City of Tallahassee / Leon County
Local Mitigation Strategy

May 2020

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EXECUTIVE SUMMARY

The *Tallahassee-Leon County Local Mitigation Strategy* (LMS) is a plan intended to identify and reduce the community's long-term vulnerability to natural and technological hazards through various forms of mitigation.[1] The Plan is organized into four chapters:

- Chapter 1 describes the role of the LMS Steering Committee and the Working Group in developing the overall mitigation strategy and its component initiatives.
- Chapter 2 is the Hazard Identification and Vulnerability Assessment. This section provides an overview of the types of natural and technological hazards the County is vulnerable to, and a history of these hazards and their effects. Natural hazards identified and assessed by the working group include hurricanes and tropical storms, thunderstorms, tornados, lightning, drought, floods, wildfires, sinkholes, storm surge/tsunami, dam failure, exotic pest infestations, and diseases and pandemics. Technological hazards include hazardous materials storage and transportation, terrorism, aviation incidents, and energy failures/disruptions.
- Chapter 3 describes ongoing and proposed mitigation programs, policies, and projects identified by the Committee and the Working Group. These include program and policy initiatives such as ordinances or updates to existing codes and plans, and capital improvements such as infrastructure upgrades or replacements. Each mitigation initiative identified in this Chapter includes potential funding sources where available.
- Chapter 4 describes the process to monitor, evaluate, and update the plan over the next five years. This section also describes procedures intended to keep the public actively involved in local hazard mitigation planning, and how the LMS will be consistent and incorporated into other local planning mechanisms where appropriate.

Within the LMS, the Steering Committee has developed a series of mitigation initiatives intended to protect the public by addressing those natural and other hazards that may affect various areas and constituencies of Leon County. This plan may also change as current projects are completed, new needs and problems are identified, and local priorities change with development, population shifts and increases. The Steering Committee meets annually to review and update this strategy. These procedures are detailed in Chapter 4, while the LMS Steering Committee bylaws are included in Appendix B.

The Florida Division of Emergency Management requires local mitigation strategy plans be adopted by resolution by local government(s). To fulfill this requirement, the *Tallahassee-Leon County Local Mitigation Strategy* 2020 Update has been adopted by resolution by both the Leon County Board of Commissioners and the Tallahassee City Commission. Adoption of the LMS allows Leon County and the City of Tallahassee to apply for hazard mitigation and disaster recovery funds from state and federal sources, as well as provide a plan for applying these funds.

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1 Hazard mitigation is any program, initiative, or action taken to permanently reduce or eliminate long-term risk to people and their property from the effects of hazards. Hazards can be natural, such as hurricanes and floods, or technological, such as hazardous materials incidents or a large-scale loss of power.

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Chapter 1 – Planning Process

This Chapter covers the planning process that the Local Mitigation Strategy Steering Committee utilized to develop the LMS.

1.1 History of the Tallahassee-Leon County Local Mitigation Strategy

In the summer of 1998, the Florida Department of Community Affairs (DCA) provided funding to all Florida counties and municipalities to assist them in preparing a comprehensive Local Mitigation Strategy (LMS). The original goals of the LMS, which remains valid, was to help local officials identify and assess the various natural and technological disasters the county faced and to identify locally developed strategies to reduce the impact of future disasters.

Utilizing this funding, the City of Tallahassee and Leon County at that time entered into an interlocal agreement to prepare an LMS that would benefit both local governments.

The original LMS stakeholder committee was assembled by the Apalachee Regional Planning Council to create the first edition of the LMS in 1999. All local government departments and divisions with a role in hazard mitigation, disaster response, or public safety were invited to participate. Major employers, including the area hospitals, the universities and schools, were also included, as well as the Tallahassee Builder's Association, the Chamber of Commerce, the Council of Neighborhood Associations (CONA), representing homeowner interests, and the State of Florida's Division of Emergency Management (DEM).

Following an advertised public workshop on September 19, 2000, the first edition of the LMS was adopted by the Leon County Board of County Commissioner at a regular meeting on September 26, 2000, and by the Tallahassee City Commission at a regular meeting on October 11, 2000.

Building upon the 1998 interlocal agreement between the City of Tallahassee and Leon County, at set of bylaws for the Tallahassee-Leon County Local Mitigation Strategy Steering Committee were adopted and ratified by both local governments on November 26, 2002. Steering Committee bylaws were approved at advertised meetings of both commissions. All meetings of the Steering Committee have and continue to be publicly advertised as per State of Florida statutory requirements for local government meetings.

The LMS has been updated every five years consistent with federal requirements in 2005, 2010, 2015, and 2017 with input provided by the Steering Committee, the Apalachee Regional Planning Council, and the Capital Chapter of the American Red Cross, with oversight review by DEM and the Federal Emergency Management Agency (FEMA). All updates were provided to the public at advertised meetings and adopted by resolution by both the Leon County Board of County Commissioners and the Tallahassee City Commission at their regular advertised public meetings.

1.2 Jurisdiction

The *Tallahassee-Leon County Local Mitigation Strategy* is a joint product of the City of Tallahassee and Leon County with input providing by various non-profits, hospitals, universities and colleges, and other public and private stakeholders. The LMS represents a consistent, comprehensive set of goals, initiatives, programs, and capital and other projects intended to reduce risks for the citizens of both the unincorporated areas of Leon County as well as those residing in the City of Tallahassee). This document also serves as the City of Tallahassee's Floodplain Management Plan. Since the initial adoption of the LMS, the Steering Committee has continued to meet on a regular basis and to endorse specific projects for funding through Federal pre- and post-disaster assistance programs. As of 2017, the LMS Committee has submitted requests for approximately $15.4 million dollars in Federal matching funds for local hazard mitigation projects since 2000.

Although the LMS is a planning document for both jurisdictions, data and analyses developed specifically for the participating local governments are provided separately where necessary. Capital projects are also listed independently for these two governments because their budgets and implementing agencies are independent of each other. Other initiatives or policies unique to either local government are also identified where appropriate. Nevertheless, the *Tallahassee-Leon County Local Mitigation Strategy* applies to the entirety of Leon County.

1.3 Purpose and Benefits of Hazard Mitigation

Purpose

Hazard mitigation is any action taken to permanently reduce or eliminate long-term risk to people and their property from the effects of hazards. Some examples of hazard mitigation include land use planning that limits infrastructure in high hazard areas, retrofitting existing structures to meet new building codes and standards, and acquiring existing structures in a high hazard area. Communities can minimize the effects of future hazards through a mix of planning, code enforcement and responsible development.

A *Local Mitigation Strategy* is a community-based plan to make cities and counties safer and more resistant to natural and technological hazards. Every community is exposed to some level of risk from various hazards. Hurricanes, tornados, floods, hazardous material spills, fires, and sinkholes are some of the hazards experienced by many communities in Florida. Hazards cannot always be eliminated, but exposure to these hazards and their potential effects can be reduced through proper planning. The local mitigation strategy does this by accomplishing the following:

1. Identifying hazards to which the county is vulnerable, such as hurricanes, tornados, floods, fires, and hazardous materials releases;
2. Determining where the community is most vulnerable to these hazards;
3. Assessing the facilities and structures that are most vulnerable to hazards;
4. Preparing a prioritized list of mitigation projects to take advantage of available funding;
5. Identifying funding sources for the mitigation projects; and
6. Making hazard awareness and education a community goal.

Benefits

A strategy or plan to mitigate hazards benefits the community by not only reducing risks, but also by conserving valuable economic, natural, and other resources. Businesses in high hazard areas lose valuable revenue when damaged or isolated by storms. The American Red Cross estimates that less than 50 percent of businesses heavily damaged by a disaster will still be in business three to five years after the disaster. Residents who build in high hazard areas are subject to physical evacuations, damage to their homes and personal property, lower home values, and higher insurance premiums.

Because disasters cost local governments money and time, a plan to address hazards can help stretch and save often scarce revenues and the time necessary to rebuild critical facilities and infrastructure. Community infrastructure such as roads, drainage systems, water systems, and wastewater treatment plants built in high hazard areas are subject to frequent damage and costly repairs, and federal post-disaster assistance does not cover all the costs of recovery. A local government is responsible for up to 12.5 percent of local public recovery costs in a federally declared disaster. In smaller events that are not federally declared, the local government is responsible for 100 percent of the local recovery costs. These costs can put a significant strain on the budget of a small local government without significant revenue sources. Keeping critical facilities out of high hazard areas or armoring these and other facilities where necessary can reduce the costs associated with damages to such infrastructure from weather and other hazardous events.

Disruption of the community's infrastructure can also hamper the local economy, impacting the tax base and making recovery more difficult. But the public costs of a disaster are not related to infrastructure alone. Critical facilities such as hospitals, schools, airports, and major government buildings located in high hazard areas are often subject to damaging conditions just when they are needed the most. And of course, the cost to community health, safety and welfare can never be accurately calculated.

The *Tallahassee-Leon County Local Mitigation Strategy* is intended to enable county and municipal officials, the business community and local citizens can help reduce risks and costs by including hazard mitigation as part of everyday planning, rather than limiting it to the measures taken immediately before or after a disaster strikes.

1.4 LMS Steering Committee and Working Group Members

History

The *Tallahassee-Leon County Local Mitigation Strategy* was written by the LMS Committee, a working group created in late 1988 by an interlocal agreement between the City of Tallahassee and Leon County to undertake long-range mitigation planning and implementation of the LMS. C Comprised of selected City and County personnel and representatives from various private, public, and non-profit sector interests, the Committee met numerous times over the next year to identify and evaluate the hazards facing Leon County and the City of Tallahassee. (For a complete list of meeting dates and minutes, please refer to Appendix C.)

The original LMS Committee was eventually divided into two groups for efficiency: (1) the Steering Committee, whose function was to direct the course of the local mitigation strategy development; and

(2) the Working Group, who provided much of the data that went into the Hazard Identification and Vulnerability Assessment, as well as identifying many of the proposed mitigation initiatives. The Committee was created in accordance with the Code of Federal Regulations, Title 44 CFR Part 201, and Section 252.46 Florida Statutes, and it is governed by a set of bylaws adopted by the City of Tallahassee and Leon County. Both the Steering Committee and Working Group are collectively referred to in this document as the LMS Committee. The representative agencies and organizations are listed below.

The interlocal agreement between both participating local governments establishing the Steering Committee designates the LMS Committee The leadership of the Steering Committee Includes several department-level directors to help ensure that hazard mitigation issues and priorities can be addressed more directly at the higher levels of administration within both the City and the County.

Existing Committee

The following table lists all current member organizations of the LMS Committee. The primary roles of Steering Committee members are also defined. This list has been included in all editions of the LMS since its inception in 1999.

Table 1: Steering Committee Members (in order of appearance in bylaws).

Agency / Department	**Primary Role(s)**	**Status**
Leon County Department of Development Services and Environmental Management	Code Compliance; Environmental Review	Voting
Leon County Department of Public Works	Drainage, Flood Control, Roads and Evacuation; Solid Waste Management	Voting
Leon County Emergency Management	Emergency Management	Voting
City of Tallahassee Department of Department of Underground Utilities and Public Infrastructure	Drainage, Flood Control	Voting
City of Tallahassee Fire Department	Fire; Emergency Rescue; HazMat Response	Voting
City of Tallahassee Police Department	Public Safety	Voting
Leon County Sheriff's Office	Public Safety	Voting
Tallahassee-Leon County Planning Department	Mitigation Planning; Comprehensive Planning	Voting
Tallahassee-Leon County Geographic Information Systems	Environmental and Property Data; Mapping	Voting
Capital Area Chapter, American Red Cross	Public Safety; Emergency Response	Voting
Leon County Emergency Medical Services	Emergency Medical Services	Voting
Blueprint Intergovernmental Agency	Planning and Implementation	Voting
Florida Division of Emergency Management	Agency Liaison	Non-voting (ex officio)
Tallahassee Memorial Hospital	Regional Hospital	Non-voting (ex officio)
Capital Regional Medical Center	Regional Hospital	Non-voting (ex officio)
Florida State University	University Liaison	Non-voting (ex officio)
Florida Agricultural and Mechanical University	University Liaison	Non-voting (ex officio)
Tallahassee Community College	Emergency Management Coordinator	Non-voting (ex officio)
Council of Neighborhood Associations	Homeowner Community Liaison	Non-voting (ex officio)
Tallahassee Area Chamber of Commerce	Business Community Liaison	Non-voting (ex officio)
Apalachee Regional Planning Council	Regional Planning	Non-voting (ex officio)
City of Tallahassee Utilities	Agency Liaison	Non-voting (ex officio)
Florida Department of Health in Leon County	Agency Liaison	Non-voting (ex officio)

Officers

2020 LMS Committee Chair:

Brent Pell, Director
Leon County Department of Public Works
2280 Miccosukee Road
Tallahassee, Florida 32308
Email: PellB@leoncountyfl.gov

2020 LMS Committee Vice-chair:

Abena Ojetayo, Director
Department of Sustainability & Community Preservation
435 N Macomb Street
City of Tallahassee, FL 32301
Email: Abena.Ojetayo@talgov.com

Support Staff:

Stephen M. Hodges, AICP
Senior Planner & LMS Coordinator
Tallahassee – Leon County Planning Department
Renaissance Center
435 N. Macomb Street
Tallahassee, Florida 32301Email: stephen.hodges@talgov.com

Under the LMS Committee bylaws, the LMS coordinator is a designated staff of the Tallahassee-Leon County Planning Department, a functionally consolidated department that reports to both the City and County Commissions. The LMS coordinator provides staff support for all Steering Committee and Working Group meetings and communications. The LMS coordinator serves as a clearinghouse for local government activities and is responsible for placing most actions regarding the LMS on the agenda for the appropriate commission. The LMS coordinator is also the primary point of contact with the Division of Emergency Management regarding LMS planning and hazard mitigation grant funding opportunities.

The jurisdiction of this LMS is Leon County and the City of Tallahassee. Stakeholders represented on the LMS Committee and Working Group include all local government departments with emergency response, hazard mitigation, and development responsibilities, as well as other departments providing significant services in these areas. Additional stakeholders include local major hospitals and institutions of higher learning and the local Council of Neighborhood Associations. The Apalachee Regional Planning Council provided assistance and coordination. This list of stakeholders may be widened as deemed necessary by the LMS Committee as they see fit in accordance with the Committee's bylaws.

1.5 Current LMS Update and Adoption Process

The four chapters of the LMS are discussed below.

Chapter One – The Planning Process

This chapter describes the planning process through which the LMS has been updated. Chapter One also describes the current composition of the LMS Steering Committee and Working Group. This section also details how the public is involved in the local hazard mitigation planning process, and the LMS update process.

Chapter Two – Risk Assessment and Vulnerability Analysis

Although the core purpose of the LMS is to address community vulnerabilities and responses to natural hazards, the updated LMS recognizes selected technological and societal hazards. This chapter has been revised to evaluate and update all identified hazards with new data where available, including their general description and location, historical occurrences, estimated impacts, probability, and extent, vulnerability, and risk. Risk and vulnerability analyses generated by new Hazus modeling runs were incorporated into the Vulnerability Analysis sections for selected natural hazards for which such data were available. (Hazus identifies the population and structures at risk for selected hazards using State of Florida Department of Revenue data to estimate potential dollar losses of vulnerable structures.) Hazus modeling runs were conducted with Hazus-MH 2.0 for the 2020 update of the Tallahassee – Leon County Post-Disaster Redevelopment Plan.

Hazards evaluated by the Steering Committee resulting in the following changes:

1. **Hurricanes and Tropical Storms**, **Drought**, **Flooding**, **Wildfires**, **Sinkholes**, and **Diseases and Pandemics** remain as stand-alone hazards. Storm Surges were incorporated into Hurricanes and Tropical Storms, because this hazard is directly associated with these events, and Exotic Pest Infestations was renamed Invasive Plants and Animals for clarity.
2. Hazard profiles for **Thunderstorms**, **Tornados,** and **Lightning** were incorporated into one section called "Severe Storms." These phenomena are usually associated with thunderstorm events which can occur outside of a hurricane or tropical storm.
3. A new natural hazard was added: **Extreme Temperatures**. This hazard reflects anticipated changes in climate over time.
4. A new Technological and Societal Hazards category labeled **Public Infrastructure Failures** was added. **Dam Failure** was moved to this new category, which also includes **Telecommunications**, **Cybersecurity**, and **Electricity, Water, and Sewer**. The intent of this combination is to consider the importance of these services to the functioning of a modern city and its surrounding urban area.
5. The hazard profile for **Aviation Incidents** was combined in a new Technological and Societal Hazard category labeled **"Transportation Incidents**." This incorporates all known hazards associated with the mass transportation of people and/or materials.
6. **Terrorism** remains as an individual Technological and Societal Hazard.

The updated LMS incorporates new Hazus modeling runs, including parcels, values, and population estimates. Additional projects intended to mitigate stormwater impacts and other hazards, as well as hazard mitigation initiatives, were reviewed and updated in the LMS within the hazard profiles in Chapter Two and the list of mitigation initiatives in Chapter Three. These developments over the last decade include the Cascade Park and Franklin Avenue drainage improvements, the Tallahassee – Leon County Public Safety Center, and the new American Red Cross facility adjacent to the Public Safety Center.

Based on direction provided to staff from the Leon County Board of County Commissioners, this edition of the LMS has been updated with information regarding the local homeless population and their vulnerability to certain hazards. These hazards include Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures, and Diseases, Epidemics, and Pandemics.

Chapter Three – Mitigation Strategy

The LMS Steering Committee incorporated changes in local government and other stakeholder priorities since the last plan update as part of the evaluation of the goals and objectives and mitigation initiatives. Initiatives are those specific program and/or projects that are intended to address hazard vulnerabilities though physical or programmatic mitigation. Any changes in local priorities were incorporated as appropriate into the goals and objectives and hazard mitigation initiatives. As initiatives were re-evaluated and re-prioritized, estimated costs of mitigation initiatives were included in a new prioritized list of Hazard Mitigation Initiatives for the 2020 LMS Update.

Specific procedures and plans for addressing local vulnerability to these societal and technological hazards are developed, maintained, and updated by other local agencies and departments. For example, the various City of Tallahassee utility departments (i.e., electric, gas, water, sewer) maintain plans and procedures for dealing with power losses and other utilities interruptions during and following hazardous events. The Leon County Comprehensive Emergency Management Plan (CEMP) addresses the first three months following a hazardous event, and also specifically details mitigation actions and local plans for addressing local vulnerability to these hazards.

Chapter Four – Plan Maintenance

Chapter Four describes the process intended to monitor, evaluate, and update the plan over the next five-year period. The Plan Maintenance section also describes how the public has been and remains actively involved in local hazard mitigation planning.

The LMS was recently updated by the Planning Department with input provided by local government agencies and departments, state and regional agencies, and the public. The update followed a review by the LMS Steering Committee of their bylaws, the current list of Steering Committee members, and the list of mitigation initiatives in the LMS. The specific changes to the LMS include:

- Added a description of Hurricane Michael and its effects on Leon County and the City of Tallahassee
- Revised the list of hazards, risks, and vulnerabilities, including their general description, location, history, vulnerability, and risk
- Updated Hazus results for hurricanes and flooding, including adding a model run for a Category 5 hurricane
- Revised hazard mitigation goals and objectives
- Reviewed the list of mitigation initiatives; and
- Updated the Public Participation section.

Based on direction provided to staff from the Leon County Board of County Commissioners through the Hurricane Hermine After Action Report, the LMS has been updated with information regarding the local homeless population and their vulnerability to certain hazards. These hazards include Hurricanes and Tropical Storms, Severe Storms, and Extreme Temperatures. Staff also invited homeless services providers through the Big Bend Continuum of Care to offer an opportunity through the LMS Steering Committee to submit proposed hazard mitigation projects eligible for HMGP funding.

The updated 2020 LMS was submitted to the Florida Division of Emergency Management in early 2020 for review.

This 2020 Tallahassee – Leon County Local Mitigation Strategy was adopted by resolution by the Leon County Board of County Commissioners on April 28, 2020, and by the Tallahassee City Commission on April 22, 2020. A press release was distributed by both the City and the County as part of the local adoption process. The LMS is available to the public on the Planning Department's website at http://www.talgov.com/place/pln-mitstrat.aspx.

1.6 Incorporation of Supporting Information and Documents

The following section describes information sources consulted by LMS Committee staff to ensure the most current and best available data was included in the 2020 LMS update, and to help the LMS Steering Committee and Planning Subcommittee assess new local mitigation needs.

2017 Tallahassee-Leon County Local Mitigation Strategy Update

The information included in the 2017 LMS update served as the primary data source for the 2020 LMS update process, as well as providing the structure and format for the update.

Tallahassee-Leon County Comprehensive Plan

The Tallahassee-Leon County Comprehensive Plan is the planning document that guides land development, infrastructure, environmental protection, and other aspects of local governance in both the City of Tallahassee and Leon County. Comprehensive Plan policies detail future land use in Tallahassee and Leon County, and other growth management policies address local mitigation. The Comprehensive Plan is updated at least once a year.

Leon County Comprehensive Emergency Management Plan

The Comprehensive Emergency Management Plan is the short-term, post-disaster planning document for Leon County that establishes the chain of command and all related organizational responses immediately following a significant hazard event or other catastrophe. The CEMP follows the National Incident Management System (NIMS) structure and is divided into three (3) sections (Basic, Recovery and Mitigation) and Annexes which include a Terrorism Annex and Maps.

The Basic Plan contains preparedness and response elements including general information about hazards in our community, geography, demographics, concept of operation, responsibilities, financial management, and specific references to standard operating guides, supporting plans, and County and State authority to implement the CEMP.

The Recovery section contains the outline of how the County will recover from an event by: implementing damage assessment processes; opening disaster recovery centers to assist residents; managing debris; keeping citizens informed through community relations; identifying unmet needs; and providing emergency housing of citizens.

The Mitigation section contains the process for identifying mitigation projects, identifying sources of funding for projects, and providing mitigation education. This annex identifies participating agencies of the Local Mitigation Strategy (LMS) Committee, and their responsibilities. It also identifies the Steering Committee and the process it follows. This section is intended to be consistent with the LMS, and to utilize and/or support mitigation initiatives and projects identified in the LMS.

City of Tallahassee/Leon County Local Mitigation Strategy & Community Rating System Annual Progress Reports

These annual progress reports are required by FEMA as part of the City of Tallahassee's participation in the National Flood Insurance Program (NFIP), and to maintain their standing in the associated municipal Community Rating System (CRS). These reports are useful in that they review the initiatives in the LMS on an annual basis and are provided to the public annually.

Tallahassee – Leon County Post-Disaster Redevelopment Plan

The PDRP identifies policies, operational strategies and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of the community after a disaster. The PDRP emphasizes seizing opportunities for hazard mitigation and community improvement consistent with the goals of the Comprehensive Plan and the initiatives of the LMS.

The LMS and the PDRP are intended to be both consistent and complimentary where appropriate. The information developed for the Risk Assessment and Vulnerability Analysis in the PDRP was utilized in the updated LMS where possible.

Tallahassee Resiliency Plan

The Tallahassee Community Resilience Plan is a document intended to address underlying chronic stresses that affect our community, such as job, food, and housing insecurity, as well as acute shocks that include flooding, extreme temperatures, and significant storm events, especially as they intensify with our changing climate. This Plan was developed following Hurricane Hermine (2016) based on community input where residents expressed the need to better prepare for hurricanes and other hazards that present an increasing threat to life, property, and the environment. This document outlines various strategies to develop resiliency which will be developed consistent with the LMS.

1.7 Planning Process

The federal rules that govern the local mitigation strategy process require that the LMS Committee (also known locally as the LMS Steering Committee) meet regularly at least once a year to review the LMS and any proposed changes. The LMS Committee has done so in accordance with these rules, and the minutes from these meetings are included in this document as Appendix C. All Committee members and additional stakeholders are contacted via an email distribution list that is regularly updated by the LMS Coordinator. The Public Information Officers for both jurisdictions (Leon County and the City of Tallahassee) are also on this email distribution list. All of these meetings are open to the public.

