of Eagle Lake	Low – Moderate
City of Fort Meade	Low – Moderate
City of Frostproof	Low – Moderate
City of Haines City	Moderate – High
Village of Highland Park	Moderate – High
Town of Hillcrest Heights	Moderate – High
City of Lakeland	Low – Moderate
City of Lake Alfred	Low – Moderate
Town of Lake Hamilton	Low – Moderate
City of Lake Wales	Low – Moderate
City of Mulberry	Low – Moderate
City of Polk City	Moderate – High
City of Winter Haven	Low - Moderate

Impact – The impact of wildfires are moderate to high. Wildfires impact residents and businesses by threatening physical structures. However, smoke can also have widespread impacts cause evacuations of areas of heavy smoke. This has personal as well as economic loss, depending on what area is affected. Uncontrolled wildfires can cause severe economic impact to the agricultural industry depending on their location.

Potential Dollar Losses to Structures – With over 40,000 residential and commercial structures in the moderate to high rated areas of the county, the potential dollar losses could exceed \$2 billion. However, according to US Forestry statistics, the average major fire burns approximately 210 acres or a little over ¾ of a square mile, so the expected damage costs would be significantly less.

The tables in Appendix C list the dollar amounts that are exposed to certain levels of wildfire hazard for each jurisdiction. Exposure does not dictate a specific damage estimate because it is impossible to determine the amount of damage that a wildfire will cause. The tables demonstrate the total values of a certain type of structure that are susceptible to that level of wildfire. If a table does not contain all levels 1 through 9, this indicates that the Florida Division of Forestry does not report that level of hazard as a risk for that jurisdiction.

Severe Storms and Tornadoes

Location – Severe storms and tornadoes affect the entire county.

Extent - Tornadoes are categorized by the Fujita scale:

Table 3-5 Fujita Tornado Scale

Category	Damage	Wind Speed
F0	Minor	< 72 mph
F1	Moderate	73 – 112 mph
F2	Significant	113-157 mph
F3	Sever	158 – 206 mph
F4	Devastating	207 – 260 mph
F5	Incredible	261 > mph

Previous Occurrences – Since 1951, 150 tornadoes (F0 – F4) and 265 severe storms have been documented in Polk County by the National Weather Service (website). The most severe (an F4 Tornado) occurred in 1958 and again 1966. Many of these storms produced lightning strikes that caused significant damage. Total damages over just the last 10 years are over \$1.7 billion in property, and \$175 million in crop damage.

The most recent major occurrence was an F1 tornado on April 23, 2005 and an F0 tornado in April 15, 2007 which both caused \$250,000 worth of damage. There have been other occurrences in the past 5 years, all of F0 strength, but with minimal damage reported. There were 3 other occurrences in 2005 (September 30, August 12, October, 23), 3 occurrences in 2006 (June 12, June 24, and September 15), and 1 other occurrence in 2007 (February 2).

Probability of Future Events – Severe storms are a common occurrence in Florida and there is a high probability that it will continue in the future.

Vulnerability – Polk County has high vulnerability to severe storms and tornadoes. Severe storms are common and most infrastructure is built to withstand the effects of such storms. Tornadoes have greater affects but in a smaller area, so the vulnerability is also moderate.

All jurisdictions within the county are at equal risk of being affected by a severe storm or tornado

Impact - The impacts are generally moderate to high and can range from short-term power outages to major damage to structures. In the past 10 years there has been only 1 death, but 44 injuries in Polk County attributed to severe weather events. If a worst-case event were to occur, such as an F3 tornado, 2 deaths and 30 injuries (State average for an F3 event) could be expected. Individual/localized damages have caused a major impact to families and neighborhoods, particularly mobile home parks. Because events are frequent, several businesses have started to specialize in making fast repairs to storm damages.