The formal planning process to review and update the existing Tallahassee-Leon County Local Mitigation Strategy began in late 2013 at a publicly advertised meeting of the Steering Committee. Since that initial meeting, local officials and staff and other community members and organizations have met several times as a subcommittee to share information and coordinate the update processes for policies and information included in the 2015 update. All regular LMS Committee meetings are publicly noticed in conformance with existing Florida Statutes and rules as well as local government policies and rules. For a complete listing of regular LMS Committee meetings since the adoption of the 2020 LMS update and meeting minutes, please refer to Appendix C.

LMS Planning Process and Schedule (2015-2020)

October 2018

The LMS Committee approved the 2020 LMS update process at their regular meeting on October 18, 2018. At that meeting, the LMS Committee members discussed the LMS update process and the new FEMA requirements. Planning Department staff sought authorization from the Committee to create an LMS Update Subcommittee composed of interested stakeholders to provide hazard mitigation data and other information for the 2015 update process. The Subcommittee was composed of staff from the organizations comprising the membership of the Steering Committee, as well as other local institutions and agencies and the public. All LMS Committee meetings are publicly noticed, including added to the Planning Department's calendar of meetings and other events, and open to the public.

2019

The Update Subcommittee met on June 25 and November 14, 2019. At the June meeting, the Subcommittee reviewed elements of the existing LMS, including hazards, new flood major mitigation

and emergency management initiatives and projects, and the hazard rating system. The Subcommittee at the November meeting discussed the goals and objectives in the LMS.

During this year, Planning Department and Tallahassee Leon County Geographic Information Systems (TLCGIS) staff collected supporting documents, researched new occurrences of hazards, analyzed vulnerability, and gathered other relevant data as part of the update process. Staff reviewed the previous LMS update, reviewed new requirements, and noted data deficiencies. As a part of this phase, staff began drafting the 2020 LMS update.

Fall/Winter 2019

Elements of the 2020 LMS update were presented to the LMS Committee at their annual meeting on December 3, 2020. The Committee authorized staff to submit a draft to the Division of Emergency Management to begin the review process.

Spring 2020

The adopted 2017 LMS is posted on the City of Tallahassee's Hazard Mitigation website at https:// www.talgov.com/place/pln-mitstrat.aspx. The public meeting to present the 2020 update was also advertised on this webpage.

A draft copy of the 2020 update was submitted to the Florida Division of Emergency Management for review in early 2020 A draft copy of this plan was added to the City of Tallahassee's Hazard Mitigation website at https://www.talgov.com/place/pln-mitstrat.aspx on March 13, 2020.

The advertised Leon County and City of Tallahassee commission meetings for adoption by resolution of the 2020 LMS update were held respectively on April 28, 2020 and April 22, 2020.

1.8 Opportunity for Public Involvement

The City of Tallahassee and Leon County both recognize the necessity of public participation in the LMS update process. All LMS Committee meetings are advertised and open to the public and promoted in various media by the Public Information Officers for both jurisdictions. All of these meetings are posted to the Planning Department's web-based community meeting calendar. The agendas for these meetings are including in this document as Appendix C.

To encourage public participation and increase community knowledge regarding the current LMS update and related planning processes, a draft copy of the 2020 LMS update was also added to the Hazard Mitigation Planning webpage. This was intended to give the community a reasonable period of time to review the draft document. If community members are unable to attend any LMS public or other meetings, citizens can provide TLCPD staff with questions, concerns or comments via an e-mail link on the webpage or by telephone through the number listed on the webpage.

Finally, the County and City commission meetings adopting the 2020 update advertised were publicly noticed, and citizens had a minimum of 30 days to review and comment on the draft LMS before the City and County Commissions adopted the 2020 update to the LMS. Citizens were also provided an opportunity to speak during these public meetings.

Despite these efforts to solicit community input, there were no public comments formally received as part of this process. This was also true of the 2015 and 2017 updates of the LMS. Soliciting effective public input is a continuing issue not only with emergency management, but other planning documents in other jurisdictions in this age of social media, media saturation, competing priorities, and other distractions. Governments at all levels have been experimenting with new forms of communication to educate citizens and to foster public feedback. These include both traditional and new forms of communication, including social media.

At this time, the 2020 LMS update, including maps and appendices, is available on the City of Tallahassee's Hazard Mitigation website at https://www.talgov.com/place/pln-mitstrat.aspx as well as the latest CRS annual progress report and a description of the LMS update process. Contact information for the Tallahassee-Leon County Planning Department (TLCPD), as well as a link for citizens to report general comments and feedback through e-mail, is also provided on this webpage.

If any public comments are received as part of the LMS process over the next five years, they will be considered by Planning staff and the Steering Committee and Working Group. These comments may include considering new projects to mitigate hazards, new initiatives and/or their relative priority, increased public education, or even requests to consider new hazards. These comments may also provide an opportunity to educate the public in the limits of what can be accomplished with hazard mitigation grant funds, and the need to provide matching funds or other combinations of resources.

As part of this process, Planning staff will work with the Steering Committee and Working Group members to reach out to the public as part of their responsibilities. Planning staff will also conduct a public meeting in mid- to late-2020 to provide an opportunity to educate the public and solicit feedback on this update. Any comments received by the public will be considered as previously described.

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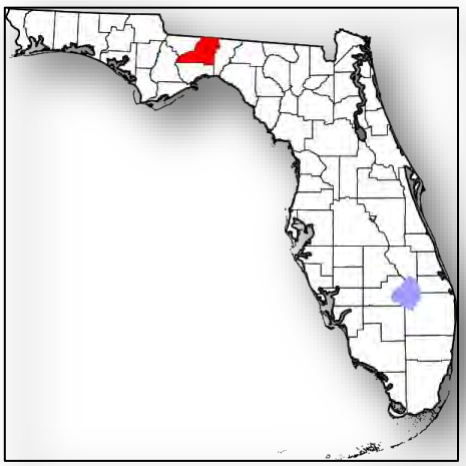
Chapter 2 – Risk Assessment and Vulnerability Analysis

2.1 Leon County Profile



Leon County is in the northwest region of Florida, traditionally known as the "Florida Panhandle." Leon County covers approximately 702 square miles, including 667 square miles of land[2], and is bordered by Georgia to the north, Jefferson County to the east, and Wakulla County to the south. The Ochlockonee River runs along the entire western edge separating Leon from Gadsden and Liberty Counties.

The City of Tallahassee is the only incorporated municipality in Leon County, and is the state capital of Florida. Tallahassee is also home to two state universities, Florida State University (FSU) and Florida Agricultural and Mechanical University (FAMU), and Tallahassee Community College

Official 2018 population estimates for the City of Tallahassee and the unincorporated areas within Leon County are presented in Table 2.

Table 2: Leon County Population Estimates by Jurisdiction, 2010 – 2018.[3]

Jurisdiction	Population Census, 2010	Population Estimate, 2018	% Change 2010-2018	% of Total Population (2018)
Unincorporated	94,111	99,951	6.2%	34.2%
Tallahassee	181,736	192,381	5.9%	65.8%
Countywide Total	275,487	292,332	6.0%	100%

According to the University of Florida, Bureau of Economic and Business Research (2018), Leon County's population is expected to experience steady population growth rates for the next 25 years. Table 2.2 displays the range of population projections for Leon County through 2045.

Population growth in Leon County and the City of Tallahassee slowed in the period 2010-2014 but has increased since then. The estimated population growth for entire county has grown by 6.0 percent from 2010-2018 (approximately 17,000 new residents). Table 3 below indicates population estimates for the County to the year 2040.

[2] Leon County Profile. Wikipedia, The Free Online Encyclopedia, http://en.wikipedia.org/wiki/Leon_County, Florida.

[3] Sources: U.S. Department of Commerce, Bureau of the Census (1930-2010), University of Florida, Bureau of Economic and Business Research (2018 estimate)

Table 3: Population Projections for Leon County, 2015 – 2045.[4]

Year	City of Tallahassee	Unincorporated Leon County	Countywide Total
2020	197,100	101,200	298,300
2025	207,800	104,100	311,900
2030	216,400	106,400	322,800
2035	223,300	108,200	331,500
2040	229,400	109,800	339,200
2045	234,800	111,200	346,000

2.2 Physiography and Environmental Characteristics

Leon County is comprised of three main physiographic regions:

1. Northern Highlands
2. Gulf Coastal Lowlands
3. River Valley Lowlands.

The Northern Highlands include the Tallahassee Hills of the central and northern half of the county. The Tallahassee Hills are the county's largest physiographic region, constituting over 40 percent of total county land area, including the City of Tallahassee. Areas of higher elevation, while less susceptible to flooding, may experience more intense winds, especially from severe storms. Abundant rainfall and loamy soils support an abundance of vegetation, even within urban areas. The resulting forest cover provides an abundant source of potential storm debris and fuel source for wildfires.

The sloped terrain and clayey upland soils within this region enhances and concentrates stormwater flow, including volume and rate. Additionally, karst features are common and may threaten property through sinkhole development, or many provide a conduit between the surface and groundwater. These conditions, combined with the fact that the Tallahassee Hills contain the county's most intense land uses, present serious challenges to managing stormwater and flooding associated with development.

The Gulf Coastal Lowlands encompass the southern half of the county. The western portion of this division is characterized by a water table perched near the surface. The southeastern portion of the county includes a mix of sandhills and karst plain with well-drained soils and numerous sinkhole lakes and springs. Abundant rainfall and sandy/loamy soils also support an abundance of vegetation in this area, including approximately 100,000 acres of the Apalachicola National Forest and extensive private forested lands. This forest cover provides an abundant source of potential storm debris and fuel source for wildfires. There are also extensive floodprone areas within this region. The combination of high

[4] Sources: University of Florida, Bureau of Economic and Business Research (2020-2045 Leon County projections); Tallahassee-Leon County Planning Department (City of Tallahassee and Unincorporated Leon County 2020-2045) projections assuming continued annexations and share of population growth captured by the City between 2000 and 2018 will continue throughout the projected time horizon). Based on the medium population projection, Leon County is expected to add over 50,000 new residents to its population between 2018 (292,332) and 2045 (346,000).

water tables and karst topography presents specially challenges for managing concentrated volumes of stormwater associated with development.

The River Valley Lowlands comprise the county's two rivers and their associated floodplains. These include the St. Marks River in the southeast portion of the county, and the Ochlockonee River in the west area of the county. Notably, hurricane surge modeling reveals the St. Marks River as one of the few areas with the potential to experience storm surge flooding. These regions are less densely populated than the Tallahassee Hills, although they do contain the Tallahassee Regional Airport and southern portions of urban Tallahassee.

2.3 Future Development Trends

To ensure consistency with other local planning mechanisms, future development trends are derived from the Tallahassee-Leon County Comprehensive Plan and new population estimates.

Within the Comprehensive Plan, the Future Land Use Element establishes the blueprint for the growth and development of the area. In order to adequately plan for future growth in Leon County and the City of Tallahassee, assumptions are made as to the amounts of residential, commercial and other uses that will be required to support land development and population growth within the 2045 planning horizon. The Future Land Use Map (Figure 2.2) within the Comprehensive Plan is based upon these assumptions, as well as the population projections of the community and the location and distribution of natural resources, infrastructure, agricultural areas, and other features.

Through the state-mandated Comprehensive Plan, Leon County and the City of Tallahassee have identified priority growth areas and developed strategies to direct growth into these areas. These strategies were established to alleviate development pressures on the northeastern part of the City and County where much growth has occurred beyond the urban core and at densities lower than the average of the community. Consequently, the Southern Strategy seeks to direct new growth to the underutilized Southside, which is closer to downtown and where infrastructure is in place. Future development strategies are also intended to encourage growth in the Multimodal Transportation District (MMTD; also called the Mobility District), which includes downtown, the universities, and older neighborhoods and corridors. The MMTD is viewed as the area within which to encourage higher density development that may be served with mass transit and other modes of transportation.

Finally, future development is directed in large part by the Urban Services Area (USA) boundary as established in the Comprehensive Plan. The USA limits the area in which urban infrastructure such as sewer services are to be provided, which in turn forces development of vacant lands (and the redevelopment of developed areas) at higher densities and intensities within the USA, thereby minimizing low-density urban sprawl.

The Future Land Use Map within the Comprehensive Plan displays the future growth areas within Leon County. The Plan is intended through policy and the Future Land Use Map to create a compact, urban development form through 2030 within the USA. This pattern of development was selected to minimize urban sprawl and to focus growth where infrastructure is in place.

A number of objectives and policies in the Comprehensive Plan also mandate the strict protection of the community's natural resources, placing the highest priority in the development of land on

protection of the natural environment. Protected environmental features include steep slopes, wetlands, floodplains, floodways, listed species habitat, and karst features. Land development regulations require the protection of these areas by placing them under permanent conservation easements.

Strict limitations on development in these areas, coupled with the land use categories established in the Plan, helps minimizes vulnerability of newer buildings, infrastructure, and critical facilities within Leon County by limiting their location, density, and impacts. The only exception is residential structures on single-family private parcels, which are allowed only when built to strict standards (e.g., elevating structures).

As of early 2020, there have been no major changes to the Comprehensive Plan to facilitate large new developments in the last five years. Several changes have been made to reflect the intensification of growth within the urban area of Tallahassee, as well as the creation of several new land use categories intended to clarify where uses such as sand mining and light industry may be located. Several significant changes include a rewrite of the Rural land use category to restrict certain land uses, and to encourage others that are compatible with Leon County's unique rural areas, and a rewrite of the Lake Protection land use category. The latter included the creation of four development "nodes," intended to collect non-residential land uses.

The Great Recession that started in 2007-2008 slowed down Leon County and the City of Tallahassee's real estate market, which resulting in few to no new residential areas. However, the effects of this recession have mostly receded from the Tallahassee economy, and growth in Leon County since that event has been focused on large apartment complexes mostly intended for the college and university student population small infill residential developments in the existing urban area, and the continued development of several planned residential and commercial developments, including Welaunee and Southwood. Southwood is continuing to be built out as planned, and the Canopy mixed use development is under construction in the area known as Welaunee. Other development trends include an increase in the number of assisted living facilities throughout the urban and suburban areas, as well as several new high-rise, mixed-use buildings in the downtown area.

Leon County and the City of Tallahassee's population growth rate is generally steady; according to the University of Florida's Bureau of Economic and Business Research, the combined population of Leon County and the City of Tallahassee was 292,332 in 2018 and is projected to be 298,300 in 2020.[5]

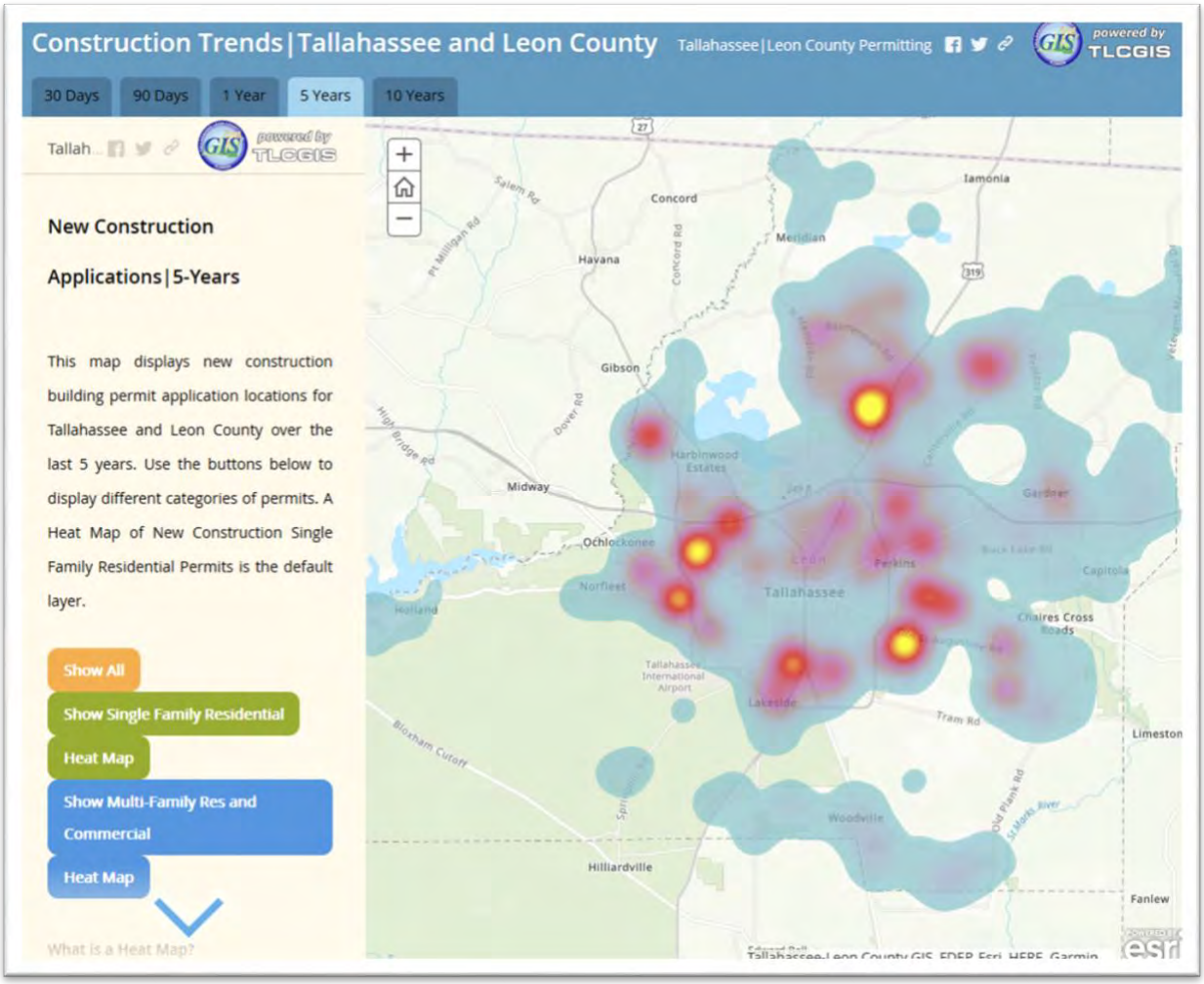
The overall trend of development continues within the Urban Service Area as guided by the Comprehensive Plan and associated land development regulations. Figure 1 indicates construction trends in Leon County within the last five years.

These development trends and their accompanying land use plans have been considered by Planning staff and the LMS Committee. The most significant effects on the initiatives comes from the increase in critical facilities, including infrastructure such as electric transmission and distribution facilities, sewer lift stations, and traffic control facilities. Additional impacts from development also impact floodzones and affected structures and place additional stresses on existing critical facilities. The projects that are proposed for HMGP funding are often in response to these trends and stresses.

5 http://oevforbusiness.org/wp-content/uploads/2019/04/population-estimate-and-projection_Apr2019.pdf.

These trends will continue to be reviewed by Planning staff, the LMS Committee, and stakeholders annually for their potential impact on hazard mitigation, including avoiding hazardous areas such as floodplains, reducing the potential effects of trees on electric utility distribution and transmission facilities while providing sufficient tree canopy cover to mitigate extreme temperatures, and other mitigation measures. The hazard mitigation initiatives and projects in this plan will also be reviewed annually in response to any significant land use plans and development trends.

Figure 1. Heat Map of Construction Trends in Leon County Within the Last Five Years.[6]



6 http://oevforbusiness.org/data-center/construction-trends/

2.4 Hazard Identification

FEMA defines natural hazards as "natural events that threaten lives, property, and other assets… [and that] tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area." Technological and societal hazards are those that are created by humans.

Leon County has experienced numerous disasters associated with various natural hazards events in the last two decades. The majority of these federally declared disasters have resulted from severe storm events, six of which qualified for federal disaster assistance. Table 4 lists the federal disaster declarations that have been issued since 1982.

Table 4: Recently Declared Disasters in Leon County, 1995 – 2018.[7]

Declaration	Date	Event	Primary Damage
#1069	October, 1995	Hurricane Opal	Flooding; Debris; Power Outages
#1223	June, 1998	Wildfires	Fire Damage
#2201	July, 1998	Drought	Crop Damage, Severe Heat
#1249	September, 1998	Hurricane Georges	Erosion, and Debris
#1339	April, 1999	Fire; Drought	Fire Damage, Crop Damage, Severe Heat
#1344	October, 2000	T.S. Helene	Riverine and Local Flooding
#1381	June, 2001	T.S. Allison	Riverine and Local Flooding
#1545	September, 2004	Hurricane Frances	Flooding; Debris
#1551	September, 2004	Hurricane Ivan	Flooding; Debris
#1561	September, 2004	Hurricane Jeanne	Debris
#1595	July, 2005	Hurricane Dennis	Debris
#1785	August, 2008	T.S. Fay	Flooding; Debris; Power Outages
#1831	April, 2009	Severe Storms	Flooding; Wind Damage
#4280	September, 2016	Hurricane Hermine	Debris; Power Outages
#4337	September, 2017	Hurricane Irma	Debris; Power Outages
#4399	October, 2018	Hurricane Michael	Debris; Power Outages

There have been a few local events that have not warranted a federal disaster declaration. For instance, Governor Rick Scott declared a state of emergency for 26 counties on April 30, 2014 to support emergency response operations for communities inundated by heavy rains.

The 2015 LMS previously provided a thorough examination of the historic impact, documented damages, vulnerable populations and potential economic impact associated with each hazard. These hazards data, incorporated in the original 2012 Tallahassee – Leon County Post-Disaster

[7] Source:
FEMA Disaster Declarations Summary
https://www.fema.gov/media-library/assets/documents/28318.

Redevelopment Plan (PDRP) and its 2019 update, have been updated by the LMS Update Committee as part of the 2020 LMS update process.

The hazards identified by the LMS Steering Committee as potentially affecting Leon County and the City of Tallahassee include the following (not in order of severity):

Natural Hazards:

1. Hurricanes and Tropical Storms (including Storm Surges)
2. Severe Storms
   (a) Thunderstorms
   (b) Tornadoes
   (c) Lightning
3. Drought
4. Flooding
5. Extreme Temperatures
6. Wildfires
7. Sinkholes
8. Invasive Plants and Animals
9. Diseases and Pandemics

Technological and Societal Hazards:

1) Public Infrastructure Failure
   (a) Telecommunications
   (b) Cybersecurity
   (c) Electricity, Water, and Sewer
   (d) Dams
2) Hazardous Materials (Storage and Transportation)
3) Transportation Incidents
   (a) Roadways
   (b) Railways
   (c) Aviation
4) Terrorism
   (a) Violent Acts
   (b) Biohazards
   (c) Cyber Attacks

This updated and modified list of hazards reflects the lessons of Hurricanes Hermine and Michael, the increases in development in Leon County and the City of Tallahassee, the record of effects of particular hazards, the changing nature of technology and the acquisition of new and updated data from old and new hazards, and the anticipated efforts of global climate change and the expected effects upon the natural and built environment of the local area.

The risk and vulnerability to these hazards in turn have been reflected in the updated list of hazard mitigation initiatives and projects, including their priority. Where specific data are available (i.e., Hazus

model runs), these have been used to update various sections of LMS based on existing development, particularly that which has occurred over the last five years.

2.5 Hazard Risk and Vulnerability

Risks are rated to help prioritize mitigation objectives and initiatives. Ratings normally incorporate the magnitude or severity of risk by hazard and its likelihood of occurrence. Additional information can also be incorporated into risk assessments such as expected changes in occurrences, increasing severity of risk and/or vulnerability, and other variables.

The measuring and rating of risk, while technically quantifiable, is nevertheless not an exact science. Other less-quantifiable factors used to estimate risk include institutional knowledge, historical and local knowledge and experience, and professional judgement. These somewhat intangible factors are essential components to weighing and rating risks for a community.

In order to help the LMS Committee weigh and rank hazards and related mitigation projects, a hazard risk rating system was utilized in earlier editions of the LMS. The risk ratings for hazards identified in the 2010 edition of the LMS and incorporated into the 2015 edition were previously scored with procedures developed by the Apalachee Regional Planning Council in 2004 through the use of Mitigation 20/20 ^{TM} software. This software application was used to derive a hazard score, or Risk Rating, for each identified hazard.

Because this software application is no longer available from the RPC, the Steering Committee in 2015 created a relative rating of hazard risks based on occurrences and expert knowledge of local hazards and historical events. For the 2020 LMS update, the Steering Committee elected to continue to use this rating system, augmented with institutional knowledge, historical and local knowledge and experience, and professional judgement. This revised ranking of the hazards was presented to the LMS Steering Committee and Working Group at over several meetings of the LMS Steering Committee in December 2019. The Risk Rating scores and ranking for each hazard is listed in Table 5.

There are several ways to identify and classify risks from various hazards. Previous editions of the Tallahassee – Leon County LMS used a simple risk classification system for estimating the degree of risk to the residents of Leon County and the City of Tallahassee from potential hazards into the following categories:

1. **High Risk**: High probability of occurrence, with loss of life and property damage.
2. **Medium Risk**: Medium probability of occurrence, with a low probability to loss of life, or property.
3. **Low Risk**: Low probability of occurrence, with a very low probability to loss of life or property damage.

The probability of occurrence is based on records of historical occurrence. These probabilities are classified and measured as follows:

1. **Highly Likely**: Annually or a 100% chance per year
2. **Likely**: Once in less than 10 years or a 10-100% chance per year
3. **Occasional**: Once per 11-100 years or a 1-9% chance/year
4. **Unlikely**: Once in greater than 100yrs or a less than one percent chance in 100 years

The probability of occurrence is summarized for each hazard within each Estimated Impacts, Probability, and Extent section. Where specific data are not available, or are minimal, professional judgement and institutional knowledge has been utilized to try to estimate the probability of occurrence.

Table 5: Leon County Hazards by Risk Rating, 2019.

High Risk	Medium Risk	Low Risk
Hurricanes and Tropical Storms	Severe Storms (Thunderstorms, Tornados, Lightning)	Storm Surge
Flooding	Drought	Extreme Temperatures
	Energy Failures	Wildfires
	Hazardous Materials	Sinkholes
		Invasive Plants and Animals
		Diseases, Epidemics, and Pandemics
		Dam Failure
		Transportation Incidents
		Terrorism

At this time, the U.S. Department of Homeland Security is encouraging the use of a Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) three-step process to meet the main goal of the National Preparedness System (NPS). The National Preparedness Goal describes the five mission areas as follows:

- **Prevention:** Prevent, avoid, or stop an imminent, threatened, or actual act of terrorism.
- **Protection:** Protect our citizens, residents, visitors, and assets against the greatest threats and hazards in a manner that allows our interests, aspirations, and way of life to thrive.
- **Mitigation:** Reduce the loss of life and property by lessening the impact of future disasters.
- **Response:** Respond quickly to save lives; protect property and the environment; and meet basic human needs in the aftermath of an incident.
- **Recovery:** Recover through a focus on the timely restoration, strengthening, and revitalization of infrastructure, housing, and a sustainable economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by an incident.[8]

The mission areas and core capabilities organize the community-wide activities and tasks performed before, during, and after disasters into a framework for achieving the goal of a secure and resilient Nation.

8 https://www.fema.gov/media-library/assets/documents/165308.

The THIRA is a three-step risk assessment completed every three years. It helps communities answer the following questions:

- What threats and hazards can affect our community?
- If they occurred, what impacts would those threats and hazards have on our community?
- Based on those impacts, what capabilities should our community have?

The THIRA helps communities understand their risks and determine the level of capability they need in order to address those risks. The outputs from this process lay the foundation for determining a community's capability gaps during the SPR process.

For the purposes of this update, a formal THIRA and SPR consistent with the NPS was not conducted due to a lack of time, personnel, and funding. However, this process will be reviewed for its applicability to the next update of the Tallahassee – Leon County LMS.

2.6 Hazard Vulnerability Modeling

Estimating hazard vulnerability across a large area such as Leon County and the City of Tallahassee involves many variables, including the type, severity, and geographic spread of hazard events, historical hazard occurrences, number, type, and value of potentially affected properties, affected individuals, topography, and other variables.

Previous editions of the LMS have used a variety of software models to estimate vulnerability to hazards. These modeling efforts and their results are summarized below.

MEMPHIS

The Florida Department of Community Affairs previously provided to local governments Geographic Information System (GIS) data analysis and Mapping for Emergency Management, Parallel Hazard Information System (MEMPHIS) outputs developed by The Kinetic Analysis Corporation. The MEMPHIS system used inventory data from the Florida Department of Revenue and U.S. Census Bureau to inventory the total number of structures, as well as the critical facilities that are potentially vulnerable to the identified hazards.

The MEMPHIS model was the original method employed to assess Leon County and the City of Tallahassee's vulnerability to natural hazards. MEMPHIS data was previously made available by the Florida Department of Community Affairs , and was derived from analysis of U.S. Census Bureau data, Department of Revenue (DOR) data, and other information related to local conditions such as historical hazard occurrences and topography.

Relevant hazard data such as wind and water levels were extracted from The Arbitrator of Storms (TAOS) data and incorporated in to the MEMPHIS modeling system. These data sources are used to present population at risk, housing and damage estimates for assessing vulnerability to natural hazards in Leon County. U.S. Census Bureau and DOR data was collected in 2000, and local information was collected in 2004. MEMPHIS data are presented in this report where relevant and appropriate to express and measure Leon County and the City of Tallahassee's vulnerability to various natural hazards.

TAOS Model

The Arbiter of Storms (TAOS) is a computer model used to produce a detailed risk analysis in a GIS environment. In previous LMS updates and reports, TAOS data was the primary data source used to assess vulnerability to natural hazards in Leon County. However, more recent MEMPHIS data has been incorporated into the majority of hazard profiles and natural hazard vulnerability analyses. Where appropriate, TAOS models have been employed to assess vulnerability not captured by the MEMPHIS analysis. A brief discussion of TAOS data follows.

Monetary damage estimates are generated by TAOS based on varying storm intensities and the values of the structures located on specified parcels as indicated within the Property Appraiser's database. Some parameters employed by the model include wind speed, water depth, wave height, and construction material. Land uses are divided into categories such as single family, multi-family, hotels, industrial, etc. while structures are classified as residential wood frame, mobile home, and commercial using the Leon County tax rolls.

ELVIS

The Economic Loss Vulnerability Index System (ELVIS) allows communities to compare the relative risk of various natural hazards through the use of loss costs. A loss cost is the long-term average of the damage a hazard causes, which are typically expressed in terms of loss per $1000 of exposure per year.

Like MEMPHIS, ELVIS data is derived from analysis of U.S. Census Bureau data, Department of Revenue (DOR) data, and other information related to local conditions (historical hazard occurrences, topography, etc.). These data sources were used in the 2010 edition of the Tallahassee – Leon County LMS to present population at risk, housing and damage estimates for assessing vulnerability to natural hazards in Leon County. U.S. Census Bureau and DOR data was collected in 2000, and local information was collected in 2004. Given the nature of the data, the ELVIS information presented above was the best available data at that time for assessing Leon County and the City of Tallahassee's vulnerability to various natural hazards.

In 2009, analysis of ELVIS data indicated that Leon County structures were most at-risk from wind-related damages.

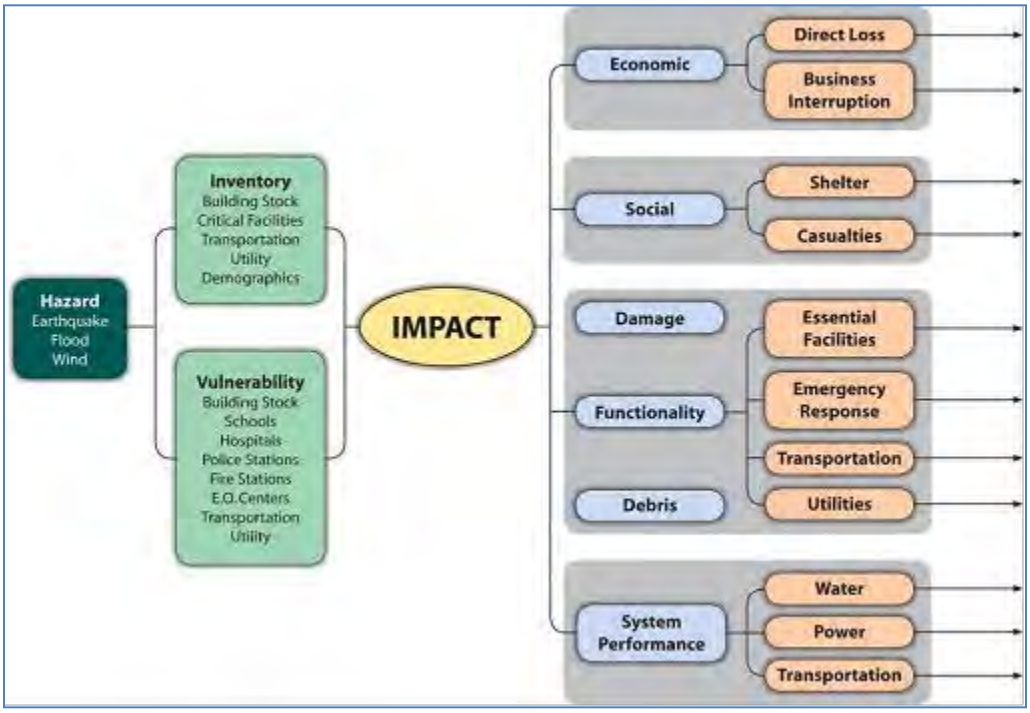
Hazus

Hazus is a GIS-based software program which produces loss estimated for earthquakes, floods, hurricanes and tsunamis based on scientific and engineering knowledge. FEMA's Hazus-MH 4.2 software is a nationally applicable standardized methodology that contains models for estimating potential losses from floods and hurricanes. It was used to model and generate estimated potential losses for hurricane winds and flooding. The model uses Census 2010 data to determine vulnerable population concentrations.

Hazus-MH 4.2 is FEMA's standardized loss estimation methodology built upon an integrated GIS platform to conduct analysis at a regional level (i.e., not on a structure by-structure basis). The Hazus-MH 4.2 risk assessment methodology is parametric, in that distinct hazard and inventory parameters (e.g., wind speed and building types) can be modeled using the software to determine the impact (i.e.,

damages and losses) on the built environment. The figure below displays the data input and output of the Hazus-MH 4.2 model.

Figure 2: Conceptual Model of Hazus-MH Methodology



Source: Alachua County PDRP

a. Hazus-MH 4.2 Hurricane Wind Model

The Hazus-MH 4.2 Hurricane Wind Model is an improvement over existing loss estimation models because it uses a wind hazard-load-damage-loss framework. New features in the Hazus-MH 4.2 Wind Model include:

- Commercial data has been updated to Dun & Bradstreet building valuations have been updated to R.S. Means and building counts are now based on census housing unit counts;
- An updated historic storms database that includes several existing historic storms;
- New coastal storm surge modeling capability that includes SLOSH and SWAN;
- Integration of the CDMS tool;
- NOAA hurricane advisory data is used to model storms with an adjustment feature for calculating building damage and loss;
- An updated probabilistic storm set that reflects updates to the Holland pressure profile model and filling model;
- An updated wind field model for user-defined storms; and
- A new vulnerability functions to permit calculation of additional losses to manufactured housing due to trees blow down.

Replacement costs were derived from Means Square Foot Costs for residential, commercial, industrial and institutional building occupancy classes. The Means publication is a nationally accepted reference on building construction costs, which is published annually. This publication provides cost information for a number of low-rise residential buildings, and for 70 other residential, commercial, institutional and industrial buildings. These are presented in a format that shows typical costs for each model building, showing variations by size of building, type of building structure and building enclosure. More detailed information on Hazus-MH 4.2 is available through FEMA at: www.fema.gov/hazus/.

Hazus-MH 4.2 is a loss estimation tool for planning purposes only. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications necessary to conduct such a study; incomplete or outdated data on inventory, demographic, or economic parameters; the unique nature and severity of each hazard when it occurs; and the amount of advance notice that residents have to prepare for the incident. As a result, potential exposure and loss estimates are approximations. Results should not be interpreted or used as precise results from and should be used only to understand relative risk.

b. Hazus-MH 4.2 Flood Model

The Hazus Flood Model produces loss estimates for vulnerability assessments and plans for flood risk mitigation, emergency preparedness and response and recovery. Losses can be calculated for a single flood event, or for a range of flood events allowing for annualized estimates of damages. Incomplete or inaccurate inventories of the built environment, demographics and economic parameters can result in uncertainty in the estimates produced by the Hazus Flood Model. The following limitations of the model should be considered:

- While the Hazus Flood Model can be used to estimate losses for an individual building, the results must be considered as average for a group of similar buildings.
- When using the general inventories included with Hazus, accuracy of losses may be less than for losses calculated from available local inventory stock imported by the user.
- The Flood Model performs its analysis at the census block level with small numbers of buildings. Damage analysis of these small numbers makes the Flood Model more sensitive to rounding errors.

The Flood Model methodology includes a flood hazard analysis and a damage analysis. In the hazard analysis phase, characteristics such as frequency, discharge and ground elevation are used to model the spatial variation in flood depth and velocity. During the loss estimation phase, structural and economic damage is calculated based on the results of the hazard analysis through the use of vulnerability function curves. Model results are then conveyed to the user via a series of reports and maps. Detailed information on the Hazus Flood Model can be found in the Hazus Flood Model User Guide and the Hazus Flood Model Technical Manual.

i. Flood Hazards

The Hazus Flood Model analyzes both riverine and coastal flood hazards. Flood hazard is defined by a relationship between depth of flooding and the annual chance of inundation to that depth. Depth, duration and velocity of water in the floodplain are the primary factors contributing to flood losses. Other hazards associated with flooding that contribute to flood losses include channel erosion and migration, sediment deposition, bridge scour and the impact of flood-born debris. Because Leon County is not a coastal county, the flood risk assessment is based on a riverine flood hazard scenario.

ii. Levels of Analysis

The Flood Model is designed for three levels of analysis, as shown below. Each subsequent level builds on the data and analysis procedures available in previous levels.

Level 1**:** The simplest type of analysis, it is based primarily on data provided with the software (e.g., census information, general building stock, general runoff models, no detailed water control data for hydraulics, etc.). The estimates are crude but are appropriate as initial loss estimates to determine where detailed analyses are warranted.

Level 2**:** Improves Level 1 results by taking into consideration additional data that are readily available. It requires more extensive inventory data and effort by the user than the Default Data Analysis. The purpose of this type of analysis is to provide the best estimates of flood damage/loss that can be obtained using the standardized methods of analysis. The user may need to employ consultants to assist in the implementation of certain methods. For example, knowledgeable users of hydrology and hydraulics models are required to define flood elevations.

Level 3: This analysis requires extensive efforts by the user in developing information on the flood hazard and the measure of exposure. This type of analysis incorporates results from engineering and economic studies carried out using methods and software not included within the methodology. At this level, one or more technical experts are required to acquire data, perform detailed analyses, assess damage/loss, and assist the user in gathering extensive inventory data. This level of analysis typically requires extensive participation by local utilities and operators of special facilities. Level 3 analyses usually take six months to two years to complete. The description of model requirements and typical applications for each level is presented in the table below:

Table 6: Hazus Flood Model Analysis Levels.

	Level 1	Level 2	Level 3
Hazard	User supplied Digital Terrain or Elevation Model (DEM), typically the USGS 30-meter DEM. The Flood Model will use default hazard data including Hydrologic Unit Codes, and accumulation methodology to develop approximate stream centerlines. USGS regression equations and gage records will be used to determine discharge frequency curves.	User supplied flood stream cross-sections attributed with elevations, or lines of Base Flood Elevation (BFE). Coastal users will supply polygons attributed with the BFE. A flood boundary of some form is required. User supplied hazard data pre-processed via the FIT. DEM consistent with their FIT data.	Similar to Level 2 although the user will likely work with Hydraulic models outside of the Flood Model and the FIT. User will be required to pre-process the data through the FIT.
Inventory	Hazus default data. Allocation of census block data via statistical analysis, and broad assumptions for first floor height based on foundation distributions. Agriculture products, vehicles, essential facilities, some transportation and utility facilities.	User supplied inventory data, such as Tax Assessor data, and inventory data developed via site surveys processed through the Comprehensive Data Management System (CDMS) tool. Users enhance the first floor height and other parameters.	High quality data re: building values, flood vulnerabilities, contents, occupancies, etc, extended to industrial and other high-value facilities.
Damage Curves	Broad regional default curves based on available FIA or USACE depth damage curves. Library of curves available for user selection. User may create their own function using library curves as guides.	User specifically modifies the existing curve library for local practices.	User-input curves based on detailed building surveys, specific crop conditions etc.
Damage Estimation	Area weighted damage estimates based on the depth of flooding within a given census block. Losses developed for general building stock, essential facilities, vehicles, agricultural products, select transportation and utility features.	Consistent with Level 1, estimation enhanced by improved hazard data and detail in inventory data and modification to damage curves.	Consistent with Level 1, estimation enhanced by improved hazard data and detail in inventory data and modification to damage curves.
Direct Loss/ Impacts	Cost of repair / replacement, shelter needs, temporary housing, vehicles, crop & livestock losses.	Consistent with Level 1, estimation enhanced by improved hazard data and detail in inventory data and modification to damage curves.	Consistent with Level 1, estimation enhanced by improved hazard data and detail in inventory data and modification to damage curves.
Induced Losses	Debris developed from direct damage to buildings based on floor areas from the general building stock.	Consistent with Level 1, estimation enhanced by improved hazard data and detail in inventory data and modification to damage curves. Site specific debris generation currently not available in the Flood Model, must be based on census block attribution of floor area.	Consistent with Level 1, estimation enhanced by improved hazard data and detail in inventory data and modification to damage curves. Site specific debris generation currently not available in the Flood Model, must be based on census block attribution of floor area.

The flood risk assessment for Leon County was conducted using a hybrid Level 1-Level 2 approach. The scenario was developed using local flood and elevation data, while the loss estimates were determined using the General Building Stock with some user-added local facilities information.

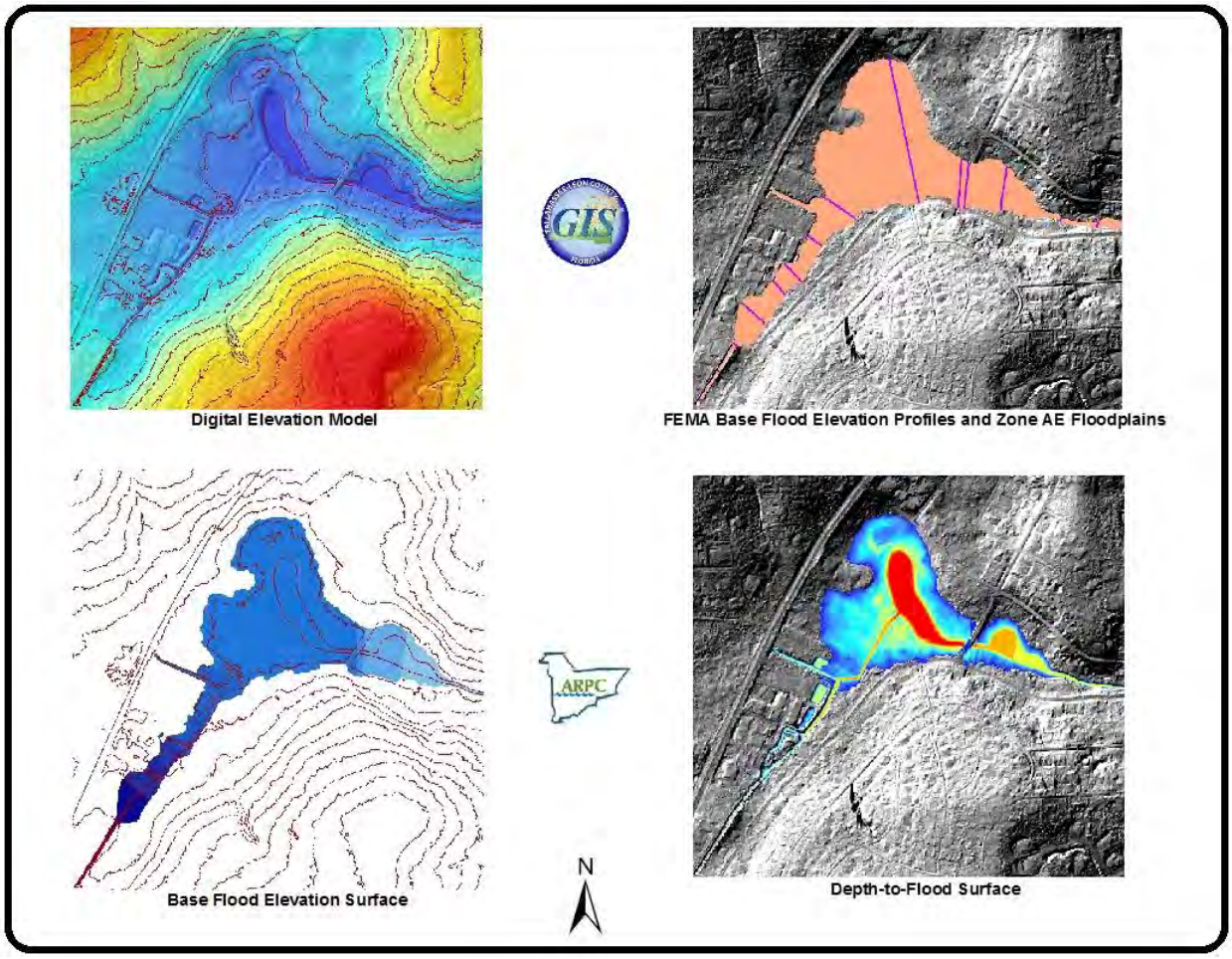
iii. Riverine Hazard Analysis: Depth to Flood Methodology

The flood risk assessment was performed using a depth-to-flood approach to compute loss estimates and was generated by comparing Base Flood Elevation (BFE) data with a Digital Elevation Model representing ground elevation. The assessment is computed for a 100-Year return period. The source for 100-year base flood elevations and associated floodplains is the FEMA Digital Flood Insurance Rate (DFIRM) data. The effective DFIRM data for Leon County was published in 2008 pursuant to the FEMA Map Modernization initiative. The floodplain delineations and BFE data was updated in 2009 to include a Letter of Map Revision submitted by the City of Tallahassee. The ground elevation surface used in the analysis was produced from a LIDAR survey conducted for Leon County and the City of Tallahassee in 2009. This data was produced as part of the 3-year Landbase Update for Tallahassee-Leon County GIS.

The study was constrained to the Zone-AE floodplains from the DFIRM data because Hazus requires base flood elevation data. The Zone AE flood zones have base flood elevations determined by engineering studies. Base flood elevations are not determined for the Zone-A floodplains, thus, they were excluded from the analysis

The figure below shows the workflow used to produce the depth-to-flood raster surface.

Figure 3: Depth-to-Flood Workflow Diagram



Source: Tallahassee-Leon County GIS

The elevation information in the BFE profiles was used to create a Base Flood Elevation surface for the extent of the Zone AE floodplains. The Zone AE floodplains were used to extract the DEM data for the extent of the floodplains. The DEM data was subtracted from the Base Flood Elevation surface to produce the Depth-to-Flood surface. The Depth-to-Flood surface was imported into Hazus as the flood hazard source for the risk assessment. The General Building Stock was used along with the portion of the user-provided inventory data to produce the loss estimates. The loss estimate data was extracted from Hazus and provided for this chapter in the loss reports that are part of the Hazus software. The data is available beginning on page 15.

Disclaimer

All of these modeling software applications are simply loss estimation tools for planning purposes only. Each has its strengths and weaknesses. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications necessary to conduct such a study; incomplete or outdated data on inventory, demographic, or economic variables

or parameters; the unique nature and severity of each hazard when it occurs; and the amount of notice that residents have to prepare for the incident. As a result, potential exposure and loss estimates are approximations. Results should not be interpreted or used as precise results from and should be used only to understand relative risk.

2.7 Hazard Vulnerability Assessment

This next section describes Leon County and the City of Tallahassee's vulnerability to natural hazards. Each hazard described in this section as follows:

1. General Description and Location
2. Historical Occurrences
3. Estimated Impacts, Probability, and Extent
4. Vulnerability Summary
5. Risk Assessment (by jurisdiction)

2.8 Hurricanes and Tropical Storms

This section combines the hazard profile and vulnerability analysis for tropical storms and hurricanes because these events are so closely related. Storm surges are also included because they are associated with these hazards.