Potential Dollar Losses to Structures – Based on records of previous occurrences in Polk County, each event averages just over \$100,000 and the most costly event was \$9.4 Million. A worst-case future occurrence of an F3 tornado impacting the most densely developed part of the county could affect 207,161 homes. A worst case scenario event, involving major damage to a quarter of the homes, (average county home value is \$83,300) would create over a \$4 billion

event. To put these estimates in perspective, Florida has experienced 37 F3 tornadoes in the past 50 years. Damages have averaged \$6.7 million and the costliest event was \$50 million.

The tables in Appendix C show the dollar value of structures exposed to tornadoes within a given probability zone for that jurisdiction. Historically, some jurisdictions have experienced more severe weather and tornadoes, which gives them a greater probability of occurrence.

Damage estimates are not provided for thunderstorms because the entire county and all jurisdictions are at equal probability of experiencing a thunderstorm, and in such an event, 100% of buildings are exposed.

Drought/Heat Wave

Location – The entire County can be affected by a hydrological drought. The extent of damage is normally minimal. In 2001 the State’s citrus crop was 6% less than normal because of a two-year drought. Lawns and landscape that can only be watered in compliance with regional watering restrictions are also affected by drought.

Extent – There are two standard methods for measuring drought.

The Palmer Drought Severity Index (PDSI) measures precipitation, air temperature, and soil moisture. It produces a value ranking an area from -6.0 (extreme drought) to +6.0 (extreme wet conditions).

The Ketch-Byram Drought Index (KBDDI) estimates the dryness of soil and duff layers, and increases for each day without rain. The values produced range from 0 (no moisture deficit) to 800 (high moisture deficit). This index is primarily used to indicate favorable conditions for wild fires.

Previous 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 damages. However, no drought or heat wave events have been reported in Polk County since January 1, 1950.

Probability of Future Events – There is a moderate chance that cycles of reduced rains will continue to cause hydrological droughts in the future.

Vulnerability – Vulnerability to drought/heat wave is low to moderate. If water levels drop to a point where water restrictions are expanded to include agriculture, vulnerability increases.

All jurisdictions within the county are at a low risk of a drought or heat wave hazard.

Impact – To date there have been no recorded human or significant economic impacts from droughts in Polk County, therefore the impact is low to moderate. However, being an agricultural county, a major long-term hydrological drought that causes the loss of an entire year’s crops could cause more than \$284 million in damages and millions more to lawns and landscaping. A more likely event would result in a 5-10% reduction in crop yield and only \$14.2 to \$28.4 million in losses. In addition, a drought could also impact the county’s \$35,554,000 annual livestock industry.

Potential Dollar Losses to Structures – None

Winter Storms/Freezes

Location – The entire county can be affected by freezes. However, except for the municipalities, the extent of damage is greatest in the rest of the county where farms/groves are located. Since 1999, 20 freezes or events of extreme wind chill have caused over \$38.9 million in damages to crops in Polk County. (Source: National Weather Service website)

Extent – There are no specific categories of intensity for hard freezes or winter storms. Winter storms and freezes are measured in wind chill and Fahrenheit degrees, specifically when it drops below freezing (32°).

Previous Occurrences – Since 1999 the Polk County area has experienced 20 freezes or events of extreme wind chill. The latest event occurred on January 1, 2003 when arctic high pressure settled over the southeastern United States which maintained the clear and cold weather across the Florida peninsula. Overnight lows of 19 to 24 occurred from Bronson to Brooksville with temperatures in the 30s farther south. Northeast winds of 10 to 15 mph produced wind chills down to 25 degrees from Tampa to Lakeland to Fort Myers. Citrus crops fared well during the freeze but strawberries took an estimated \$4.5 million dollar loss and tropical fish an estimated \$4 million dollar loss. (NCDC Website)

Probability of Future Events – There is a moderate probability that multiple freezes will occur each year. Several are likely to be hard freezes that could damage crops.