General Description and Location

Tropical storms and hurricanes are both types of tropical cyclones, which is the generic term for a non-frontal synoptic scale low-pressure system over tropical or sub-tropical waters with organized convection (i.e. thunderstorm activity) and definite cyclonic surface wind circulation.[9] A tropical storm is defined as a tropical cyclone in which the maximum sustained surface wind speed ranges from 39 mph to 73 mph, and a hurricane is a tropical cyclone with maximum sustained surface wind speeds over 74 mph. Hurricane season lasts from June 1st to November 30th of each year, with August and September being the peak months of tropical storm and hurricane activity.

A tropical storm or hurricane is likely to result in damage from both wind and floodwaters. However, less severe storms may produce the same effects, particularly flooding. Hurricanes and tropical storms affect the entire Gulf coast of the United States, including Leon County and the City of Tallahassee, as well as much of the Atlantic coast, including coastal and inland counties such as Leon County.

The Saffir-Simpson Scale organizes storms by various categories of wind speed. As storm intensity moves up the scale, the potential threat to public health and safety increases. However, lower category events can still cause extensive damage, if not from high winds then from substantial periods of rainfall. Table 7 provides a summary of different category storms as ranked by the Saffir-Simpson Scale.

[9] http://www.aoml.noaa.gov/hrd/tcfaq/A1.html

Table 7: Saffir-Simpson Hurricane Scale.[10]

Category	Wind speeds
Five	≥70 m/s, ≥137 knots ≥157 mph, ≥252 km/h
Four	58–70 m/s, 113–136 knots 130–156 mph, 209–251 km/h
Three	50–58 m/s, 96–112 knots 111–129 mph, 178–208 km/h
Two	43–49 m/s, 83–95 knots 96–110 mph, 154–177 km/h
One	33–42 m/s, 64–82 knots 74–95 mph, 119–153 km/h

Storm Surge

A storm surge is defined as an abnormal rise in sea level accompanying a hurricane or other intense storm. The height of the surge or rise is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge heights are usually estimated by subtracting the normal or astronomic high tide from the observed storm tide. Storm surges are evaluated separately from rain-driven flooding. Storm-generated waves on top of the storm surge will create an even greater high-water mark.

A tsunami, also known as a seismic sea wave or as a tidal wave, is a series of waves in a body of water caused by the displacement of a large volume of water, generally in an ocean or a large lake. Earthquakes, volcanic eruptions and other underwater explosions (including detonations of underwater nuclear devices), landslides, glacier calvings, meteorite impacts and other disturbances above or below water all have the potential to generate a tsunami. In being generated by the displacement of water, a tsunami contrasts both with a normal ocean wave generated by wind and with tides, which are generated by the gravitational pull of the moon and the sun on bodies of water.[11]

Due to the immense volumes of water and energy involved, the effects of tsunamis can be devastating. Some meteorological storm conditions such as deep depressions associated with tropical cyclones, including hurricanes, can generate a storm surge which can be several meters above normal tide levels. This is due to the low atmospheric pressure within the center of the depression. As these storm surges come ashore, they may inundate large areas of land.

There is often no advance warning of an approaching tsunami. However, because earthquakes are often a cause of tsunami, any earthquake occurring near a body of water may generate a tsunami if it occurs at shallow depth, is of moderate or high magnitude, and the water volume and depth is sufficient.

Based on elevation, the southern reaches of Leon County are vulnerable to storm surges and tsunamis.

[10] NOAA Hurricane Research Division "Frequently Asked Questions."
[11] http://en.wikipedia.org/wiki/Tsunami.

Historical Occurrences

Since 1851, a total of 76 storms have passed within 65 miles of Tallahassee, including 50 tropical storms, and 26 hurricanes. (Many of these tropical storms were hurricanes upon landfall but were reduced in intensity by the time the storm track passed near Tallahassee.) The Tallahassee region has been hit by many hurricanes over the last 170+ years, including four major (Category 3 or stronger) hurricanes. Even hurricanes that make landfall in places such as Pensacola, Panama City, among other places, can be felt here (e.g. Dennis '05, Ivan '04, Opal '95, Michael '18). The most recent hurricane (not including tropical storms) to directly impact the Tallahassee area was Hurricane Michael on October 10-11, 2018.

Statistically, hurricanes directly impact Tallahassee on average once every eight years (22 hurricanes in the last 171 years). According to historical hurricane climatology data, the frequency of storms comes in multi-decade cycles where there will be long stretches between active periods of numerous storms.

Tropical storms conditions are much more common than hurricanes for this region of Florida. Tropical storms strike on average once every 3.5 years (50 tropical storms in 171 years). The last tropical storm to directly impact Florida State University was Tropical Storm Debby in 2012.

Table 8 below summarizes the tropical cyclone activity to have been felt on the Main Campus of Florida State University since Hurricane Kate in 1985, plus a few extra historical hurricanes.

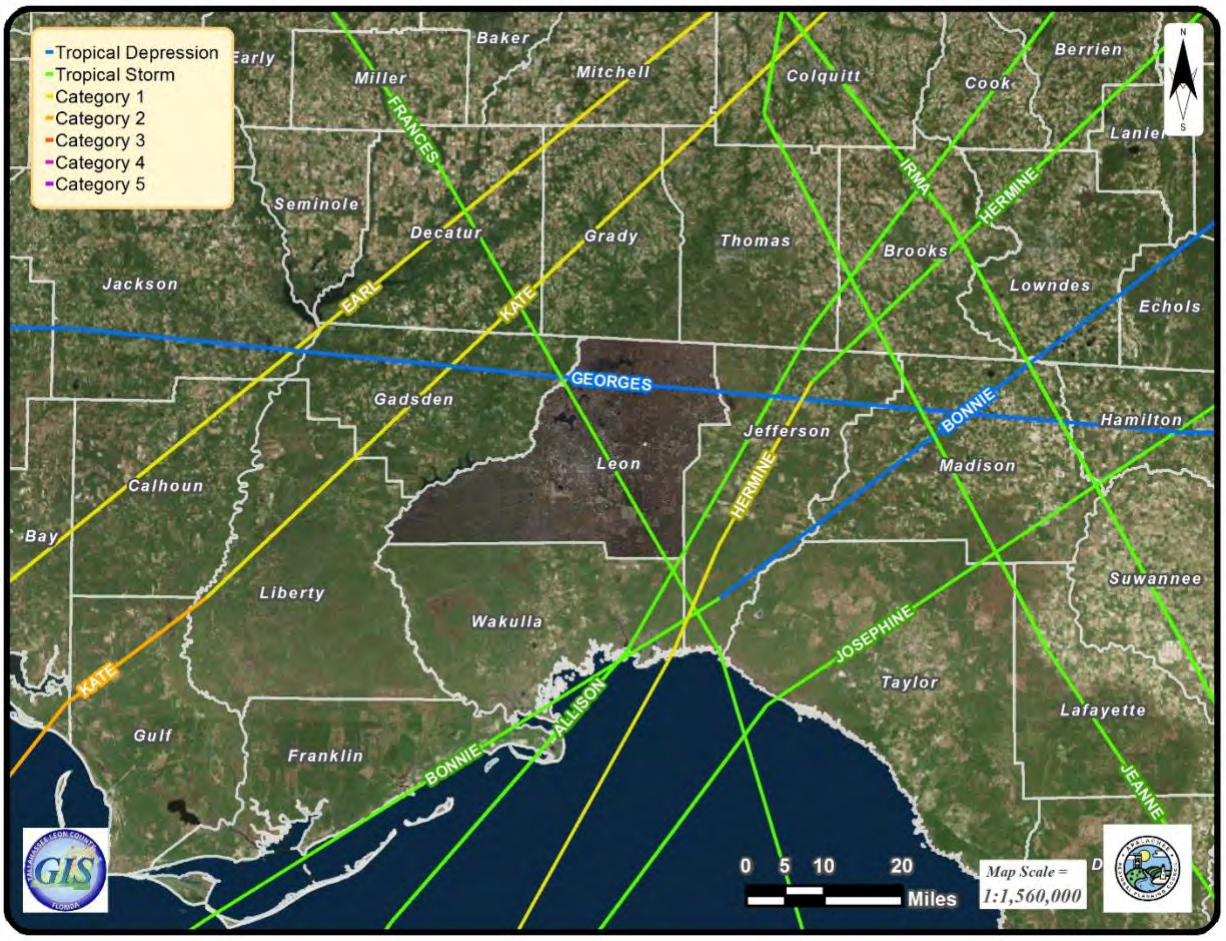
Table 8: Tropical Storms/Hurricanes Affecting Campus of Florida State University since 1985.[12]

Year	Storm	Maximum Sustained Wind	Maximum Wind Gust	Maximum Rainfall	Impact Summary
1953	Hurricane Florence				
1964	Hurricane Dora				
1966	Hurricane Alma				
1972	Hurricane Agnes				
1985	Hurricane Kate	53 mph	87 mph	approx. 3.00 in	Many trees fell, landing on cars, houses, and power lines. Most people were without power for 5 days, and others were without it for up to 3 weeks.
1995	Hurricane Opal	32.2 mph	63.3 mph	1.25 in	
1995	Tropical Storm Erin	31.1 mph	39.1 mph	0.80 in	
1996	Tropical Storm Josephine	28.8 mph	39.1 mph	7.79 in	
1998	Tropical Storm Georges	27.6 mph	33.4 mph	6.42 in	
1998	Tropical Storm Earl	33.4 mph	48.3 mph	5.41 in	
2001	Tropical Storm Allison	10.13 in			1 fatality and 1 injury on campus due to flash flooding. Flash flooding throughout Tallahassee.
2004	Tropical Storm Jeanne	33.4 mph	48.3 mph	1.21 in	
2004	Hurricane Ivan	38 mph	54.1 mph		
2004	Tropical Storm Frances	47.2 mph	59.8 mph	2.48 in	
2005	Hurricane Dennis	38 mph	50.6 mph	6.64 in	FSU Marine Lab damaged by storm surge
2006	Tropical Storm Alberto	34.6 mph	38 mph	3.25 in	
2008	Tropical Storm Fay	26.5 mph	26.5 mph	15.62 in	$95,562 on campus damage. Widespread community flooding.
2009	Tropical Storm Claudette	25.3 mph	39.1 mph	2.1 in	
2012	Tropical Storm Debby	27.6 mph	36.8 mph	5.5 inches on campus. 15-25 inches in Leon/Wakulla counties	Severe flooding in Wakulla County. No impacts on campus.
2016	Hurricane Hermine	47 mph	64 mph	5.54 inches	Campus-wide power outage for approximately 64 hours. Some trees down on campus. 80% of city-county without power for up to 1 week. Numerous trees and power lines down throughout community.
2018	Hurricane Michael	44 mph	71 mph	3.34 inches (TLH Airport) 3.56 (Tallahassee Mall area)	Trees down on campus. 90% of the city-county without power for up to a week. Numerous trees and power lines down throughout community making commuting almost impossible.

[12]https://emergency.fsu.edu/resources/hazards/tropical-storms-hurricanes/tropical-storms-hurricanes-history-fsu.

The federal National Oceanographic and Atmospheric Administration (NOAA) has created an online database of historical hurricane tracks that includes all recorded storm events to date. The following map indicates the historical track of hurricanes passing within 65 miles of Leon County, 1985 – 2013.

Figure 4: Historical Track of Hurricanes Passing within 60 miles of Leon County, 1985 – 2017.[13]



As Figure 3 indicates, there have been many hurricanes and tropical storms passing through or near Leon County over time. These storms can create significant damage even at relatively low intensities. Although Leon County's inland position affords some protection against flooding from storm surge, tropical storms and hurricanes can produce localized flooding from heavy rainfall and damage to trees and structures from strong winds, including power outages.

Two significant hurricane events have occurred since the last LMS update in 2015. On September 2, 2016, Hurricane Hermine, the first hurricane to make landfall in Florida since Hurricane Wilma in 2005, made landfall just east of St. Marks, Florida. High winds from the hurricane knocked down many trees in northwestern Florida, some of which fell onto power lines and roofs. The resulting power outages affected about 325,000 people, roughly 1% of all homes and businesses in the state. In Leon County, where the state capital Tallahassee is, 57% of all residential homes lost power, including approximately

[13]NOAA Historical Hurricane Tracks, 2014, http://coast.noaa.gov/hurricanes/#

80% of the city, as well as Florida State University. Of the 145,000 homes and businesses that lost electricity, 3,685 were still without power six days after the storm. Strong winds in the Tallahassee area caused trees to fall onto several houses, injuring several people. Hermine was the first hurricane to directly affect the city since Hurricane Kate in 1985. Throughout Leon County, 45 homes or businesses were destroyed, 187 suffered severe damage, and 259 experienced minor damage. Losses across Leon County reached $10.3 million.[14]

On October 10, 2018, Hurricane Michael made landfall as a high-end Category 4 hurricane near Mexico Beach, Florida with maximum sustained wind speed of 155 mph and a minimum pressure of 919 mb. Hurricane Michael was an historic and unprecedented storm as the third-most intense hurricane ever to make landfall in the continental United States and the single most intense to impact the Florida Panhandle in recorded history. Hurricane Michael inflicted widespread damage throughout the Panhandle and Big Bend area which spread well inland as Michael remained at hurricane strength into southwest Georgia and brought tropical storm force gusts as far north as Atlanta. Leon County experienced tropical storm-force wind gusts for a prolonged period of approximately 12 hours causing hundreds of downed trees that blocked over 1,000 roads, left approximately 135,000 electric utility customers in Leon County without power (95% of all customers countywide), and damaged homes and other infrastructure throughout the County. By comparison, Leon County experienced tropical storm-force winds for approximately 4 hours, with a peak gust of 64 miles per hour during Hurricane Hermine in 2016. Due to the intensity of the storm, many of the weather gauges in Leon County and throughout the affected area were knocked out. The gauge at the Tallahassee International Airport recorded a maximum of 47 mph sustained winds with a peak gust of 71 mph; however, areas further west in Leon County likely received significantly higher winds. Average rainfall throughout Leon County from Hurricane Michael totaled approximately 2.5” to 3”.[15]

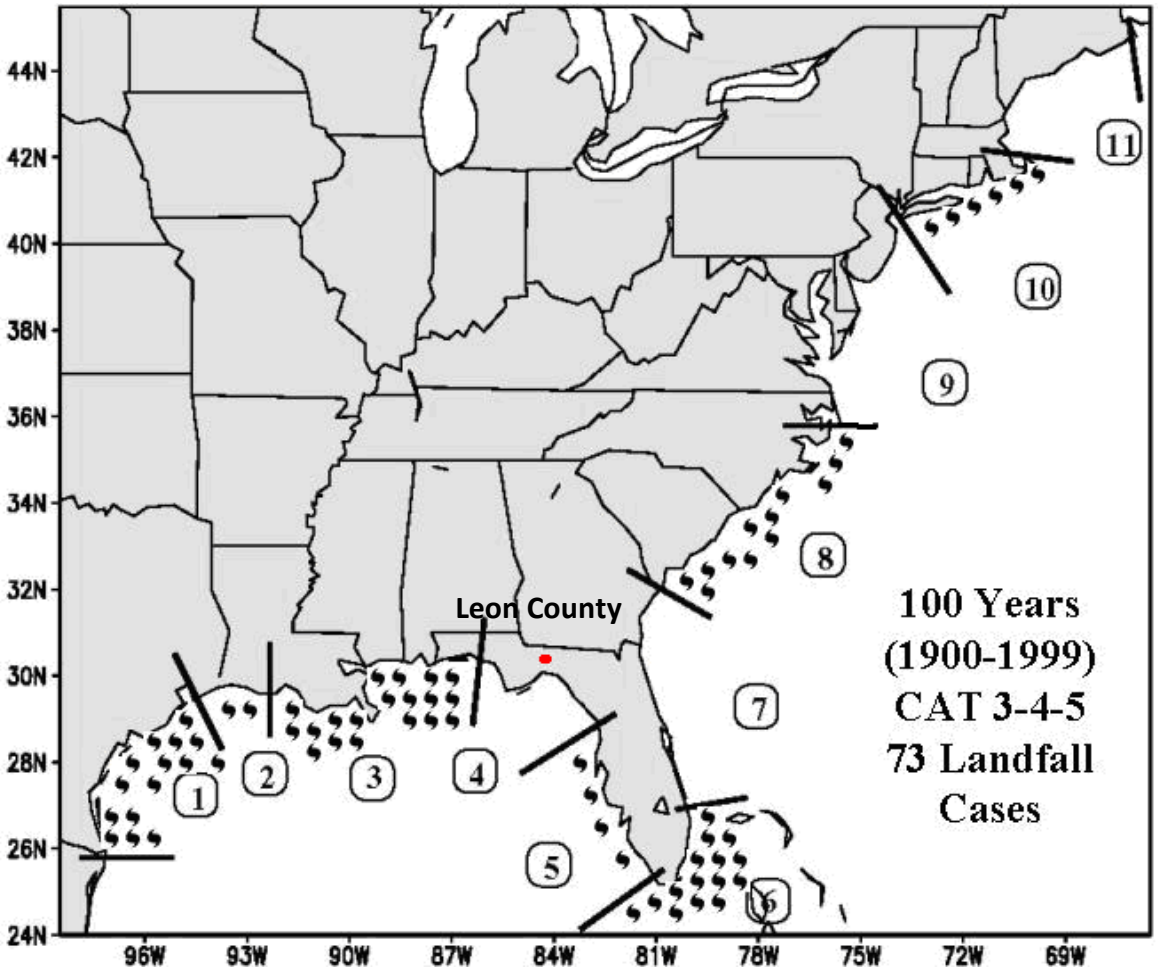
Probability of Landfall

The United States Landfalling Hurricane Probability Project is a joint effort between the Tropical Meteorology Project at Colorado State University (CSU), Fort Collins, CO and the GeoGraphics Laboratory at Bridgewater State College, Bridgewater, MA. Coordinated by Dr. William Gray, the project has calculated the tropical cyclone landfall and wind gust probabilities for the eastern United States coastline form Brownsville, Texas to Eastport, Maine. The United States Landfalling Hurricane Probability Project web page[16] can help communities assess the statistical chances of high winds resulting from tropical cyclones striking their particular region or county in any particular year.

The following figure displays the Landfall Probabilities Regional Map. This map displays the division of the Gulf and Atlantic Coasts into regions based on frequency of intense or major hurricane (Category 3 to 5 on the Saffir-Simpson scale) landfalls during the 20th century (1900-1999). Leon County is located in Region Four (Bay, Gulf, Washington, Calhoun, Franklin, Wakulla, Jefferson, Liberty, Gadsden, Leon, Taylor, Dixie, Levy, Madison, Lafayette, Gilchrist, and Citrus counties).

14 https://en.wikipedia.org/wiki/Hurricane_Hermine#cite_note-60.
15 http://www.leoncountyfl.gov/MichaelAAR.
16 United States Landfalling Hurricane Probability Project, http://www.e-transit.org/hurricane/welcome.html.

Figure 5: Landfall Probabilities Regional Map, 2014.[17]



The following tables display the tropical cyclone landfall and wind gust probabilities for Region Four and Leon County, Florida during 2019.

Table 9: 2014 Tropical Cyclone Landfall Probabilities by Region (Climatology in Parentheses), 2019.[18]

Region Number	Probability of 1 or More Named Storms Making Landfall in the Region	Probability of 1 or More Hurricanes Making Landfall in the Region	Probability of 1 or More Intense Hurricanes Making Landfall in the Region
4	30.5% (29.3%)	14.5% (13.9%)	1.6% (1.6%)

[17]Ibid.
[18] bid.

Table 10: Tropical Cyclone Landfall Probabilities by County (Climatology in Parentheses), 2019.[19]

County Name	Probability of 1 or More Named Storms Making Landfall in the County	Probability of 1 or More Hurricanes Making Landfall in the County	Probability of 1 or More Intense Hurricanes Making Landfall in the County	Probability of Tropical Storm-Force (>= 40 mph) Wind Gusts in the County	Probability of Hurricane-Force (>= 75 mph) Wind Gusts in the County	Probability of Intense Hurricane-Force (>= 115 mph) Wind Gusts in the County
Leon	4.1% (3.9%)	1.8% (1.7%)	0.2% (0.2%)	22.8% (21.9%)	6.6% (6.3%)	1.7% (1.6%)

Table 11: 50-Year Tropical Cyclone Landfall Probabilities by Region (Climatology in Parentheses), 2019.[20]

Region Number	50 Year Probability of 1 or More Named Storms Making Landfall in the Region	50 Year Probability of 1 or More Hurricanes Making Landfall in the Region	50 Year Probability of 1 or More Intense Hurricanes Making Landfall in the Region
4	>99.9%	>99.9%	54.8%

Table 12: Tropical Cyclone Landfall Probabilities by County, 2019.[21]

County Name	50 Year Probability of 1 or More Named Storms Making Landfall in the County	50 Year Probability of 1 or More Hurricanes Making Landfall in the County	50 Year Probability of 1 or More Intense Hurricanes Making Landfall in the County	50 Year Probability of Tropical Storm-Force (>= 40 mph) Wind Gusts in the County	50 Year Probability of Hurricane-Force (>= 75 mph) Wind Gusts in the County	50 Year Probability of Intense Hurricane-Force (>= 115 mph) Wind Gusts in the County
Leon	86.6%	57.6%	8.6%	>99.9%	96.5%	55.4%

Fifty-year probabilities were included in this study because most structures are built to last at least 50 years. Therefore, construction decisions on the cost of hurricane-protecting building materials should be based on the longer period if there is a significant likelihood of a hurricane making landfall over the lifespan of a residential or other building of value.

Tables 9 and 10 indicate a relatively low probability of a tropical cyclone (tropical storm or hurricane) making landfall in 2019 in Region 4 (Big Bend coast of Florida) or Leon County. However, Table 12 clearly indicates that over a 50-year period, there is an 86.6% chance of a named storm making landfall in Leon County, and a 55.4% chance of an intense hurricane (Category 3, 4, or 5 on the Saffir-Simpson scale, which could affect all of Leon County if it strikes the coast within 50 miles of the City of Tallahassee).

The most anticipated hurricane events for Leon County and the City of Tallahassee include a slow-moving, category 1 hurricane with heavy rain, a faster-moving category 1 storm with a similar path to Hurricane Kate in 1985 and the devastating storm of 1877, or a Category 3 storm with the similar path. However, as indicated by Hurricane Michael in late 2018, there is also a possibility, albeit remote, of a Category 5 hurricane striking the Gulf Coast south of Leon County. Although it is likely that such a

[19] Ibid.
[20] Ibid.
[21] Ibid.

storm would weaken to a Category 4 by the time it reached Leon County, it would still be devastating across a wide region, as was Hurricane Michael.

Storm Surge

There are no records of storm surges or tsunamis directly affecting Leon County. An event that would have created such surges if it had come ashore south of Leon County occurred in 1993. Beginning on March 12 and subsiding on March 15, 1993, a large cyclonic storm swept through the eastern coast of the North America. Named the 1993 Superstorm or the Great Blizzard of 1993, this storm stretched from Central America to Canada, and was unique for its intensity, massive size, and wide-reaching effect. The Florida Panhandle reported up to four inches of snow, with hurricane-force wind gusts and record low barometric pressures. Between Louisiana and Cuba, hurricane-force winds produced extreme storm surges in the Gulf of Mexico, which along with scattered tornados killed dozens of people.[22] The Superstorm also produced substantial storm surge along the Gulf Coast from Apalachee Bay in the Florida panhandle to south of Tampa Bay. Storm surges in those areas reached up to 12 feet, higher than many hurricanes. The following figure displays estimated heights for storm surge produced by the 1993 Superstorm.

[22] Storm of the Century, Wikipedia, The Free Online Encyclopedia, 2009. <http://en.wikipedia.org/wiki/Storm_of_the_Century_(1993)>

Figure 6: NOAA Estimate of Storm Surges along Florida's Gulf Coast, 13 March 1993.[23]

Despite the significant heights of storm surges associated with the 1993 Superstorm, the storm surge did not reach Leon County.

Estimated Impacts, Probability, and Extent

A wide variety of residential, commercial, and public buildings, as well as critical facilities and infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by several of the impacts associated with hurricanes. Wind and water are the most common

[23] Ibid.

hazards associated with hurricanes, and both can be tremendously destructive and deadly. These hazards include tornados, heavy rainfall, waves in coastal areas, and flooding. Because Leon County is not a coastal county, it is not subject to waves, but storm surges of sea levels can affect the southernmost part of the County as indicated in Figure 5 below, and flooding can occur in mapped floodprone areas of the County, as well as upland areas depending on the amount, rate, and duration of rainfall.