Vulnerability– There is a low to moderate vulnerability to winter storms/freezes for Polk County. The citrus industry is the most vulnerable to freezes. Currently Polk County consists of 3,114 farms totaling 626,634 acres that produce an average of \$284,787,000 in crops each year. (Dept. of Agriculture website)

Table 3-6 Polk County Wildfire Vulnerability

Area of the County	Level of Risk
Unincorporated Areas of the County	Low – Moderate
City of Auburndale	Low - Moderate
City of Bartow	Moderate
City of Davenport	Low – Moderate
City of Dundee	Moderate
City of Eagle Lake	Low – Moderate
City of Fort Meade	Moderate
City of Frostproof	Moderate
City of Haines City	Low – Moderate
Village of Highland Park	Low – Moderate
Town of Hillcrest Heights	Moderate
City of Lakeland	Moderate
Town of Lake Alfred	Low – Moderate
Town of Lake Hamilton	Moderate
City of Lake Wales	Low – Moderate
City of Mulberry	Moderate
Town of Polk City	Low - Moderate
City of Winter Haven	Moderate

Impact – For growers the impact can vary from low to moderate. A major freeze that causes the loss of an entire year’s crops could cause more than \$284 million in damages. It is highly unlikely that this worst-case scenario could occur. In recent years citrus has been affected very little by freezes. New hybrids and growing techniques have limited the impact of freezes significantly. A more likely event would impact 5-10% of crop production and cause only \$14.2 to \$28.4 million in losses.

Potential Dollar Losses to Structures – None

Conclusions/Recommendations

The following table represents a summary of the natural hazards that affect Polk County. The table lists the hazards from greatest threat to least threat. Probability, impact, and vulnerability are discussed in the hazard profiles. Injury/Death indicates the likelihood of human losses for each hazard. Economic loss is the amount of damage done to the economic infrastructure by the hazard. Environmental loss indicates the adverse effects the hazard has on the environment. Service Disruption shows how badly basic services and utilities could be affected by the hazard.

Table 3-7 Polk County Vulnerability Summary Table

	Probability	Impact	Vulnerability	Injury/Death	Economic Loss	Environmental Loss	Service Disruption
Hurricanes and Coastal Storms	low-med	high	high	med-high	med-high	med-high	med
Severe Storms and Tornadoes	high	med-high	high	med-high	low-med	low-med	med
Wildfires	med-high	med-high	high	low-med	low-med	med-high	low
Flooding	med	med-high	med	low	med	med	med
Winter Storms/Freezes	med	low-med	low-med	low	med-high	high	low
Sinkholes	low-med	med	med	low	low-med	med	low
Drought/Heat Wave	med	low-med	low-med	low	low-med	med	low

Hurricanes and Coastal Storms pose the greatest threat to Polk County. The probability, vulnerability, impact and potential losses total the highest of all natural hazards assessed.

Because many mitigation programs, policies and projects are available to reduce future losses, this hazard should receive the most emphasis.

Severe Storms and Tornadoes are a way of life in Central Florida. There are few cost effective ways to mitigate the effects of a 150-200 mph tornado, and even fewer ways for governments to assist.

The threat of **Wildfires** may be moderate, but their future impact could be significant and cause the loss of a major natural resource. Mitigation measures are possible and affordable.

Flooding is one of the most likely natural hazards to cause damage to Polk County. Floods are frequent occurrences and there are several mitigation programs, policies and projects available to reduce future losses.

Winter Storms/Freezes have little impact on Polk County, except for the potential minor economic impact to citrus crops. Like drought/heat wave, there is little that can be done to reduce future effects.

The major threat of **Sinkholes** is the human and economic impact. Although there are currently few mitigation measures that government can undertake, future sinkhole mitigation should be given consideration by the LMS workgroup.

The major impact of **Drought/Heat Wave** is to our water supply. Water restrictions and other conservation measures have been implemented and/or encouraged in recent years, but few other mitigation measures are available. The LMS workgroup may want to include support of water conservation efforts in the updated strategy.

Repetitive Loss Properties

Repetitive Loss Properties are properties in which two or more flood insurance claims of at least \$1,000 have been filed with the National Flood Insurance Program (NFIP) over a 10-year period since 1978. These areas are identified by Section-Township-Range.

Polk County contains 33 properties considered to be repetitive loss properties. Of these 33 properties, 30 properties are single family residential properties. The non-residential properties are commercial and manufacturing properties.