Overall, based on these probabilities and the historical record, the probability of a hurricane or a tropical storm affecting Leon County and the City of Tallahassee is **occasional** as defined under Section 2.2.1 Risk.

Hazus GIS Vulnerability and Risk Assessment Results

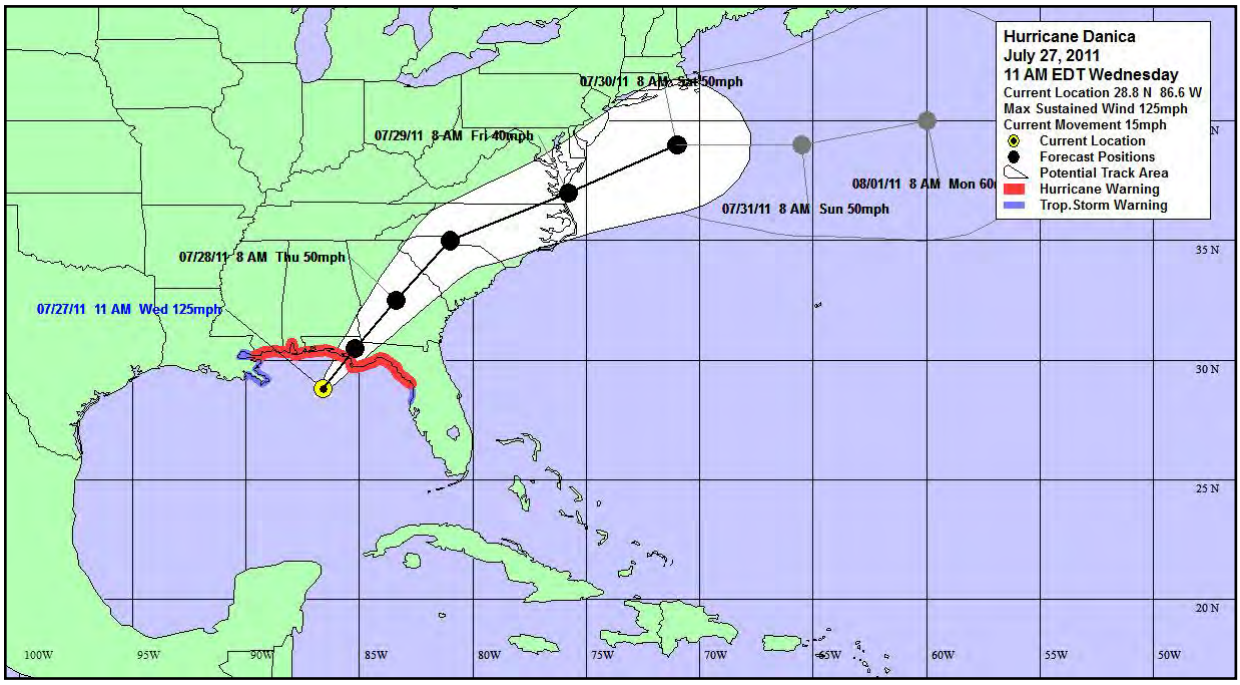
The vulnerability assessments results were generated using the Tallahassee/Leon County GIS Department's geospatial databases for improved property (structures), critical facilities, other essential facilities and properties of cultural significance. Building vulnerability was assessed using Hazus-MH 4.2 for hurricane wind and flooding. Hazus-MH 4.2 calculates losses that are due to building and contents damage and monetary losses resulting from loss of function. Losses are not calculated for individual buildings, but instead are based on the performances of entire occupancy classes of buildings (i.e., residential, commercial and other).

1. Hurricane Wind Analysis

   For comparison purposes, three deterministic scenarios were used to examine potential impact from tropical weather events. The Tallahassee Office of the National Weather Service provided two of the tropical weather scenarios which included a slow moving, category 1 hurricane with heavy rain and the devastating storm of 1877 as a category 3 storm. The Florida Division of Emergency Management (FDEM) also used the data from Hurricane Michael to create a similar scenario but with a more direct impact on Leon County. FDEM used the Hazus-MH 4.2 Wind Model to calculate the economic impact from these three scenarios; those data are included here and discussed.

   The figure below shows the path of the category 3 hurricane, which is the most likely scenario that will require activation of the Leon County PDRP.

Figure 7: Category 3 Hurricane Path



The Tallahassee-Leon County GIS office Based on the default data included in Hazus-MH, which uses U.S. Census 2010 tract data and 2006 R.S. Means building valuations, there is an estimated 94,270 buildings with a total replacement value of $33.6 billion in Leon County. The building count and dollar exposure, by property type, are listed in the table below.

Table 13: General Building Stock in Leon County.

Property Type	Number of Properties	Value
Residential	85,356	$22,225,130,000
Commercial	5,225	$4,469,287,000
Government	2,131	$2,905,398,000
Industrial	2,034	$535,740,000
Education	1,647	$2,820,244,000
Religious	2,423	$518,324,000
Agriculture	291	$141,474,000

Source: Tallahassee-Leon County GIS

The table below lists the facilities included in Hazus-MH 4.2 the model; whenever possible local data was used to augment the model data. The facilities indicated with an * are considered to be "essential" facilities by FEMA and are included in calculating damages.

Table 14: Essential Facilities.

Facility	Data Source
Fire Stations*	Hazus and local GIS Data
Police Stations*	Hazus
EOCs*	Hazus and local GIS Data
Communications	Hazus
Medical Care Facilities*	Hazus
Schools*	Hazus and Local GIS Data
General Building Stock*	Hazus
Dams and Levees	Hazus
Highways	Hazus
Railways	Hazus
Bus	Hazus
Airport	Hazus
Wastewater Facilities	Hazus
Electric Generating Facilities	Hazus
Hazardous Materials	Hazus
Demographics	Hazus

a. Category 3 Hurricane Deterministic Scenario

Based on the Category 3 hurricane deterministic scenario input into Hazus-MH 4.2, the model estimates that approximately 10,921 buildings will be moderately damaged, and 370 buildings will be totally destroyed. The tables below display the estimated economic losses by property type and the estimated damage count also by property type.

Table 15: Economic Loss – Category 3 Hurricane.[24]

Property Type	Value
Residential	$1,412,286,000
Commercial	$228,178,000
Industrial	$25,220,000
Other	$274,759,000
Business Interruption	$413,319
Total Direct Economic Loss	**$2,353,764**

Source: Hazus-MH 4.2

[24] The building related losses are broken into two categories: direct property losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

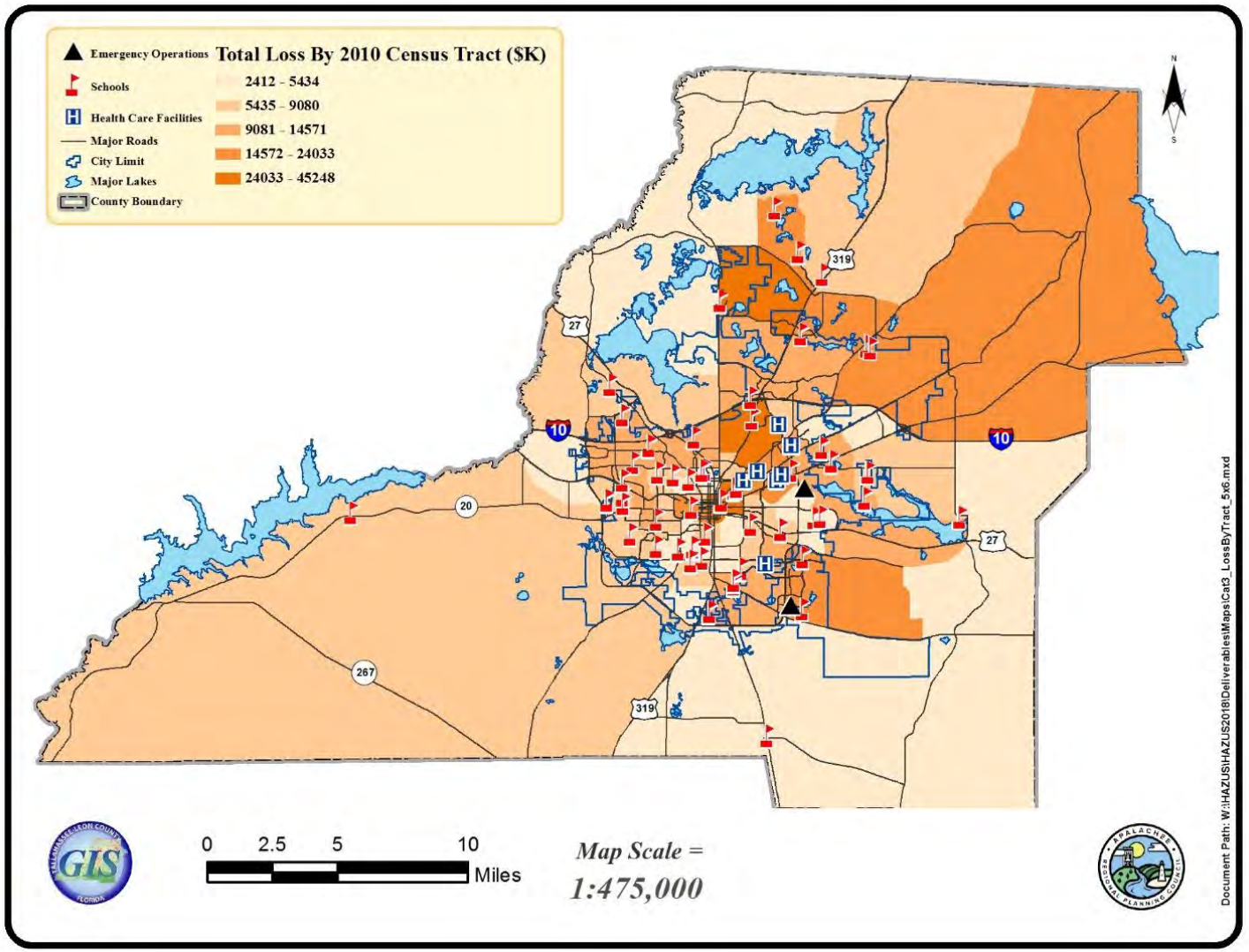
Table 16: Damage by Property Type – Category 3 Hurricane.

Property Type	Moderate	Severe	Destruction
Residential	9,293	1,037	351
Commercial	977	268	11
Government	164	51	0
Industrial	208	66	0
Education	116	42	0
Religious	74	18	0
Agriculture	89	44	8

Source: Hazus-MH 4.2

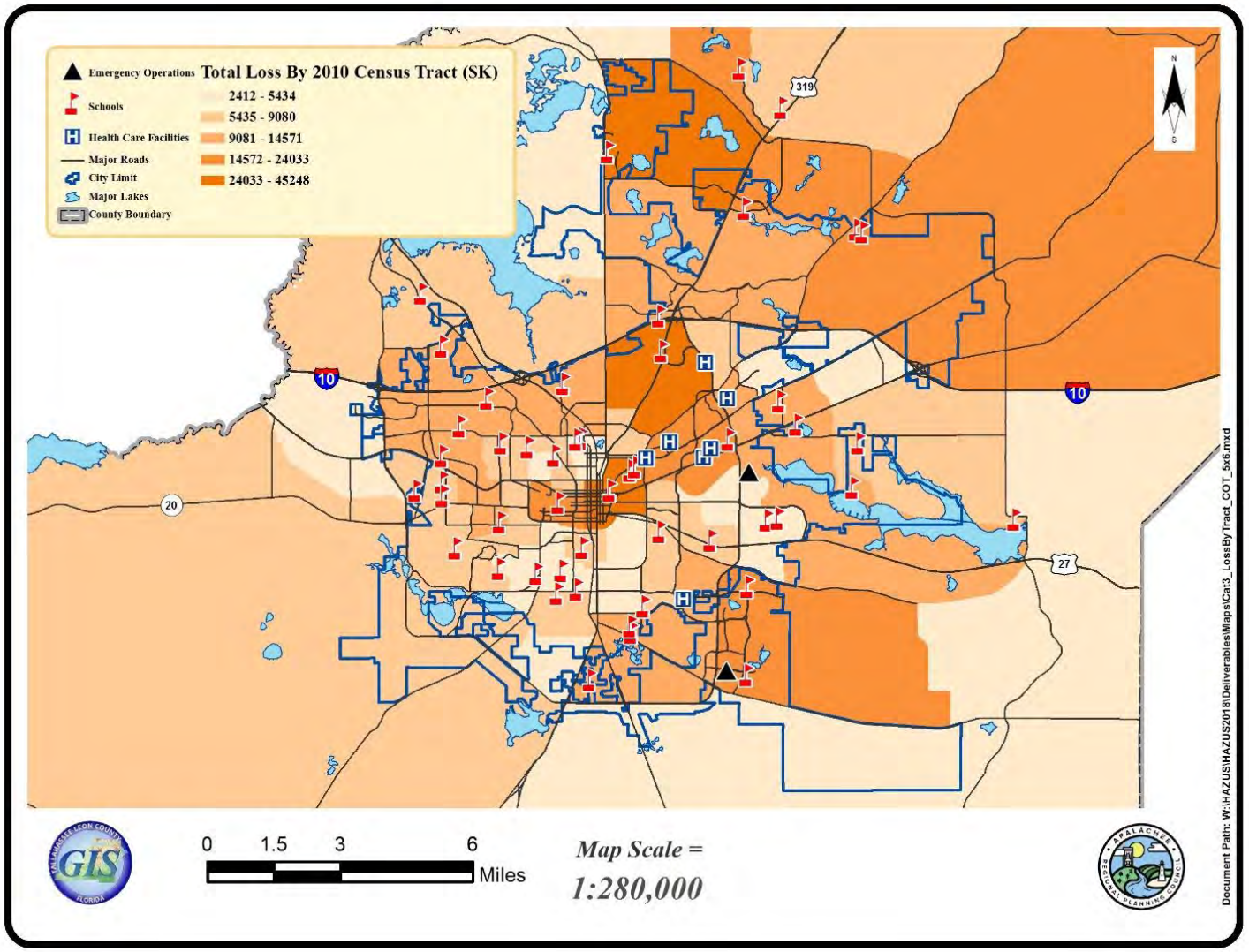
The total property damage losses were $1.94 million, the largest loss was sustained by residential occupancies which account for over 69% of the total loss. Approximately 351 residences will be damaged enough to displace those families for a lengthy duration of time. This will require both long-term housing and social services to be provided if these families are to remain in the community. The maps below display the extent of loss by census tract in both the county and the city for the hypothetical Category 3 hurricane.

Figure 8: Category 3 Hurricane Loss by Census Tract – Leon County



Source: Hazus-MH 4.2.

Figure 9: Category 3 Hurricane Loss by Census Tract – City of Tallahassee



Source: Hazus-MH 4.2.

b. Hurricane Michael 2018 Deterministic Scenario
In this scenario, the parameters from Hurricane Michael parameters were used to determine the impacts with peak wind gusts of 145 mph in Leon County. Given the strength Hurricane Michael maintained as it traveled inland, this level of impact in Leon County is a plausible worst-case scenario. The tables below display the estimated economic losses by property type and the estimated damage count also by property type.

Table 17: Economic Loss - Category 4 Hurricane

Property Type	Value
Residential	$6,618,774,000
Commercial	$1,358,096,000
Industrial	$132,067,000
Other	$1,597,957,000
Business Interruption*	$2,121,335,000
Total Direct Economic Loss*	**$11,828,231,000**

Source: Hazus-MH 4.2

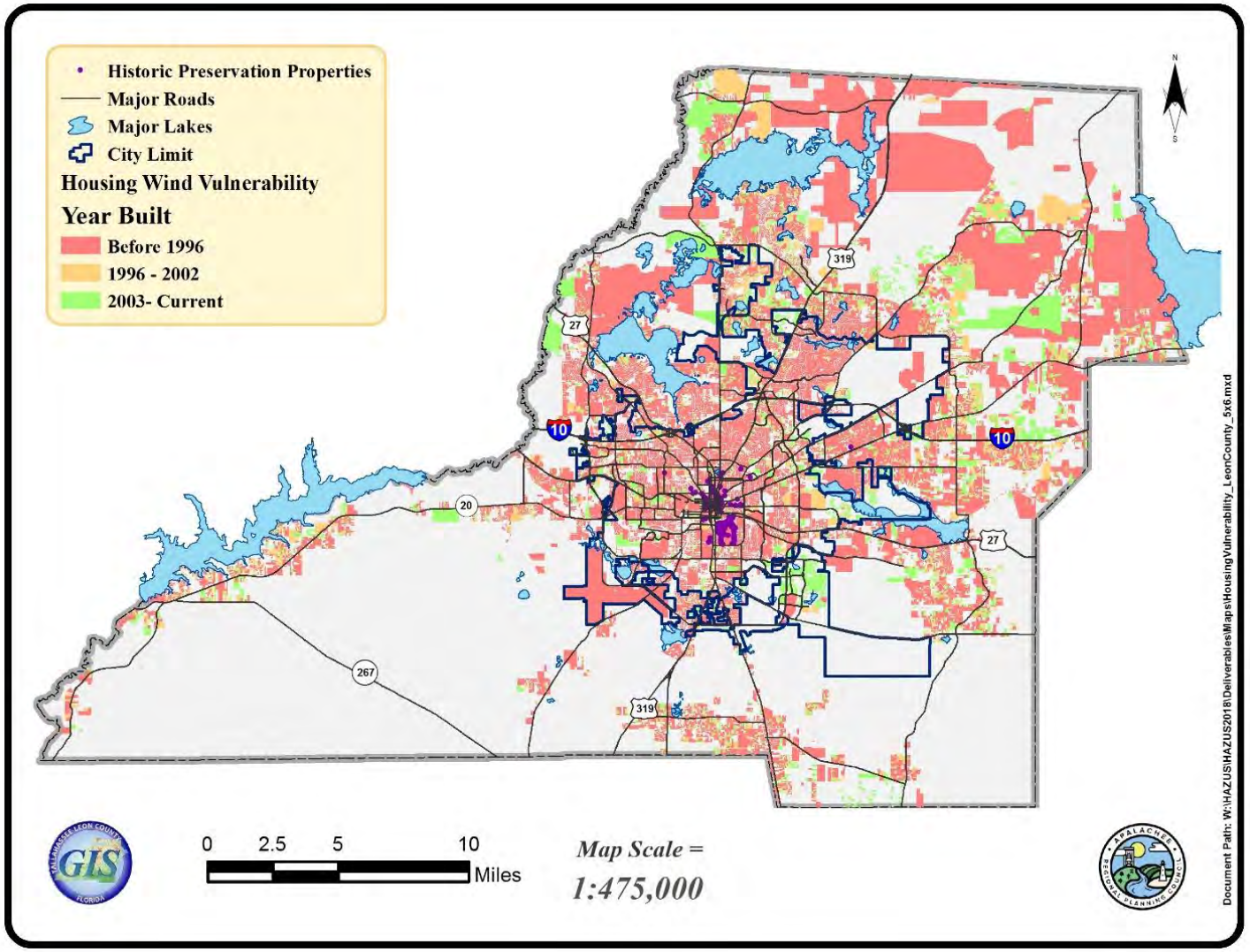
Table 18: Damage by Property Type – Category 4 Hurricane

Property Type	Moderate	Severe	Destruction
Residential	28,785	11,973	4,474
Commercial	1,759	1,756	99
Government	280	334	1
Industrial	351	392	1
Education	175	326	0
Religious	163	146	1
Agriculture	217	182	58

Source: Hazus-MH 4.2

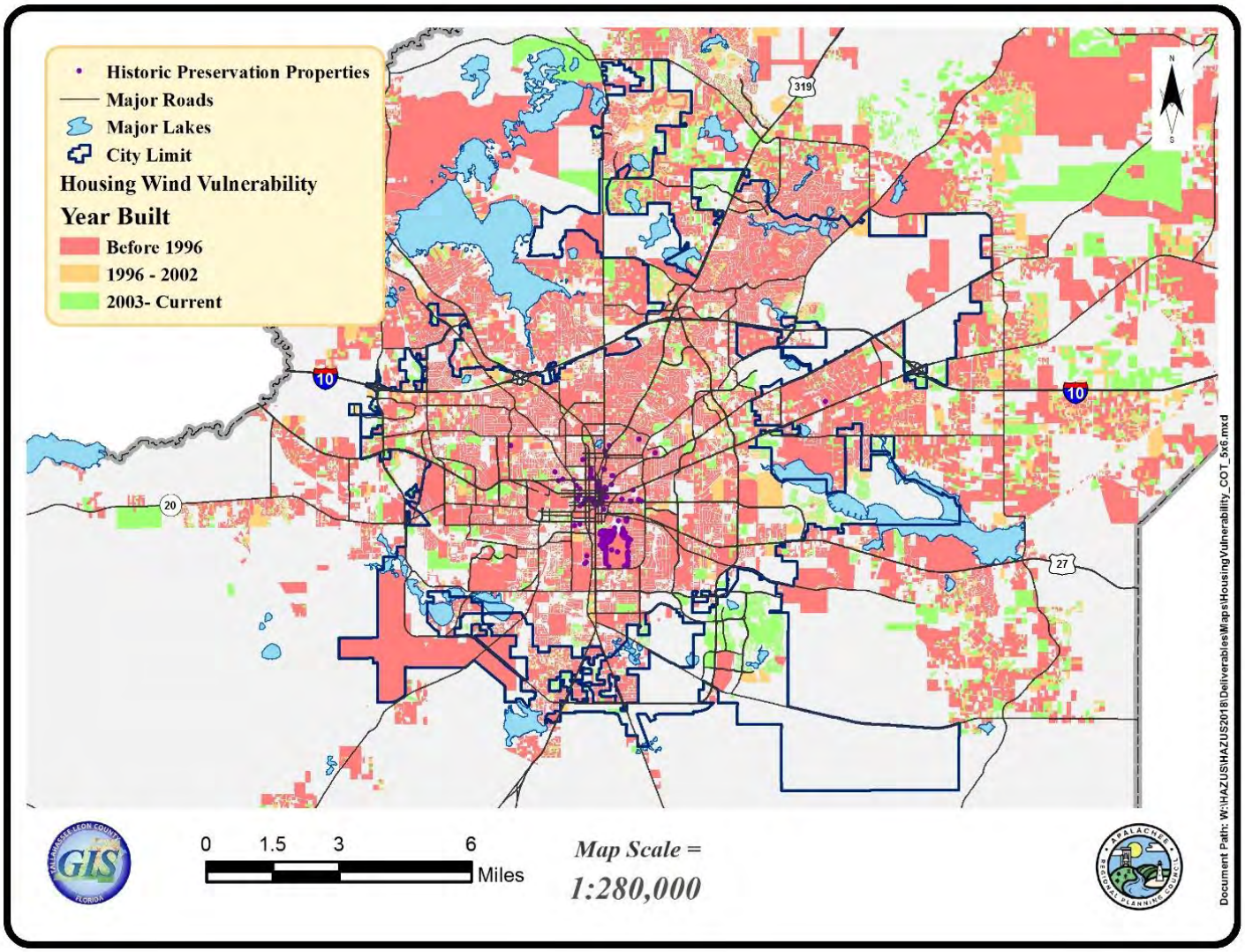
c. In 1951 the City of Tallahassee officially adopted the Southern Standard Building Code by ordinance as the first building code in the city. The Leon County Building Inspection Department was established in 1973 and the 1976 Standard Building Code was adopted. The 2001 Florida Building Code (FBC) was the first statewide code issued and was adopted by both the city and the county. Both the city and the county adopted and enforce the FBC which became effective March 1, 2009. Working with the Leon County Property Appraiser database and building officials from both the City of Tallahassee and Leon County, structural vulnerability was determined based on building codes in place in over the last six decades. The following maps indicate structural vulnerability based on the date of construction in the city and the county. They also include properties on the National Register of Historic Places. Mobile homes are also particularly susceptible to hurricanes. Several mobile home clusters are located within storm surge zones as indicated in a following map below.

Figure 10: Housing Vulnerability – Leon County



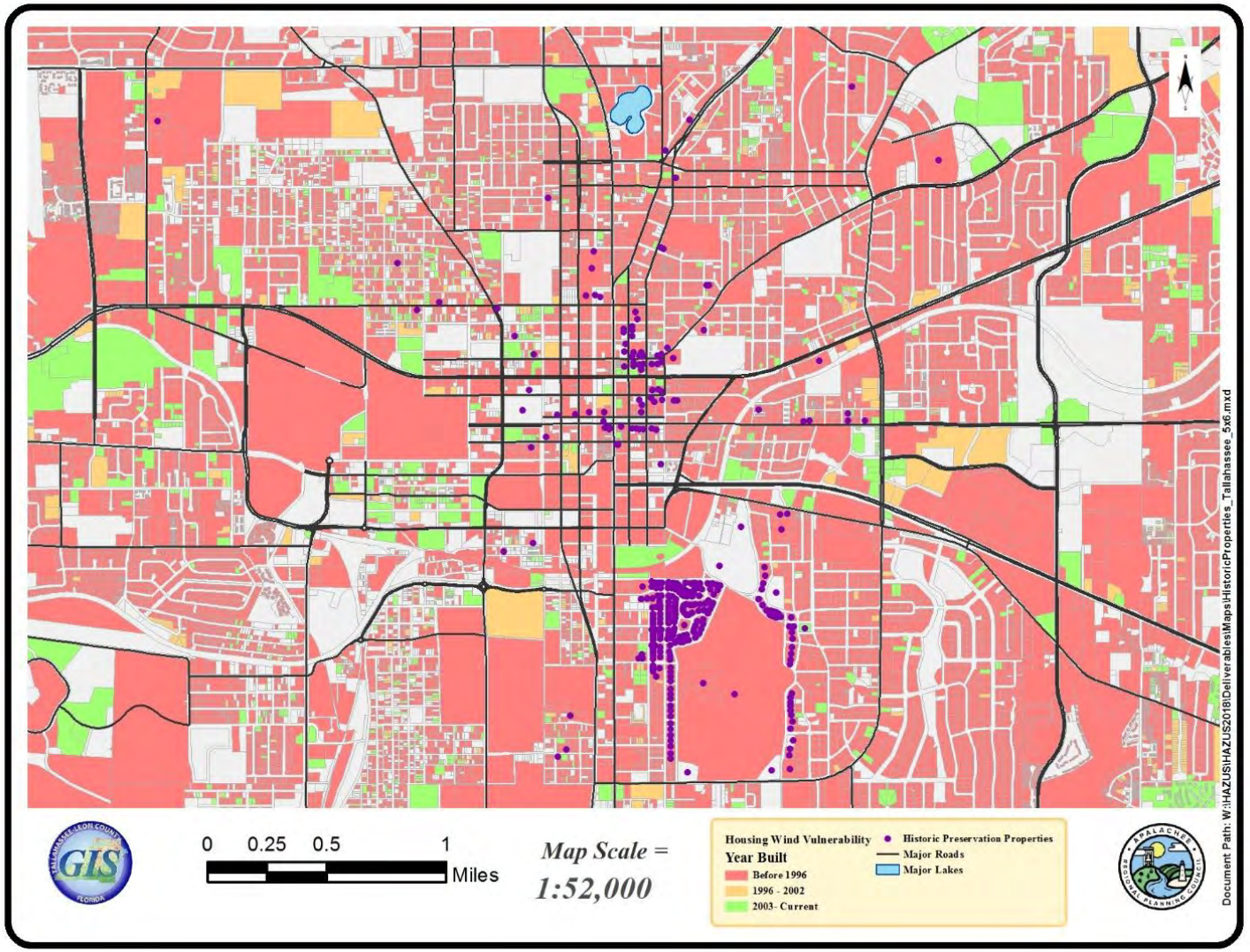
Source: Tallahassee-Leon County GIS

Figure 11: Housing Vulnerability – City of Tallahassee



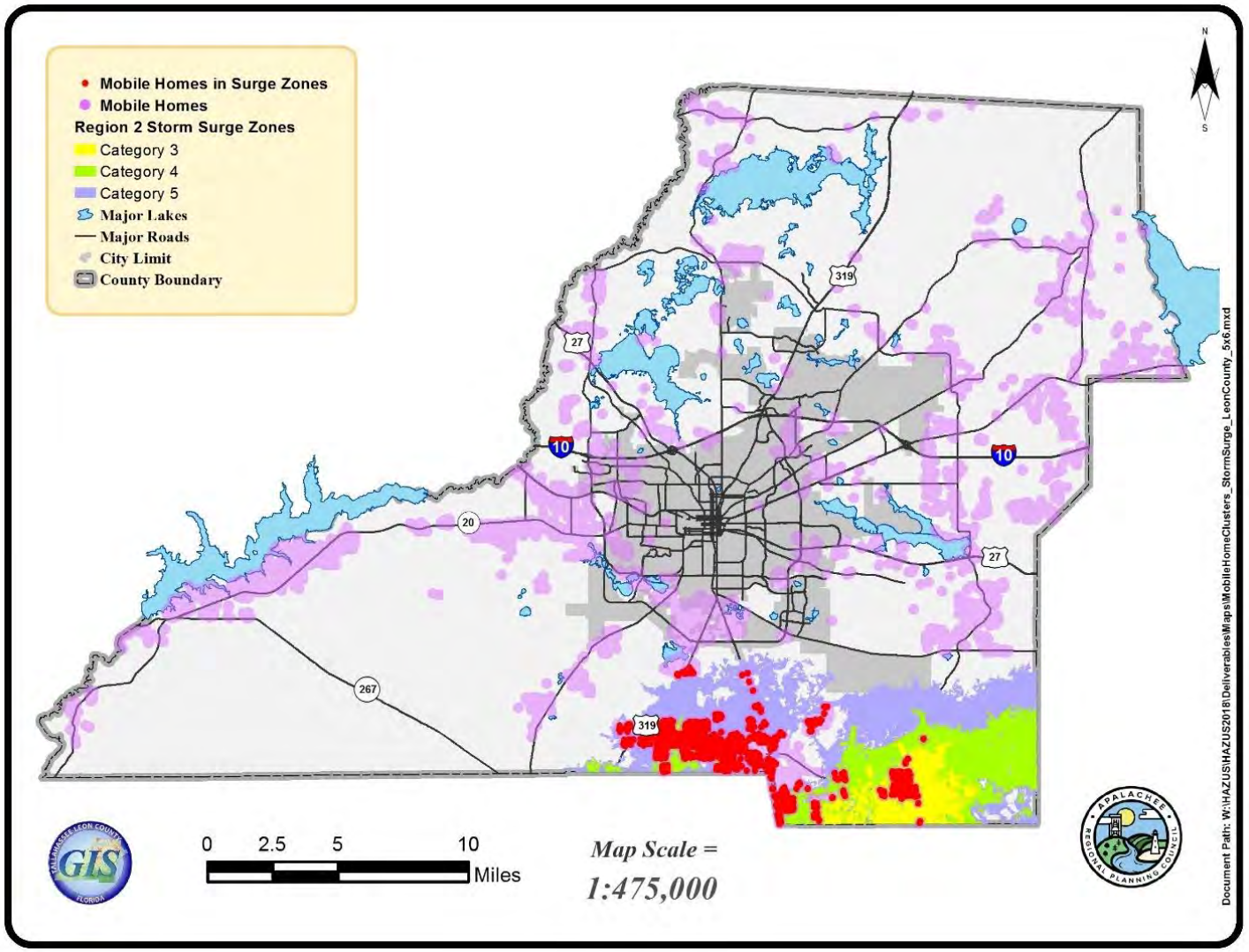
Source: Tallahassee-Leon County GIS

Figure 12: Historic Properties in the City of Tallahassee



Source: Tallahassee-Leon County GIS

Figure 13: Mobile Home Cluster and Hurricane Storm Surge



Source: Tallahassee-Leon County GIS

d. Category 1 Hurricane Deterministic Scenario

In comparison, the economic loss from a category 1 hurricane is significantly less than that of a category 3 or 4 hurricane. The estimated total property damages are $253 million, but again the largest loss was to residences which accounted for 90% of the total loss. The number of households that may need long-term housing is also significantly less. Less than 15 residences will be significantly damaged in comparison with more than 1,350 from the same hurricane making landfall as a category 3 storm. The tables below display the economic loss and damage by property type from Hazus-MH 4.2 for an impact from a category 1 hurricane.

Table 19: Economic Loss - Category 1 Hurricane

Property Type	Value
Residential	$213,716,000
Commercial	$6,888,000
Industrial	$569,000
Other	$6,767,000
Business Interruption	$24,897,000
Total Direct Economic Loss	**$252,837,000**

Table 20: Damage by Property Type – Category 1 Hurricane

Property Type	Moderate	Severe	Destruction
Residential	334	10	1
Commercial	25	1	0
Government	3	0	0
Industrial	4	0	0
Education	3	0	0
Religious	1	0	0
Agriculture	4	0	0

e. Behavioral Analysis

According to the Apalachee Regional Evacuation Study published in 2010, 70% of the population residing in mobile or manufactured homes intends to evacuate for a category 3 hurricane while only 20% of the residents state they will leave if they live in a site built home. The majority of the evacuating population, 70% from site-built homes and 50% from mobile or manufactured homes, state they will leave their county while less than 10% intend to use a public shelter. The table below display evacuation rates for Leon County.

Table 21: Leon County Evacuation Rates

Housing Type	Storm Threat Scenario				
	Cat 1	**Cat 2**	**Cat 3**	**Cat 4**	**Cat 5**
Site Built	5%	10%	20%	25%	30%
Mobile or Manufactured Home	50%	55%	70%	80%	85%

Source: Apalachee Regional Evacuation Study, 2010

Debris

Besides the damage severe weather (storm) events can produce, high winds can also create significant quantities of debris from downed trees, branches and damaged buildings. This debris can impede emergency management efforts; present a safety hazard for emergency and repair workers and citizens; and present significant storage and disposal issues.

A 1999 study by the Florida Department of Community Affairs was conducted to estimate how much debris may be produced by different storm intensities. The objective was to help local governments assess their capacity to collect and dispose of debris in the post-storm period. For this study, DCA utilized the TAOS model to estimate the number and type of parcels that will produce debris of 10 cubic yards/acre or more for each of the six storm intensities.[25]

The data generated by the TAOS model are presented in Table 20. Structure types are classified as mobile homes, residential, commercial, and industrial. The winds produced by a tropical storm do not significantly contribute to the production of debris of more than 10 cubic yards/acre, as most parcels remain unaffected in the city and county. However, a Category 1 storm results in a significant increase in debris production. Affected parcel percentages for the study area range from 55-77 percent, while county percentages are much lower at 21-33 percent. This is probably due to fewer structures in the unincorporated areas. The most telling TAOS model prediction is that nearly 100 percent of all parcels will produce debris of 10 cubic yards/acre or more for the remaining storm intensities.

Table 22: Debris Produced by Tropical Storms and Hurricanes.[26]

Structure Type	Debris Of 10 Cubic Yards Or More Per Acre[27]											
	Tropical Storm				Category 1 Storm				Category 2 Storm			
	City Parcels		Co. Parcels		City Parcels		Co. Parcels		City Parcels		Co. Parcels	
	#	%	#	%	#	%	#	%	#	%	#	%
Mobile Homes	2	<1	32	<1	396	55	1,081	21	724	100	5,194	99
Residential	623	2	199	<1	23,837	63	4,869	21	37,586	100	22,997	99
Commercial	11	<1	3	<1	1,658	68	154	44	2,432	100	352	99
Industrial	3	<1	1	<1	431	74	95	35	586	100	269	99
Govt./Educ.	9	<1	0	0	861	77	120	33	1,125	100	367	99

[25] Ten cubic yards of debris was selected as a threshold level for this analysis because it approximates the carrying capacity of a standard dump truck.

[26] Source: DCA, TAOS, 1999.

[27] All parcels are affected with 10 cubic yards or more of debris/acre in Category 3-5 storms.

Following a major storm event, there is usually significant public pressure to reinstate electrical power as quickly as possible, among other services. Electric power makes possible air conditioning, lights, preservation of food, and use of computers and cell phones, which are increasingly essential infrastructure, especially in an emergency situation.

Actions that can be taken to mitigate the potential impact of debris on local transportation and power distribution systems include the replacement of aboveground lines with buried lines, and the trimming of trees around above-ground electrical infrastructure such as poles and power lines. However, burying power lines in existing developed areas can be time-consuming and expensive, as well as impact existing trees. Additionally, underground lines may cost more to service than above ground lines, although the rate of required service may be less.

Trimming trees is regularly conducted by the City of Tallahassee. Many homeowners also trim trees on their property for the same reasons. Keeping trees trimmed and healthy is one of the single best actions homeowners and other property owners can take to mitigate the effects of major storms.

In 1951 the City of Tallahassee officially adopted the Southern Standard Building Code by ordinance as the first building code in the city. The Leon County Building Inspection Department was established in 1973 and the 1976 Standard Building Code was adopted. The 2001 Florida Building Code (FBC) was the first statewide code issued and was adopted by both the city and the county. Both the city and the county adopted and enforce the FBC which became effective March 1, 2009. Working with the Leon County Property Appraiser database and building officials from both the City of Tallahassee and Leon County, structural vulnerability was determined based on building codes in place in over the last six decades. The following maps indicate structural vulnerability based on the date of construction in the city and the county. They also include properties on the National Register of Historic Places.

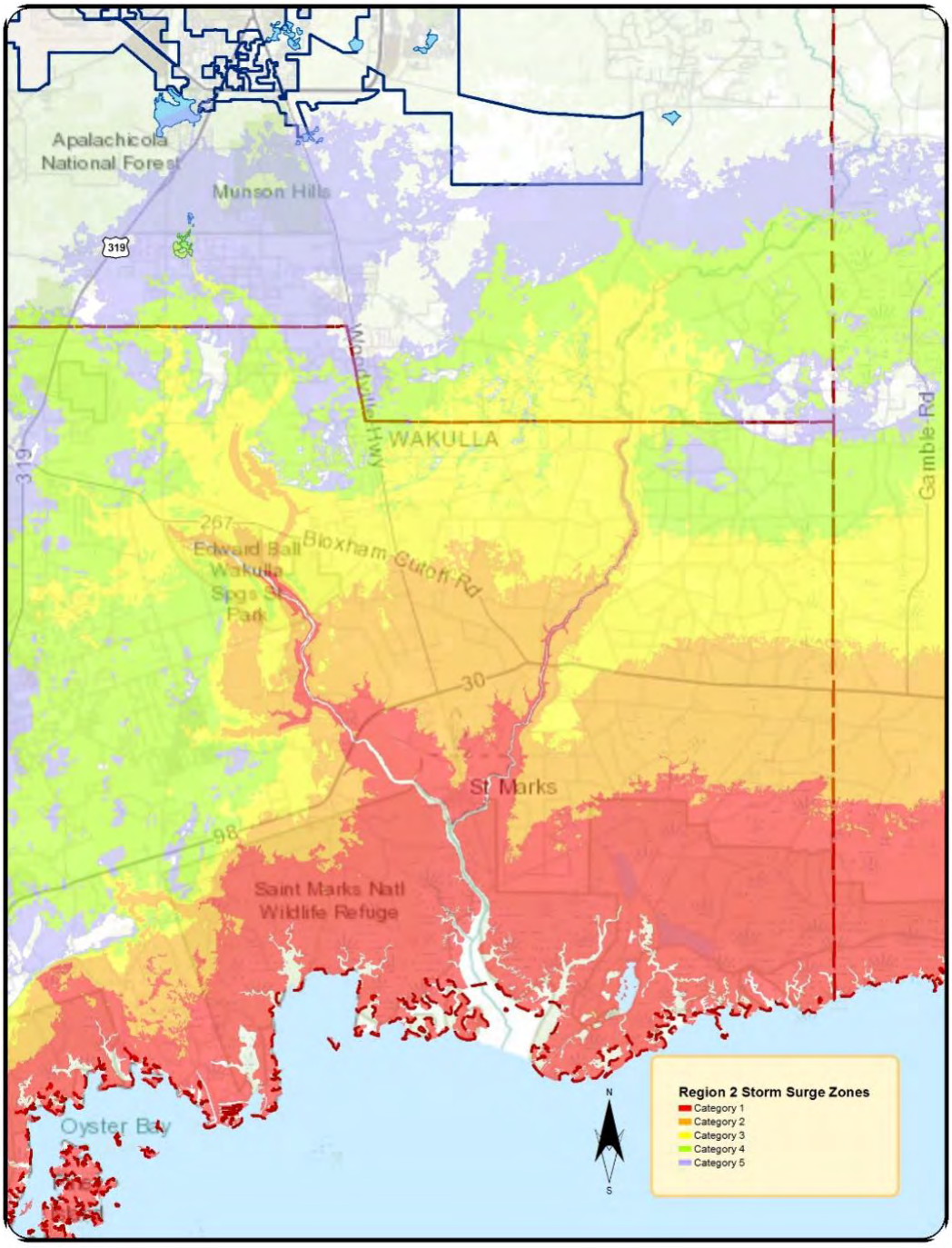
Storm Surge

Storm surges can affect river and stream valleys and adjacent low-lying lands along the southern and southeastern borders of Leon County. High water, particularly moving water commonly associated with tsunamis, can damage structures and other property, and sweep away people, livestock, and other living beings and materials.

The following figure indicates the predicted extent and vulnerability within Leon County to flood damage from a tropical cyclone storm surge. A storm surge appears in Leon County beginning with a Category 3 storm (see Maps 3-5). Affected areas include the southern portion of Leon County just north of Munson Slough and in the southeast along the St. Marks River.

A storm surge from a Category 3 or 4 hurricane would reach the southernmost areas of Leon County within the 100-year floodprone areas south of Oak Ridge Road and the county line (also known as the southern reaches of the Munson Slough), and within the lowlands surrounding the St. Marks River in the extreme southeast corner of Leon County. The storm surge from a Category 5 hurricane is projected to reach almost all the way to Tram Road and Capital Circle as indicated. The level of expected flooding from a storm surge depends on many factors, but for a Category 5 hurricane, storm surges could reach 24’in depth in Leon County, as occurred during Hurricane Camille in 1969 in Mississippi.

Figure 14: Estimated Hurricane Storm Surge within Franklin and Leon counties.[28]



The impacts of this flooding would affect residential and other structures and associated infrastructure such as septic tanks, along with roadways within these areas. Injuries and fatalities would be very

[28] Apalachee Regional Planning Council, 2018.

limited in these areas given advance warning and a mandatory evacuation. A tsunami, although unlikely, would provide little to possibly no warning, unlike a hurricane.

Based on this and the historical record, the probability of a tsunami affecting Leon County and the City of Tallahassee is **unlikely** as defined under Section 2.2.1 Risk. However, the probability based on the historical record of a storm surge event, which is associated with tropical cyclones affecting Leon County and the City of Tallahassee is **occasional**.

Vulnerability Summary

Based on the Hazus modeling results, Leon County and the City of Tallahassee are vulnerable to property damage from wind, water, and flooding resulting from hurricanes and tropical storms, including storm surges associated with Category 3 or stronger hurricanes. (Flooding will be discussed in further detail later in this document.) Wind and water damages are highly correlated with storm intensity, and property-specific and area-wide flooding is correlated with storm size and speed, not necessarily intensity. Due to Leon County's inland location, a majority of damage will be caused from high winds. The southern border area of Leon County is also vulnerable to flooding from storm surges.

High winds can topple trees, which can damage structures and infrastructure. Because many areas within Leon County and the City of Tallahassee have a moderate to heavy tree cover, and because the majority of electric and telephone lines are aboveground (and many newer underground lines are primarily served by existing overhead lines), power outages are associated with high winds and heavy rain. Blocked roads and limited access from fallen trees and tree limbers also affective response time and debris management.

Vulnerable Populations

Although hurricanes and tropical storms can affect large populations equally, there are certain population groups that are more vulnerable than others. For instance, local emergency management and public health planners have identified Special Needs Shelter(s) for those "who during periods of evacuation or emergency, requires sheltering assistance, due to physical impairment, mental impairment, cognitive impairment or sensory disabilities." The loss of power during and following hurricanes and tropical storms can affect people with special needs such as those who require medical care that relies on a steady source of electricity.

Another group in Leon county particularly vulnerable to the effects of hurricanes and tropical storms are homeless people. The number of homeless people is difficult to estimate because counting persons who do not have a permanent address is difficult. Homeless populations are usually divided into those who are sheltered (i.e., homeless shelters, churches, etc.) and those who are unsheltered (i.e., living on the street, illegally squatting in structures of various kinds, or in the woods in tents). These numbers are also subject to change as people move in and out of shelters, arrive in or leave Leon County, and/or transition into housing.

According to the Florida interagency Council on Homeless 2018 report, the annual statewide Point-in-Time count indicated the following total number of homeless persons within the Big Bend Continuum

of Care geographic area, which includes Franklin, Gadsden, Jefferson, Leon, Liberty, Madison, Taylor, and Wakulla counties.

Table 23. Estimated Number of Homeless Persons by Year within the Big Bend Continuum of Care Area.[29]

Year	2014	2015	2016	2017	2018
Total Number of Homeless	805	863	869	1,072	909

The 2018 count total of 909 homeless people comprised 810 sheltered and 99 unsheltered persons.[30] Although this is a slight decrease over the 2017 estimate, it is anticipated that that the number of homeless within Leon County will continue to increase locally correlated with the increasing cost of housing.

Unsheltered homeless people are the most vulnerable to hurricanes and tropical storms, particularly if they are not aware of an incoming storm and/or if their camp is in a low area that is vulnerable to flooding. The conditions following a storm can exacerbate their plight if there is no power for local stores, shelters, libraries, and other places where those with few choices can go dry out, get food and a shower, recharge cell phones, or even just escape the heat and mosquitos that come out after a storm.

Storm Surge

The southern portion of Leon County is vulnerable to storm surges and associated flooding. Figure 14 above indicates estimated surges associated with Category 1-5 hurricanes. Flooding from storm surges can be therefore expected as the result of strong hurricanes along the St. Marks River and Munson Slough, and within broader areas extending northwards into Leon County and possibly the extreme southernmost portions of the City of Tallahassee.

The worst-case event of a storm surge would be generated by a Category 5 hurricane. Flooding associated with this storm surge, as indicated in Figure 14, would likely affect the following developed features in Leon County:

- Highways 319 South, 61 (Wakulla Springs Road), Woodville Highway, and all collector and local roadways in the southeast quadrant of the county south of Tram Road and east of Highway 319 South
- Approximately 2,900 residential parcels, five schools, 30 retail businesses, 17 religious/non-profit parcels, 20 warehouse parcels, eight office parcels, 11 multi-family parcels, and eight transportation/communications/utilities parcels. This would include approximately 12 mobile home clusters identified in Figure 12. These areas are within the area on Figure 30 indicated as the estimated storm surge associated with a Category 5 hurricane.

29 Florida interagency Council on Homeless 2018 report
30 https://myflfamilies.com/service-programs/homelessness/docs/Council%20on%20Homelessness%20Annual%20Report%202018.pdf

Risk Assessment

Based on the historical data, the Tropical Meteorology Research Project, the U.S. Landfalling Hurricane Probability Project, and the Hazus analysis, hurricanes and tropical storms are classified as a **high risk** to Leon County residents. Historical records reveal tropical storm or hurricane-related damages occur with an average frequency of once every two years. Predictably, damage totals rise significantly with increased storm intensity.

Based on the data, storm surge is classified as a **low risk** to Leon County residents. Figure 32 indicates that only a small area of southern Leon County is vulnerable to storm surge events.

2.9 Severe Storms

This section includes the hazard profiles and vulnerability analyses for thunderstorms, tornadoes, and lightning because these events are so closely related.

General Description and Location

Thunderstorms

According to the National Oceanic and Atmospheric Administration (NOAA), a thunderstorm is a rain shower during which thunder is heard. Because thunder comes from lightning, all thunderstorms have lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail three-quarters inch or greater; winds gusting in excess of 50 knots (57.5 mph); or a tornado.[31]

The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Nearly 1,800 thunderstorms are happening at any moment around the world. Thunderstorms are most likely to occur in the spring and summer months and during the afternoon and evening hours but they can occur year-round and at all hours of the day or night. Along the Gulf Coast and across the southeastern and western states, most thunderstorms occur during the afternoon.