Each of these properties has filed at least two claims due to flooding, with some filing up to six. This alludes to the increased vulnerability of these properties. Each property is located within a floodplain, though to differing levels. Specific location within the floodplain contributes to the vulnerability, as well as construction and drainage issues which cause greater chance of flooding.

Special Needs Populations

Polk County has a number of residents who are categorized as “special needs.” These are primarily people who require constant medical attention and are unable to survive without help in the event of a natural disaster. Anyone who falls under the category of “special needs” must fill out a registration form with the County, containing their vital information and what needs they require.

The number of registered special needs residents changes monthly, but averages around 4000 people. There are three shelters in the County which are designated as “Special Needs Shelters” and that are equipped and prepared to handle people with specific medical needs. The three shelters are:

Lakeland Adult Day Care, City of Lakeland
Haines City Adult Day Care, City of Haines City
Polk County Health Department Special Care Unit, City of Bartow

Building Inventory and Land Uses

Table 3-8 gives an extensive list of land uses and building types for each jurisdiction. This information helps to present an idea of what type of land uses are being employed within each jurisdiction and what the major economic engines are.

Table 3-8 Existing Building Inventory and Land Uses

	Auburndale	Bartow	Davenport	Dundee	Eagle Lake	Fort Meade	Frostproof	Haines City	Highland Park
Residential									
SF	4227	4994	1366	1168	755	1548	968	3178	69
Mobile Home	229	341	449	109	3	11	112	173	0
MF	218	219	30	25	9	42	43	176	27
Other	1720	1018	853	802	301	410	254	595	26
Commercial									
Shopping Centers	215	172	24	57	25	58	62	32	0
Supermarkets	1	1	0	0	0	2	0	1	0
Offices	40	68	4	11	1	10	17	9	0
Professional Services	8	35	0	1	0	5	5	53	0
Restaurants	21	24	0	3	1	9	4	12	1
Banking and Finance	9	9	1	2	1	3	4	3	0
Service Centers	38	35	6	10	9	18	11	7	0
Other	142	231	43	101	32	63	99	110	8
Industrial									
Light	27	39	2	3	2	5	3	6	0
Heavy	1	2	0	1	0	1	0	2	0
Mineral Processing	0	1	0	0	0	0	0	2	0
Other	77	60	11	26	5	28	74	32	0
Institutional									
Churches	75	90	14	21	5	39	17	27	0
Cultural	0	5	0	0	0	1	0	0	0
Other	136	100	38	27	15	15	15	114	4

	Hillcrest Heights	Lake Alfred	Lake Hamilton	Lake Wales	Lakeland	Mulberry	Polk City	Winter Haven	Unincorp. Polk County
Residential									
SF	105	1318	514	3955	23846	707	630	9066	135022
Mobile Home	0	3	0	0	1179	58	185	373	31008
MF	11	74	17	240	3194	24	11	1730	7049
Other	11	715	249	1037	3018	111	478	3647	36703
Commercial									
Shopping Centers	0	70	28	174	812	98	42	550	1171
Supermarkets	0	0	0	1	4	1	1	4	2
Offices	0	9	2	85	406	25	3	198	224
Professional Services	0	3	0	76	328	3	2	105	142
Restaurants	0	6	0	27	127	14	3	52	73
Banking and Finance	0	2	0	11	49	3	1	25	32
Service Centers	0	14	3	44	202	15	2	77	372
Other	0	59	36	619	1133	125	26	657	2151
Industrial									
Light	0	15	4	17	86	45	5	47	480
Heavy	0	0	0	0	2	1	0	1	14
Mineral Processing	0	0	0	1	0	1	0	0	30
Other	0	12	27	61	458	100	3	142	1451
Institutional									
Churches	0	19	8	68	308	28	8	139	513
Cultural	0	0	0	3	10	0	0	4	229
Other	1	29	7	122	586	17	16	390	2232

Source: Polk County Property Appraiser

Critical Facilities Inventory

Table 3-9 contains a count of the number of critical facilities located within each jurisdiction. Critical facilities are chosen by each jurisdiction, but generally include utilities, emergency operations buildings, government facilities, medical centers, roads, and communication sites. This table only gives a general idea of how many critical facilities of a certain category are located within a jurisdiction. Due to the sensitive nature of some of the critical facilities, a comprehensive list is not included in this plan. To obtain a comprehensive copy of the critical facilities list, please contact Polk County Emergency Management at:

Polk County Emergency Management
1295 Brice Boulevard
Bartow, FL 33820
863-534-5600

Table 3-9 Number of Critical Facilities by Jurisdiction

	Totals	Auburndale	Bartow	Davenport	Dundee	Eagle Lake
Public Service Facilities						
Government Facilities	94	3	36	1	1	1
County Administration	9	0	7	0	0	0
DOH	7	2	2	0	0	0
City Halls	14	1	1	1	1	1
State Buildings	64	0	26	0	0	0
Correctional Facilities	11	0	5	0	0	0
Parks/Rec	103	2	0	0	1	2
Emergency Services						
Emergency Operations Center	4	0	1	0	0	0
Emergency Services	89	3	4	4	1	3
Fire	31	0	0	1	0	1
EMS	22	1	2	1	0	1
Police/Law Enforcement	36	2	2	2	1	1
Schools/Shelters	163	10	17	6	3	3
Transportation						
Airports/Airfields	18	1	1	0	1	0
Evacuation Routes (Miles)*	523.75	17.2	26.3	6.9	5.86	8.3
Utility Services						
Sewer Treatment Facilities	28	1	1	0	0	1
Landfill	1	0	0	0	0	0
Fuel Sites	11	1	2	1	1	0
Healthcare Services						
Hospitals/Medical Facilities	141	2	14	14	1	0
Special Needs Facilities	31	0	1	0	0	0
Communication Sites						
Communication Totals	287	15	26	14	4	3
County Radio Tower	12	0	3	1	1	0
AM Towers	11	1	2	0	0	0
FM Towers	15	1	1	0	0	0
Wireless Antenna	218	12	20	9	3	3
Cellular Antenna	29	1	0	4	0	0
TV Broadcast Stations	2	0	0	0	0	0
Volunteer Services						
Volunteer Totals	5	0	0	0	0	0
Salvation Army	2	0	0	0	0	0
Red Cross Facilities	1	0	0	0	0	0
Other	2	0	0	0	0	0

* A map showing the evacuation routes within Polk County can be found in Appendix B

	Fort Meade	Frostproof	Haines City	Highland Park	Hillcrest Heights	Lake Alfred
Public Service Facilities						
Government Facilities	1	1	3	0	0	1
County Administration	0	0	0	0	0	0
DOH	0	0	1	0	0	0
City Halls	1	1	1	0	0	1
State Buildings	0	0	1	0	0	0
Correctional Facilities	0	1	0	0	0	0
Parks/Rec	3	1	2	0	0	4
Emergency Services						
Emergency Operations Center	0	0	0	0	0	0
Emergency Services	2	1	6	0	0	2
Fire	0	0	2	0	0	0
EMS	1	0	2	0	0	1
Police/Law Enforcement	1	1	2	0	0	1
Schools/Shelters	3	4	9	0	0	7
Transportation						
Airports/Airfields	0	1	1	0	0	0
Evacuation Routes (Miles)*	7.2	7.8	13.6	1	3.2	15.21
Utility Services						
Sewer Treatment Facilities	1	0	1	0	0	0
Landfill	0	0	0	0	0	0
Fuel Sites	1	1	0	0	0	0
Healthcare Services						
Hospitals/Medical Facilities	0	1	4	0	0	1
Special Needs Facilities	0	0	3	0	0	2
Communication Sites						
Communication Totals	15	13	14	0	1	3
County Radio Tower	1	2	0	0	0	0
AM Towers	0	0	1	0	0	0
FM Towers	2	1	2	0	0	0
Wireless Antenna	9	8	11	0	1	3
Cellular Antenna	3	2	0	0	0	0
TV Broadcast Stations	0	0	0	0	0	0
Volunteer Services						
Volunteer Totals	0	0	0	0	0	0
Salvation Army	0	0	0	0	0	0
Red Cross Facilities	0	0	0	0	0	0
Other	0	0	0	0	0	0