Heavy rain from thunderstorms can lead to flash flooding. Strong winds, hail, and tornados are also dangers associated with some thunderstorms. Thunderstorms typically produce heavy rain for a brief period, anywhere from 30 minutes to an hour. About 10 percent of thunderstorms are classified as severe—one that produces hail at one inch in diameter or greater, has winds of 57.5 (50 knots) miles per hour or higher, or produces a tornado.[32]

Tornadoes

A tornado is a violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 miles per hour or more. In extreme cases, winds may approach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long.

[31] NOAA National Severe Storms Laboratory, 2019, https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/. [32] FEMA, Thunderstorms, https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/.

The most powerful tornadoes are produced by "super-cell thunderstorms." These storms are affected by horizontal wind shears (winds moving in different directions at different altitudes) that begin to rotate the storm. This horizontal rotation can be tilted vertically by violent updrafts, and the rotation radius can shrink, forming a vertical column of very quickly swirling air. This rotating air can eventually reach the ground, forming a tornado.

Severe thunderstorms can produce tornadoes, high winds, and hail—any of which can cause extensive property damage and loss of life. Thunderstorms form when warm, moist air collides with cooler, drier air. Because these masses tend to come together during the transition from summer to winter, most thunderstorms occur during the spring and fall months.

Tornadoes occasionally accompany tropical storms and hurricanes that move over land. Tornadoes are the most common to the right and front of the storm center path as it comes ashore. Tornadoes vary in terms of duration, wind speed and the toll that they take, Tornados are classified by their wind speed and destructiveness. The Fujita (or simple "F") Scale of tornado intensity has been traditionally used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure. On February 1, 2007, NOAA's National Weather Service fully implemented the Enhanced Fujita (EF) scale to rate tornadoes, replacing the original Fujita Scale. The EF Scale will still rate tornado categories from zero to five, but the ranges of wind speed in each category are now more accurate. The table below describes Enhanced Fujita Scale ratings and the associated wind speeds and type of damage for each F-Scale tornado number.

Table 24. Enhanced Fujita EF) Scale of Tornado Intensity.[33]

EF-Scale Number	3-second Gust	Type of Damage Done
EF0	65-85 mph	Minor damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	96-110 mph	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135 mph	Considerable damage. Roofs torn off from 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.
EF3	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 are badly damaged
EF4	166-200 mph	Devastating damage. Well-constructed and whole frame houses completely leveled; some frame homes may be swept away; cars and other large objects thrown, and small missiles generated.
EF5	Over 200 mph	Incredible damage. Strong-framed, well-built houses leveled off foundations and swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; cars, trucks, and trains can be thrown approximately 1 mile (1.6 km).

33 https://en.wikipedia.org/wiki/Enhanced_Fujita_scale.

Tornados can occur anywhere within Leon County and the City of Tallahassee. They are relatively rare, but they have occurred in the past and are likely to occur in the future.

Lightning

Lightning is a sudden electrostatic discharge during an electric storm between electrically charged regions of a cloud, between clouds, or between a cloud and the ground. A lightning flash is referred to as a strike if it hits an object on the ground. Although lightning is always accompanied by the sound of thunder, distant lightning may be seen but may be too far away for the thunder to be heard.[34] Lightning can strike up to 10 miles from a thunderstorm. If an individual can hear the rumble, a bolt is close enough to hit.

Lightning is associated with thunderstorms. Florida is commonly subject to strong weather systems as the result of sea breezes that move inland from the ocean and settle over the moisture-rich atmosphere of the peninsula and other coastal areas. These sea breezes are like weak cool fronts that push toward the hot land in the interior. The temperature differential creates the ideal conditions for thunderstorm development, and lightning. Thunderclouds and showers form along the boundaries and become stronger when the east-west sea breezes collide in the middle of the state. Lightning can occur anywhere within Leon County and the City of Tallahassee.

Historical Occurrences

Thunderstorms

Florida has the highest average precipitation of any state, in large part because afternoon thunderstorms are common in most of the state from late spring until early autumn. Hail can accompany the most severe thunderstorms.

Precipitation data collected over an approximate 60.5-year period from near the Tallahassee Municipal Airport indicates an annual average rainfall of 64.8 inches, with 1964's 104.2 inches as the wettest year on record, and 90 inches of rain recorded in 1994. July is the wettest month and experiences rainfall of the highest average intensity. Summer provides the largest seasonal contribution, accounting for 38 percent of annual precipitation. The average storm for the period produced 0.7 inches, with average peak intensity recorded around 0.3 inches/hour. Based on the FDOT IDF curves the following expected frequencies and magnitudes of historic storm events of 24-hour duration:

2-year frequency:	4.7 inches
25-year frequency:	8.5 inches
10-year frequency:	7.5 inches
100-year frequency:	10.9 inches

The region has experienced multiple storms that have resulted in significant rainfall. The most notable

[34] http://en.wikipedia.org/wiki/Lightning

events for the study period were tropical storms Allison (2001), Helene (2000), Becky (1970), and Fay (2008). Table 24 provides a summary of the most severe rainfall events recorded in Leon County and Tallahassee between 1958 and 2018. This is not a complete record of storms, but only the most severe. Thunderstorms are almost a daily occurrence in Leon County and the City of Tallahassee on summer afternoons, and they are common when cold fronts blow through in the winter.

The City of Tallahassee and Leon County experienced significant rainfall levels associated with tropical storms Alberto and Beryl and Tropical Depression #10 in 1994, hurricanes Bonnie, Frances and Jeanne in 2004, and T.S. Debby in 2012. The most recent storm event that caused flooding in many areas of Leon County and the City of Tallahassee occurred on April 30, 2014. A state of emergency was declared by the Governor for 26 counties, including Leon County. However, these events did not exceed in rank any event in the following table.

Table 25: Severe Storm Events in Leon County by Rank, 1958 – 2014.[35]

Rank	Date	Storm Depth	Storm Duration (Hours)	Peak 15-min. Intensity (Inches/ Hour)	Peak 1-Hour Intensity (inches/ Hour)	Estimated Design Storm (Frequency/ Duration)	Storm Name
1	September 8, 1968	6.52	5	6.48	4.83	150yr/1hr	
2	September 20, 1969	13.83	74	5.20	2.18	125yr/48hr	T.D. #29
3	June 9, 2001	10.58	65	5.68	4.53	125yr/1hr	T.S. Alison
4	March 2, 2002	11.58	30	3.48	2.40	100yr/4hr	
5	September 22, 2000	8.62	38	4.40	3.04	100yr/4hr	T.S. Helene
6	July 21, 1970	8.18	19	5.32	3.46	100yr/4hr	T.S. Becky
7	August 22, 2008	12.82	78	2.20	1.33	75yr/72hr	T.S. Fay
8	December 3, 1964	9.78	44	2.40	2.15	40yr/24hr	
9	July 17, 1964	9.89	51	4.20	3.44	35yr/2hr	
10	August 18, 1998	4.45	6	5.16	3.82	35yr/1hr	
11	March 1, 1994	8.22	18	3.12	1.49	35yr/12hr	
12	March 2, 1991	9.48	26	2.64	1.91	35yr/24hr	
13	August 5, 2001	10.18	37	3.64	2.23	30yr/48hr	T.S. Barry
14	June 23, 2012	10.09	70	1.84	1.16	30yr/48hr	T.S. Debby
15	June 15, 1986	3.90	3	4.80	3.70	30yr/1hr	

According to the NOAA National Climatic Data Center, 410 days with thunderstorm events were reported in Leon County between 09/09/2009 and 09/09/2019.[36] Wind gusts associated with these events ranged from 41 to 60 knots. Two fatalities were recorded on two days of these events, and at least 83 events caused varying amounts of property damage.

[35] City of Tallahassee, Water Resources Engineering, 2019.

[36] NOAA National Climatic Data Center, http://www.ncdc.noaa.gov/.

Tornadoes

Tornados are a relatively infrequent occurrence in Leon County. Nevertheless, because it is situated less than 30 miles from the Gulf of Mexico, Leon County is vulnerable to tornado events primarily associated with hurricanes. Tornados associated with summer or winter storm fronts are rare. Nevertheless, tornados have occurred throughout Leon County and have developed from severe storm systems over land.

Generally, there is an inverse correlation between the intensity and occurrences of tornados. However, as a tornado increases in scale, its power to destroy property, inflict injuries, and create fatalities increases dramatically. Populations especially vulnerable are those residing in older manufactured homes and substandard site-built homes.

There have been five days with tornado events reported in Leon County between 09/09/2009 and 09/09/2019. Table 25 lists all of the reported tornado sightings for Leon County in this time period.

Until March of 2019, no tornados reported at a F3 scale or higher had been reported to date in Leon, Gadsden, Liberty, Wakulla and Jefferson counties. However, an E3 Based on historic records from the period 1950 to 2014, tornadic activity within this region has resulted in a total of eleven injuries and two fatalities. Leon County has been fortunate in this regard, as there have been no reported tornado-related deaths or and only 2 injuries within the county during the last 60 years. The following table details historical occurrences of tornado events in Leon County from 1950 through 2014.

Table 26: Leon County Tornado History, 2009-2019.[37]

Date	F-scale
December 9, 2009	EF0
April 7, 2014	EF0
April 19, 2015	EF1
March 3, 2019	EF3
April 19, 2019	EFO

Lightning

Florida is the most lightning prone state in the U.S. The corridor from Tampa Bay, FL to Titusville, FL (a.k.a. “Lightning Alley”) receives the most lightning in the United States on an annual basis. Furthermore, more than 90% of the lightning in this area occurs from May through October, between the hours of noon and midnight. During this time of day and year, people in Central Florida who spend a large portion of their lives outdoors (e.g. construction workers, park rangers, golfers, campers etc.) are much more likely to be struck than anytime or anywhere else in the country.

On average, Florida receives an average of 1,447,914 cloud-to-ground lightning strikes per year. This averages out to 25.3 flashes per square mile annually, though the highest density of lightning flashes occurs in the central and southern Florida Peninsula. Over the past 50 years (1959-2010), Florida has

[37]NOAA National Climatic Data Center,http://www.ncdc.noaa.gov/.

recorded 461 fatalities and over 1,790 injuries due to lightning. Also, lightning can also result in property loss, damage to aircraft and electronics, and can be the spark that ignites devastating wildfires.[38]

Based on data provided by the NOAA National Climatic Data Center, there were 1,385,710 cloud-to-ground lightning flashes in Florida in 2018.[39]

Because of this prevalence of strikes, Florida tops the national list for lightning deaths with 471 deaths between 1959 and 2013.[40] According to data collected and maintained by NOAA, Florida had 49 fatalities from lightning from 2009 through 2018. This continues to place Florida first in rankings by state for lightning fatalities.[41] There are no recorded fatalities from lightning in Leon County.

Lightning strikes are usually recorded when they cause damage, including wild or structural fires. According to data maintained by the NOAA National Climatic Data Center, there were ten lightning strike events that caused property damage in Leon County between 09/09/2009 and 9/9/2019.[42] Although no injuries or fatalities were recorded because of these events, eight of these events caused fires that caused property damage.

The Tallahassee Fire Department recorded 75 structure fires resulting in nearly $1.5 million of property damage caused by lightning strikes from 2004-2009.[43] There are six recorded wildfires of varying sizes that were started by lightning in the time period of July 2010 to late May of 2012.[44]

Estimated Impacts, Probability, and Extent

Thunderstorms

The impacts of thunderstorms vary greatly based on the presence and degree of high winds, rain and/or hail, and the specific area affected by a storm. Recorded local impacts of thunderstorms include high winds breaking branches and topple trees, which can and have affected structures, roadways, vehicles, power lines, cable, and other critical infrastructure. High winds have brought down traffic lights, blown out windows in tall buildings, and grounded emergency services aircraft.

Microbursts, defined as a localized column of sinking air caused by a small and intense downdraft (the air does not spin like it does in the case of a cyclone or tornado), also occur within thunderstorms in Leon County. There are several instances where microbursts have brought down large trees and damaged property, including several homes in the Glendale neighborhood in 1996 and the roof of the Donald L. Tucker Civic Center in the early 2000s.

38 https://cacarc.wordpress.com/2011/06/20/2011-national-lightning-safety-awareness-week-facts-about-lightning/.

39 Vaisala 2018 Annual Lightning Report,https://www.vaisala.com/en/lp/2018-annual-lightning-report.

40 http://articles.orlandosentinel.com/2013-07-05/news/os-lightning-deaths-florida-20130705_1_lightning-alley-lightning-deaths-john-jensenius

41 www.vaisala.com/lightning.

42 Ibid.

43 Tallahassee Fire Department, 2009.

44 Florida Department of Agriculture and Consumer Services, http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Wildland-Fire/Resources/Wildland-Fire-Daily-Report-for-Florida.

The rainfall associated with thunderstorms floods streets, drainage ditches, lakes, watercourses, and structures, particularly within floodprone areas within Leon County and the City of Tallahassee. Rainfall in sufficient amounts and/or duration can overwhelm stormwater management facilities and conveyance systems. If this rainfall is within a closed basin, and if there is no route for this stormwater to drain (e.g., sinkhole), the accumulated stormwater can damage structures and other property.

The impacts of thunderstorms can also vary depending on where these events occur. However, because thunderstorms can occur anywhere in the County, all citizens, structures, and critical facilities and systems can potentially be affected by the effects of these storms.

Based on historical data, it is anticipated the probability of future events for this hazard would reflect the historical frequency of occurrences, and that Leon County and the City of Tallahassee or portions thereof could expect an average of approximately four severe thunderstorms per year containing damaging winds of 58 miles per hour or greater, rainfall exceeding one inch in an hour, and/or hail of ¾ of an inch or greater. The probability based on the historical record of a severe thunderstorm affecting Leon County and the City of Tallahassee is **highly likely**.

Tornadoes

Extensive damage to infrastructure, public and private property can be expected and has occurred locally from tornados. Wind damages from tornados have devastating potential, particularly for manufactured homes. The area affected by tornados is relatively small, depending on their speed, size, and height above ground, but these effects can be significant. Tornados can break branches and topple trees, which can affect structures and other property such as automobiles, power lines, and other critical infrastructure. Tornados can also affect traffic lights, blow out windows, and ground emergency services aircraft. Because tornados can occur anywhere in the County, all citizens, structures, and critical facilities and systems can be potentially affected.

Between 1950 and 2014, tornados in Leon County have caused two recorded injuries. On March 7, 2008, a category F1 (maximum wind speeds 73-112 mph) tornado injured one person and caused $1 million in damages.[45] There were several tornados reported during the Florida Severe Storms event from March 26, 2009 to May 5, 2009. This was a declared a Major Disaster (DR-1831).[46]

Based on these historical records, Leon County and the City of Tallahassee can expect an F0 tornado at least once every four years. The worst-case scenario would be an F2 tornado once every 16 years. However, the extent of any damage depends on where a tornado may touch down and how long it lasts. Because tornadoes can occur anywhere within the county, all citizens, structures, and critical facilities are at risk and may be affected.

When compared to other Florida counties, the probability of a tornado in Leon County is low. Nevertheless, as population and development increases, the risk of property damage, injuries, and fatalities increases. Overall, the probability based on the historical record of a tornado affecting Leon County and the City of Tallahassee is **likely**.

[45] http://www.city-data.com/county/Leon_County-FL.html#ixzz3WH7FWob1. [46] Ibid.

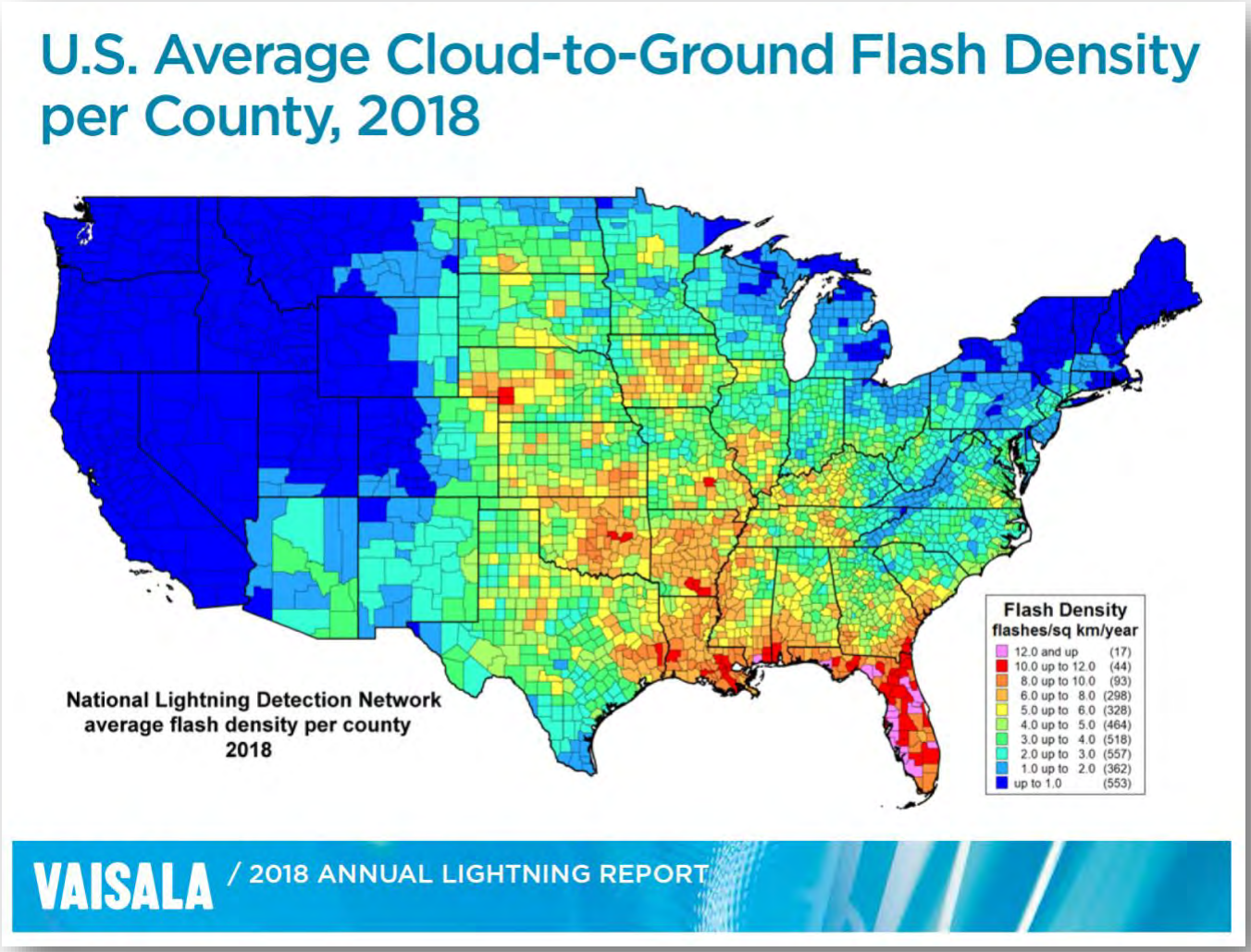
Lightning

Based on the data summarized above, lightning can cause injuries, fatalities, and forest and structure fires. Lightning can damage electrical systems and other infrastructure, kill trees, and physically damage structures.

According to data maintained by the NOAA National Climatic Data Center, a lightning strike that causes property damage occurs on average at least once a year. Additional data provided by the Tallahassee Fire Department indicates that lightning caused on average 15 structure fires annually between 2004-2009.

There are several measures of lightning, including flash density maps. These are based on data acquired and managed by the National Lightning Detection Network. According to the 2018 Annual Lightning Report prepared by Vaisala under contract to NOAA, Florida leads the nation in lightning flash density per square kilometer.

Figure 15: U.S. Average Cloud-to-Ground Flash Density per County, 2018.[47]

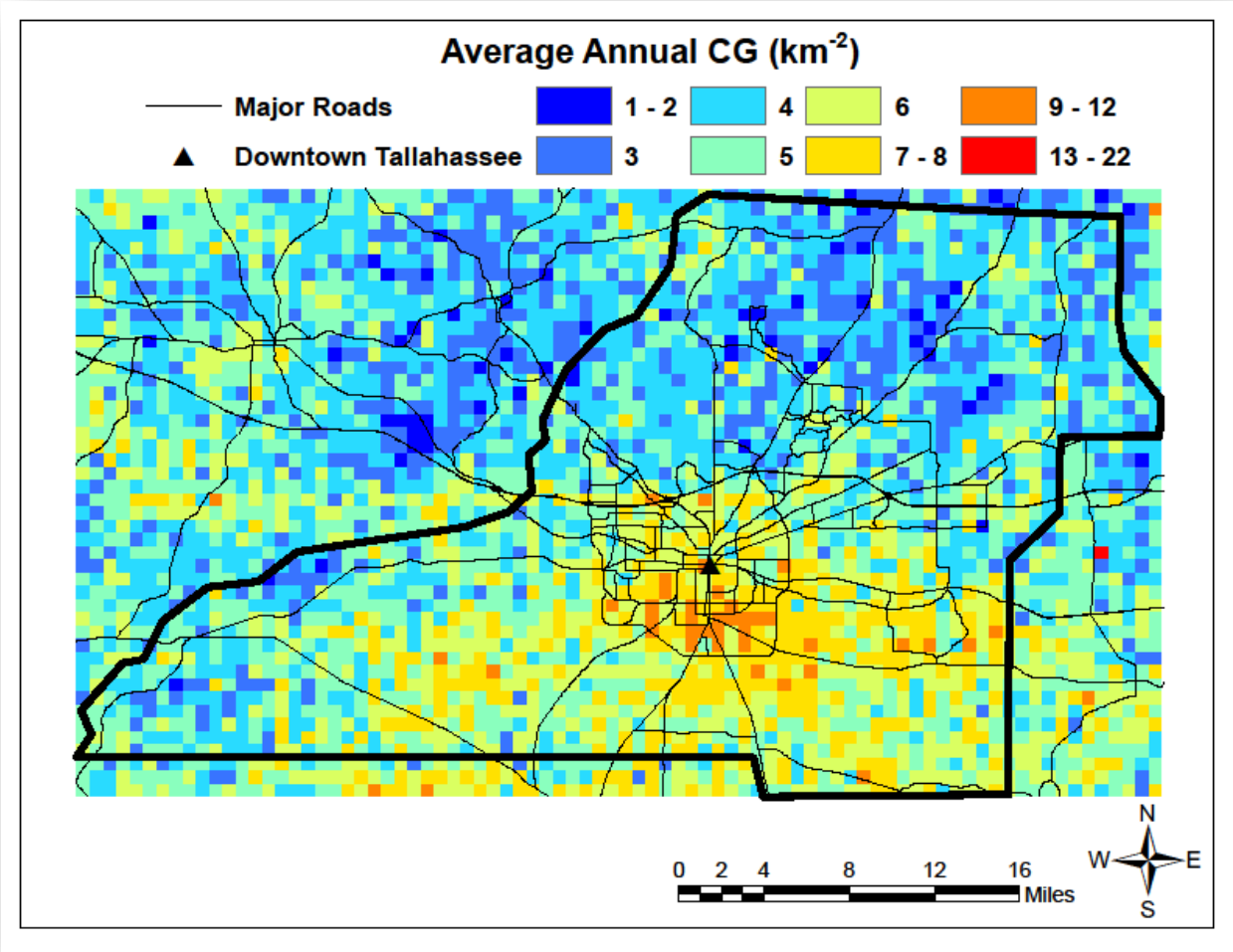


Lightning can occur anywhere in Leon County and the City of Tallahassee. Therefore, all citizens, structures, and critical facilities and systems can be potentially affected.[48] However, the vulnerability is heightened in certain locations as described below.

According to Figure 17, Leon County has a flash density of between 10-12 flashes/square kilometer/year, which is the second-highest classification level measured by the National Lightning Detection Network. A lightning flash density map produced by Florida State University's Department of Meteorology indicates that the average annual number of CG flashes ranges within the county from 1-2 to 9-12, depending on location. The southern portions of the urban area of Tallahassee, as well as several large areas south of the city, are more prone to lightning than other areas within the county.

[47] www.vaisala.com/lightning..
[48] Tallahassee Fire Department.

Figure 16: Lightning Flash Density Map of Leon County, Florida.[49]



Additionally, according to an analysis of local fire event data conducted the Tallahassee Fire Department, structure fires caused by lightning are correlated to community population density. Furthermore, since land use and demographic data indicate that the northeast and southeast quadrants of the Tallahassee urban area are the most densely populated, they would have the greatest number of structures potentially affected by lightning strikes.