* A map showing the evacuation routes within Polk County can be found in Appendix B

	Lake Hamilton	Lake Wales	Lakeland	Mulberry	Polk City	Winter Haven
Public Service Facilities						
Government Facilities	0	6	22	1	1	10
County Administration	0	0	1	0	0	1
DOH	0	1	1	0	0	0
City Halls	0	1	1	1	1	1
State Buildings	0	4	19	0	0	8
Correctional Facilities	0	0	0	0	2	0
Parks/Rec	1	2	16	0	0	17
Emergency Services						
Emergency Operations Center	0	1	1	0	0	1
Emergency Services	2	10	21	3	2	12
Fire	1	6	5	1	1	4
EMS	0	2	5	1	1	2
Police/Law Enforcement	1	2	11	1	0	6
Schools/Shelters	0	10	60	4	2	21
Transportation						
Airports/Airfields	0	2	3	1	2	1
Evacuation Routes (Miles)*	3.9	11.9	83.98	8.3	12	23.03
Utility Services						
Sewer Treatment Facilities	1	1	6	2	1	4
Landfill	0	0	0	0	0	1
Fuel Sites	0	0	2	1	0	0
Healthcare Services						
Hospitals/Medical Facilities	0	11	57	1	0	34
Special Needs Facilities	0	1	16	0	0	8
Communication Sites						
Communication Totals	3	26	66	14	11	24
County Radio Tower	0	1	1	0	1	1
AM Towers	0	2	3	0	0	1
FM Towers	0	0	6	0	0	1
Wireless Antenna	2	19	47	11	8	20
Cellular Antenna	1	4	8	2	2	1
TV Broadcast Stations	0	0	1	1	0	0
Volunteer Services						
Volunteer Totals	0	1	2	0	0	2
Salvation Army	0	0	1	0	0	1
Red Cross Facilities	0	0	0	0	0	1
Other	0	1	1	0	0	0

* A map showing the evacuation routes within Polk County can be found in Appendix B

Future Structures, Land Use, and Development

Growth has traditionally come to Polk from the west, from Tampa through Plant City and into the Lakeland area. Now the eastern portion of the County, primarily along the I-4 Corridor and the north US Highway 27, is benefiting from the Orlando market area. The opening of the Eagle Ridge Mall on U.S. 27 north of Lake Wales further fueled growth in this area. Other new development in the Cypress Gardens Boulevard area of Winter Haven and on Highway 60 east of Lake Wales is spurring additional growth on the east side of the county. In 2003 the County adopted the North Ridge Selected Area Plan to recognize the development pressures on the area south of the I-4/US 27 intersection. That amendment and all the associated implementation tools adopted to date (LDC, transportation variance, CRA, etc.) for that area completed the planning area for the urban node around the I-4/US 27 intersection.

The 2000 Census of Population showed the largest growth areas are northern Polk cities and Lake Wales. This reflects the general areas of development activity and, as a result, those areas have increased demand in the use of public services. Since the 2000 census the growth north of Haines City (northeast Polk - North Ridge, North US 27 and Ronald Reagan Parkway SAPs), north and east of Lakeland, and the area south of Winter Have/north Lake Wales showed the largest urbanization.

Although the County has approved conditional uses for 13 developments with over 4,000 residential lots/units (see Table 3-10) in the Rural Development Area (RDA), only one development (23 lots) has been developed and platted. Approximately 120 lots have been developed in rural subdivisions (5 acre or larger lots) in the last five years. These developments represent less than 1% of the lots created in the County in the period between 2004 and 2007. Almost 11% (2,240) of the lots created in that period are located in the Suburban Development Area (SDA). The development outside the Urban Development and Urban Growth area is infrequent and more isolated.

Table 3-10 Polk County Rural Development

Rural Residential Developments			
Project Name	Units	SF (non-Residential)	Approval Date
Pine Valley North	100		January 2006
Pine Valley South	80		January 2006
Masterpiece Road	101		June 2006
Lake Easy	23		June 2006
Lake Streety	71		2005
Horseshoe Creek	11		September 2006
Tindale Camp Road	114		December 2007
Rural Mixed-Use Development			
Project Name	Units	SF (non-Residential)	Approval Date
Fox Branch Ranch	1043	5 acres	December 2005
Temple Town	503	54,420 sf	January 2006
Walk-in-Water Ranch	2440 (not incl. in total)	35,000 sf	Pending
Mammoth Grove	762	10,000	2006
RFL Cypress Land Holdings	1,086	5 acres	May 2006
RFL Cypress Land Holdings II	472	8.7	December 2007
Mills	476	7.8	March 2008
TOTAL	4,842		

Source: Polk County Growth Management, February 2007

The inclusion of agricultural land in the vacant and developable category does not mean that the County expects all such lands to be developed for urban uses. Many of these areas contain viable agricultural activities and environmentally sensitive habitats such as floodplains, scrub, high recharge areas and sinkholes. Additionally, the County and other agencies likely will acquire additional public lands over time to accommodate the needs for environmental protection, flood protection, potable water supplies, and recreation.

Using the results of the analysis of the percentage of lots in the RDA, SDA and UDA, we can anticipate that development in the UDA will continue to increase while the percentage of development in the RDA and SDA will remain low (1% and 11% respectively). The anticipated number of units in these two development areas should be about, 370,455 units and thus with a capacity population of 926,131 persons.

Table 3-11 from Polk County's Evaluation and Appraisal Report, shows the developable acreage throughout the county. It is divided into separate land use categories, and shows the capacity for growth and residential structures for that land use category. This shows the potential for population growth within the county.

Table 3-11 Developable Acreage by Future Land Use Categories

Future Land Use Categories	Total Acreage	Developable Acreage	Density – Potential Residential units	Intensity (SF)	Population Capacity
Agricultural Residential Rural (A/RR)	486,598	269,543	53,909		134,772
*Agricultural Residential Rural (A/RR) - 1% of total development	486,598	269,543	*4,010		*10,025
Business Park Center (BPC)	12,333	6,076		31,761,143	0
Community Activity Center (CAC)	890	429		5,604,971	0
Convenience Center (CC)	148	75		819,045	0
Commercial Enclave (CE)	607	243		3,179,740	0
CORE	58,161	16,427	821		2,053
Development of Regional Impact (DRI)	21,468	12,006	42,021		105,052
Employment Center (EC)	1,546	1,229	4,916	22,484,647	12,290
High Impact Commercial (HIC)	250	41		719,578	0
Industrial (IND)	6,878	3,548		100,459,793	0
Institutional (INST)	7,750	2,701		29,416,387	0
Linear Commercial CorridorLCC	2,254	933		12,186,203	0
Leisure Recreation (L/R)	5,017	3,186		2,428,424	
Neighborhood Activity Center (NAC)	856	540		5,879,788	0
Office Center (OC)	203	66		866,397	0
Professional Institutional (PI)	283	202	302	6,144,345	756
Phosphate Mining (PM)	172,185	120,407		3,933,694,609	0
Preservation (PRESV)	34,626	1,162		25,315	0
Regional Activity Center (RAC)	1,953	1,441		21,967,817	0
Rural Commercial Cluster Commercial (RCC)	205	86		749,046	0
Rural Commercial Cluster Residential (RCC-R)	1,621	401	801		2,003
Residential High (RH)	1,215	913	13,691		34,228
Residential Low (RL)	63,701	29,437	147,185		367,963
Residential Medium (RM)	12,374	6,972	69,718		174,294
Recreation and Open Space (ROS)	95,667	1,351		588,499	0
Residential Suburban (RS)	58,067	21,432		64,297	160,743
* Residential Suburban (RS) - 1% of total development	*	21,432	45,400 *		113,500*
Town Center (TC)	411	334	3,335	5,085,174	8,339
Tourist Commercial Corridor (TCC)	838	693		18,119,002	0
Developable residential - (minus ARR or non-res)		42,057			
TOTAL			400,996		1,002,491
TOTAL AJUSTED to trend (ARR, RS units/pop)	1,534,705	501,874	332,200	4,202,179,921	830,501

* # of unit expected to be developed in the SDA and RDA reduced to 11% and 1% based on the 2004-2007 trend analysis under section 2.5

Source: 2009 Polk County EAR, Compiled by Polk County Growth Management Division & GIS staff, February 2008.

Each hazard affects buildings and infrastructure in a separate manner. To provide further understanding of the effects of these hazards, a brief discussion is provided for (1) existing buildings, infrastructure, and critical facilities, (2) future buildings, infrastructure, and critical facilities, and (3) land uses and development trends.

Coastal Storms/Hurricanes

Existing Buildings, Infrastructure and Critical Facilities – Over 202,125 homes and businesses would receive moderate to minor damage from a Category 3 hurricane. There are also 723 critical facilities located within the Category 3 storm impact area.

Future Buildings, Infrastructure and Critical Facilities – There are dozens of lots for sale throughout Polk County and building will continue until build-out occurs. With growth comes the need for a larger infrastructure resulting in critical facilities being located in vulnerable areas.

Land Uses and Development Trends – Most future development will occur throughout the county, but predominantly along the east and northern areas of the county. Because of the vulnerability to hurricane force winds, future construction is subject to the State’s stringent building codes, and county zoning requirements regarding flood zones.

Flood

Existing Buildings, Infrastructure and Critical Facilities – There are no critical facilities located in the 100-year Flood Plain and only a few sections of road that are normally affected. Damages are usually minor and repaired quickly.

Future Buildings, Infrastructure and Critical Facilities – All future construction will continue to be above the 100-year flood plain.

Land Uses and Development Trends - Development in the 100-year flood plain is strictly controlled by the County. All new construction must be elevated above the base flood elevation.

Sinkholes

Existing Buildings, Infrastructure and Critical Facilities – Homes, roads, Fire Stations and Libraries could all potentially be affected by sinkholes.

Future Buildings, Infrastructure and Critical Facilities – See the Land Uses and Development Trends section below.

Land Uses and Development Trends – Like most of Florida, Polk County’s population is growing and developments will likely be planned or proposed. The denser the population, the greater the chance for future damages due to sinkholes.

Wildfire

Existing Buildings, Infrastructure and Critical Facilities – Few buildings border heavily wooded areas and even fewer critical facilities.

Future Buildings, Infrastructure and Critical Facilities – See Land Use and Development Trend maps in the Introduction.

Land Uses and Development Trends – Most development is in the eastern and northern areas of Polk County, away from heavily forested acres. Future development is expected to continue this trend. Those communities that are/may be vulnerable to wildfires are encouraged to follow the recommendations of the Firewise USA program.

Severe Storms/Tornadoes

Existing Buildings, Infrastructure and Critical Facilities – Every structure in Polk County could be damaged by a severe storm, tornado or lightning strike.

Future Buildings, Infrastructure and Critical Facilities – All future construction will be completed to comply with more stringent building codes/requirements. Damage to roofs and manufactured homes will be less on average.

Land Uses and Development Trends – Like most of Florida, Polk County's population is growing and many developments are planned or proposed. The denser the population, the greater the chance for future damages.

Drought/Heat Wave

Existing Buildings, Infrastructure and Critical Facilities – No impact

Future Buildings, Infrastructure and Critical Facilities – No impact

Land Uses and Development Trends – The more the growth the greater demand on the water supply. Increased development throughout the county and in the entire region may soon cause hydrological drought to become a hazard of much greater significance.

Winter Storms/Freezes

Existing Buildings, Infrastructure and Critical Facilities – No impact

Future Buildings, Infrastructure and Critical Facilities – No impact

Land Uses and Development Trends – As indicated previously, farm lands and groves are being lost to new areas of development. Most are in 5-acre tracts and are being billed as mini farms/ranchettes.