Based on the historical record of thunderstorms, which lightning is associated with, and the annual and 10-year flash densities previously indicated, the probability of lightning affecting Leon County and the City of Tallahassee is **highly likely**. The expected or anticipated number of lightning events (CG strikes) per year would be from 1-15, depending on location within the County and by the relative density of structures that would be vulnerable to lightning strikes.

[49] Florida State University, Department of Meteorology.

Vulnerability Summary

Leon County and the City of Tallahassee have a record of county-wide vulnerability to property damage from thunderstorms and their associated flooding, tornados, and lightning. Areas and features specifically vulnerable to flooding from severe thunderstorms include parcels wholly or partially located within the 100-year floodplain. Specific areas and structures vulnerable to flooding also include the following:

- Mobile homes and septic tanks located in a 100-year floodplain
- Repetitive loss properties
- All structures and facilities within Special Flood Hazard Areas, Non-Special Flood Hazard Areas, and Undetermined-Risk Areas as identified on local FIRM maps
- Unrecorded subdivisions, and subdivisions built before 1991-92
- Pineview Elementary School
- Belle Vue Middle School
- Other structures, properties, and local nuisance flooding areas identified by the City and County departments of public works.
- Parking areas adjacent to Leon High School and the FSU Flying High Circus.

Any structure, infrastructure component, or other facility that has adjacent large trees may have additional vulnerability to high winds associated with severe thunderstorms, as well as tornados. These include many older residential subdivisions in Leon County and the City of Tallahassee.

Citizens in Leon County and the City of Tallahassee who work outside and transient populations are also particularly vulnerable to severe thunderstorms. Tallahassee has two universities and a community college. There are approximately 65-70,000 students that attend one or more of these institutions. These students can be vulnerable to severe thunderstorms if they are in areas of the campus where there is no shelter. High school and middle school students may also be vulnerable if they are outside during such an event.

The homeless, especially those who are unsheltered, are particularly vulnerable to severe storms and related events such as tornados. As previously discussed above, unsheltered homeless persons are affected by such storms in ways that sheltered persons are not, and the effects can be anything from merely getting wet to getting electrocuted, suffering heat cramp, exhaustion, or strokes. If a winter storm or front blows through, the associated drop in air temperatures can affect a person's health significantly.

People participating in leisure activities such as fishing, camping, boating, soccer and golf are also vulnerable to severe thunderstorms, as well as first responders, roofing, HVAC, or other building contractors, and large masses of people attending various outdoor events such as music or other festivals, political rallies, or sporting events. Locations within Leon County and the City of Tallahassee with a heightened vulnerability to thunderstorms include:

- All Leon County and City of Tallahassee parks, boat landings, golf courses, and greenways
- All open bodies of water in Leon County where boating is allowed
- All State of Florida wildlife management areas, forests, and parks in Leon County

- Outdoor recreational facilities (e.g., running tracks, stadiums, playing and sports fields) managed by the Leon County School Board, Florida State University, Florida Agricultural and Mechanical University, Tallahassee Community College, and charter and other private educational facilities
- Tops of parking decks, buildings (particularly in the downtown area), telecommunication towers, water towers, and other tall infrastructure.

Structures, infrastructure, and large trees lacking lightning mitigation features such as grounded lightning rods are also vulnerable to lightning strikes associated with thunderstorms.

Tornados

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities and populations within Leon County and the City of Tallahassee are exposed to this hazard. Residents living in manufactured housing, including single structures and clusters, are more vulnerable than those living in permanent structures. Mobile home clusters are identified in Figure 21.

Citizens in Leon County and the City of Tallahassee who work outside and transient populations are also particularly vulnerable to tornados. Tallahassee has two universities and a community college. There are approximately 65-70,000 students that attend one or more of these institutions. These students can be vulnerable to tornados if they are in areas of the campus where there is no shelter. High school and middle school students may also be vulnerable if they are outside during such an event.

People participating in leisure activities such as fishing, camping, boating, soccer and golf are vulnerable to tornados, as well as first responders, workers such as roofers or roofing, HVAC, or other building contractors, and large masses of people attending various outdoor events such as music or other festivals, political rallies, or sporting events.

Other locations within Leon County and the City of Tallahassee with a heightened vulnerability to tornados include:

- All Leon County and City of Tallahassee parks, boat landings, golf courses, and greenways
- All open bodies of water in Leon County where boating is allowed
- All State of Florida wildlife management areas, forests, and parks in Leon County
- Outdoor recreational facilities (e.g., running tracks, stadiums, playing and sports fields) managed by the Leon County School Board, Florida State University, Florida Agricultural and Mechanical University, Tallahassee Community College, and charter and other private educational facilities
- Tops of parking decks, buildings (particularly in the downtown area), telecommunication towers, water towers, and other tall infrastructure.

Residents living or working in structures that have large, adjacent trees, or critical facilities or infrastructure such as power lines and traffic lights, or in densely residential and other developed areas, have increased vulnerability to the high winds, flying debris, and sudden changes in air pressure

associated with tornados. These include many older residential subdivisions in Leon County and the City of Tallahassee.

Lightning

Figure 14 indicates that the southern half of the urban area of Tallahassee receives more CG strikes on average than the northern half. All structures in this area have increased vulnerability to lightning strikes, as well as residents and visitors that are not in automobiles or structures.

Since 2006, 64 percent of lightning deaths nationwide (238) occurred when people were participating in leisure activities such as fishing, camping, boating, soccer and golf. First responders are also vulnerable to lightning, as well as workers such as roofers or roofing, HVAC, or other building contractors. Large masses of people attending various outdoor events such as music or other festivals, or baseball or football games, can also be vulnerable to lightning. Areas within Leon County and the City of Tallahassee anticipated to be vulnerable to lightning strikes would include:

- All Leon County and City of Tallahassee parks, boat landings, golf courses, and greenways
- All open bodies of water in Leon County where boating is allowed
- All State of Florida wildlife management areas, forests, and parks in Leon County
- Outdoor recreational facilities (e.g., running tracks, stadiums, playing and sports fields) managed by the Leon County School Board, Florida State University, Florida Agricultural and Mechanical University, Tallahassee Community College, and charter and other private educational facilities
- Tops of parking decks, buildings (particularly in the downtown area), telecommunication towers, water towers, and other tall infrastructure.

Residents within these areas, including events where significant numbers of citizens are gathered for festivals, sporting events, political rallies, and other events, are particularly vulnerable to lightning strikes. Structures, infrastructure, and large trees lacking lightning mitigation features such as grounded lightning rods are also vulnerable to lightning strikes.

Citizens in Leon County and the City of Tallahassee who work outside and transient populations are also particularly vulnerable to lightning strikes. Tallahassee has two universities and a community college. There are approximately 65-70,000 students that attend one or more of these institutions. These students can be vulnerable to lightning strikes if they are in areas of the campus where there is no shelter. High school and middle school students may also be vulnerable if they are outside during such an event.

Vulnerability to lightning is also seasonal in nature. The summer months in Leon County and the City of Tallahassee (June through August) accounts for 73% of all lightning related fires from 2004-2009, with August being the peak month.[50]

[50] Ibid.

Risk Assessment

Based on the historical record, the potential damage, and the size and breadth of the urban area of Tallahassee, thunderstorms, tornados, and lightning are all classified as a **medium risk** to Leon County and the City of Tallahassee.

2.10 Drought

General Description and Location

Drought is a natural part of the local climate, just like hurricanes, thunderstorms, wildfires, and tornados. However, unlike other hazards that affect the state, droughts can impact large areas and last for months, even years. Drought can affect water supplies, agriculture, and fire danger levels and is measured based on the severity of these impacts.[51]

Drought is typically defined as a prolonged period when there is a precipitation deficit from normal values. There are several indexes that are used to characterize and measure droughts, but the most used index is the Palmer Drought Severity Index (PDSI), devised in 1965. The PDSI was the first drought indicator to assess moisture status comprehensively. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for non-irrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief. The PDSI uses a zero as normal, and drought is shown in terms of negative numbers. For example, negative 2 is moderate drought, negative 3 is severe drought, and negative 4 is extreme drought.

A normally recurrent feature of climate, drought is a relative, rather than absolute, condition that varies by region. Each drought differs in intensity, duration, and spatial extent.[52] Drought is monitored through the U.S. Drought Monitor program, a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. The U.S. Drought Monitor program uses the following classification system to illustrate the intensity and impacts of drought.

[51] Ibid..

[52] *How to Reduce Drought Risk,* Western Drought Coordination Council (1998), http://www.drought.unl.edu/plan/handbook/risk.pdf.

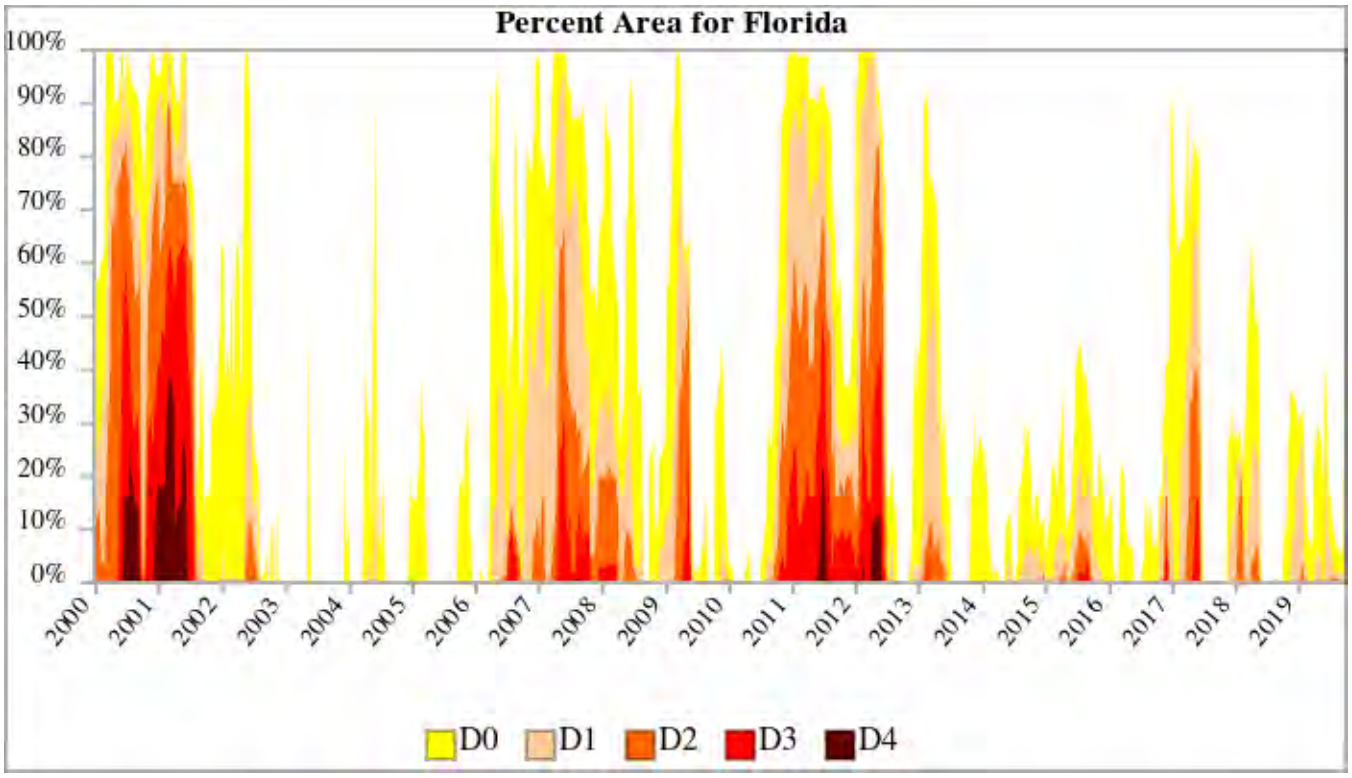
Figure 17: Intensity and Impacts of Drought.[53]

All areas of Leon County and the City of Tallahassee are vulnerable to drought. Because drought is a regional phenomenon, it can affect areas larger than a single county or municipality.

Historical Occurrences

Droughts are periodic events that impact Leon County and the City of Tallahassee. They can impact large areas and last for months, even years. An examination of weather records since 1900 reveals that in every decade there has been at least one severe and widespread drought somewhere within Florida. The following figure indicates the historical drought record for Florida from 2000 to 2019.

Figure 18: Florida Drought Map for the period 2000-2019.[54]



53 https://droughtmonitor.unl.edu/.
54 National Integrated Drought Information System, https://www.drought.gov/drought/states/florida.

This figure indicates that since 2000, the longest duration of drought (D1-D4) in Florida lasted 124 weeks beginning on April 11, 2006 and ending on August 19, 2008. The most intense period of drought occurred the week of February 27, 2001 where D4 affected 39.08% of Florida land. There were at least three periods of significant drought in the last 15 years in Florida, and that the last severe drought period occurred from late 2011 to mid-2012. These drought periods brought about the disappearance of Lake Jackson and dried out much of Lakes Miccosukee, Lafayette, and Iamonia.

The last five years have been relatively wet for Leon County, but there were a few months of significant drought (D3) in early 2017.

Estimated Impacts, Probability, and Extent

Drought events can impact individual drinking water wells, surface water bodies and water courses, increase the risk of fire danger, contribute to sinkhole development, impede farm productivity, and strain municipal or regional water supplies. For instance, during the period of May through June of 2000, over three hundred (300) water wells either went dry or had to be deepened. The Northwest Florida Water Management District issued Water Shortage Warnings during two periods of drought conditions in 2000 and 2007. The Water Shortage Warning provides for voluntary water conservation actions, during which all users are encouraged to reduce water use and to conserve water to the maximum extent possible. However, no water shortages were reported since then.

Drought can also dramatically affect local natural lake levels. As the water table responds to the lack of rain by a decrease in the level of the potentiometric surface of the Floridan aquifer underlying Leon County, many lakes that have karst (sinkhole) connections to the aquifer respond by draining into the aquifer and therefore drying out. This is a natural process that has been going on for millennia, but it can interfere with traditional uses of these lakes, and it can increase fire danger through the many terrestrial plants that move into the dry lake beds over time. Drought also affects timber productivity in Leon County, and can increase fire danger in upland areas as well.

According to the City of Tallahassee Water Utilities Division, the area has never had significant problems meeting its water needs, even during extended dry periods. The county's source of potable water, the Floridan Aquifer, provides an abundant supply to buffer the effects of a drought. For example, 1998 was an unusually dry year that produced a record single day peak withdrawal of 59 million gallons (previous peak was 45 million). The average daily withdrawal for 1998 was over 30 million gallons per day (MGD). The normal average is closer to 24-25 MGD. However, this increased use presented no pressure problems on the water distribution system and required no conservation measures.

A drought with a PDSI of -3 can occur every three to four years in Leon County and the City of Tallahassee, based on the last 15 years' data. Overall, the probability based on the historical record of a drought affecting Leon County and the City of Tallahassee is **likely** as defined under Section 2.2.1 Risk.

Vulnerability Summary

Leon County and the City of Tallahassee have limited vulnerability to the negative effects of drought. Although drought can exacerbate demand for potable water, the City of Tallahassee's water needs

account for less than seven (7) percent of the water available for local withdrawal in the Floridan Aquifer. It should be noted that Leon County has not experienced extended drought conditions in excess of several months. However, the City believes that extended droughts would still not pose serious problems to critical needs (potable water, firefighting, etc.), although irrigation restrictions might be required.

Although public supplies tend to be drawn from much deeper wells that are not normally affected by drought conditions, drought can dry up surficial and other shallow water wells. Therefore, residents who depend upon private water wells are vulnerable to drought, as well as those who live in areas where wildfires are a hazard in dry conditions.

Risk Assessment

An assessment of potential dollar costs was not performed due to the fact that droughts are not expected to damage existing or future structures or critical facilities within Leon County. Although agricultural production is limited in Leon County and therefore monetary damages incurred during a drought are expected to be minimal, drought is nevertheless ranked as a **medium risk** to the residents of Leon County based on the impacts an extended drought can have on wildfire and potable water supplies.

2.11 Flooding

General Description and Location

A flood is an overflow of water that submerges land which is usually dry.[55] Flooding can occur in either floodplains (low-lying lands around rivers and streams, lakes, and wetlands), or in other low-lying, poorly drained areas. Flooding in Florida typically is caused by heavy or prolonged rainfall from tropical storms and hurricanes. The Federal Emergency Management Agency (FEMA) estimates about 14.25 million acres, or 41 percent, of Florida is prone to flooding, which is the highest percentage of all 50 states. Heavy rainfall can be described locally as one or more inch per hour. Short, intense episodes can induce flooding as well as less-intense, longer-duration events.

The annual rainfall in Tallahassee is approximately 62 inches/year, but this rainfall tends to be seasonal and episodic. Flooding has been an issue historically within Leon County and the City of Tallahassee, and because of this, both the City of Tallahassee and Leon County have active stormwater management programs funded by stormwater fees levied upon property owners.

The 100-year floodplain is the land that is predicted to flood during a 100-year storm, which has a 1% chance of occurring in any given year. The 100-year floodplain is also sometimes called the 1% annual chance floodplain or base flood. Areas within the 100-year floodplain may flood in much smaller storms as well. The 100-year floodplain is used by FEMA to administer the federal flood insurance program and the City of Tallahassee and Leon County to regulate development.

Local flooding can vary widely based on variables such as soil composition, saturation, and slope; depth to aquifer; land use; location, type, size, and elevation of structures; depth, width, and peak discharge of floodways; presence of vegetation; size and type of watershed; and extent of impervious area within

[55] http://en.wikipedia.org/wiki/Flood.

a watershed. Other variables include the length of a rain event, the amount of rainfall, and the frequency between storms.

The extent of local flooding and its probable and actual impacts varies widely and is dependent upon the location of property or structure within identified floodprone areas, special flood hazard areas, and other areas prone to flood hazards or damage from flooding.

FEMA Flood Insurance Rate Map (FIRM) Zones

Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. Table 2.31 below describes each FEMA FIRM zone. Possible flood hazards have been determined for all areas within Leon County.

The 100-year flood event, which has a one percent chance of occurring in any given year, is used as the base flood for the purpose of flood mitigation planning. The boundaries of the 100-year floodplain as designated by the FEMA Flood Insurance Rate Maps (FIRM).

Many areas around streams, rivers, lakes, and wetlands in both Leon County and the City of Tallahassee are susceptible to flooding. Closed basins occur throughout Leon County and play a large role in area flooding. Homes and other structures in many of the closed basins are built below the level where water can "pop-off" into another basin, making them more at risk for flooding.

Table 27. Description of FEMA FIRM Zones.[56]

FIRM Zone	Explanation
A	An area inundated by 100-year flooding, for which no Base Flood Elevations have been established
AE	An area inundated by 100-year flooding, for which Base Flood Elevations (BFE) have been determined.
AH	An area inundated by 100-year flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet.
ANI	Area Not Included: An area that is located within a community or county that is not mapped on any published FIRM.
AO	An area inundated by 100-year flooding (usually sheet flow on sloping terrain), for which average depths have been determined; flood depths range from 1 to 3 feet.
D	An area of undetermined but possible flood hazards.
IN	Area in Special Flood Hazard Area (SFHA): This is an area inundated by 100-year flooding for which BFEs or velocity may have been determined. No distinctions are made between the different flood hazard zones that may be included within the SFHA
UNDES	Area of Undesignated Flood Hazard: A body of open water, such as a pond, lake ocean, etc., located within a community's jurisdictional limits that has no defined flood hazard.
V	An area inundated by 100-year flooding with velocity hazard (wave action); no BFEs have been determined.
VE	An area inundated by 100-year flooding with velocity hazard (wave action); BFEs have been determined.
X	An area that is determined to be outside the 100- and 500-year floodplains
X500	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.
100IC	Discharge Contained in Channel: An area where the 100-year flooding is contained within the channel banks and the channel is too narrow to show to scale. An arbitrary channel width of 3 meters is shown.

Floodplain Impacts

In urban areas, stormwater systems can become overtaxed or blocked with debris, leaving no space for excess water to enter the system. When the stormwater is unable to enter the stormwater system, it can cause localized flooding, standing water, block roadways, or cause sheetflow or overland flow.

Leon County and the City of Tallahassee have experienced significant growth in the last several decades. Changing land uses have accompanied this growth and development, changing the natural topography and increasing the area of impervious surface. The dynamics of land use within this growth context can serve to exacerbate flooding problems. As upland areas are developed, the natural detention capacity of the land diminishes, resulting in increased runoff rates and flow volumes. Flood

[56] FEMA.

problems can arise as conveyance capacities are exceeded and/or the sheer quantity of runoff overwhelms the system's ability to absorb additional stormwater before properties and roadways become impacted.

Local Drainage Basins

The area within the City of Tallahassee municipal boundary drains into four major basins: Lake Jackson, Fred George, Lake Lafayette, and Lake Munson. These basins account for nearly 30 percent of the county's total land area.

The Lake Jackson Basin (27,450 acres) is located in the northwest region, and is adjacent to the Ochlockonee River floodplain, an area of little development. The Basin includes Lake Jackson, Lake Carr, Mallard, and Holley Pond. The Lake Jackson Basin includes areas of intense development, such as the North Monroe commercial corridor and the Market Square – Timberlane district, that contribute to localized flooding along tributaries draining to the lake. The lake has several direct connections to the underlying aquifer.

Fred George Basin (2,816 acres) is located directly south of the Lake Jackson Basin and is the smallest of the four major basins. The uplands in the northern and eastern portions have undergone some residential development and include a portion of the northern suburbs of the City. A large portion of the low-lying areas is susceptible to flooding, with 15 percent of the total basin area comprised of wetlands, lakes, or floodplains. Sandy, well-drained soils characterize the basin, and are typically located on nearly level to slightly sloping grades. Fred George sink forms a direct conduit to the upper limestone formations of the Floridan Aquifer.

The Lake Lafayette Basin (53,124 acres) is located in northern Leon County and includes the entire northeastern quadrant of the City. A significant portion of this large basin has undergone extensive urban development in recent years, particularly the area between Centerville and Thomasville Roads. Other areas of the basin remain sparsely populated but are undergoing rapid change. Several major developments have been constructed, including Piney-Z Plantation and Fallschase. Much of the area surrounding Lake Lafayette is wet, and contains many ponds, lakes, and other water storage areas.

The Lake Munson Basin (44,514 acres) is located in southern Leon County, and with its three major tributaries (East, Central, and West Ditches), drains nearly 70 percent of the City. These three ditches have all been dug in hard clay, with no confining levees, and until relatively recently, have been mostly unimproved. The East Ditch runs along the south edge of the City, and generally parallels Orange Avenue. The Central Ditch runs through the middle of the City, beginning near Leon High School. Central Ditch flows under Franklin Boulevard to Cascade Park, and then proceeds along Canal Street, and eventually to Springhill Road. The West Ditch runs along the west edge of the City, behind Tallahassee Community College and through the Dale Mabry subdivision.

All three tributaries drain into Munson Slough, south of Tallahassee. Munson Slough and its tributaries are typified by a considerable number of lakes, swamps, and ponds connected by short reaches of streams. The lower part of Munson Slough has little slope and terminates in a system of sinkholes near Wakulla County. Much of this basin is highly urbanized, with the exception of the vicinity of Munson Slough, and includes high-density land uses with extensive impervious surfaces.

Flood Management

Floodplain management responsibilities are shared among federal, state, regional, and local governments. Local governments have the most direct control in floodplain management through land use planning and regulation, land acquisition and management, and as sponsors for the flood insurance program administered by FEMA. Water Management Districts (WMDs) and the Florida Department of Environmental Planning also regulate development activities in floodplains and flood prone areas.

The Tallahassee – Leon County Comprehensive Plan has several policies that address development within floodprone areas and floodplains. Both Leon County and the City of Tallahassee have adopted and continue to enforce floodplain management policies and regulations that helps mitigate the effects of flooding on new and improved structures. These include:

> **Policy 1.4.6: [L]** *(Effective 7/16/90; Revision Effective 4/10/09)*
>
> By 2014, land development regulations will include standards for the regulation of future land use categories, subdivision, signage, and areas subject to seasonal or periodic flooding and areas of known hazards. Regulations concerning areas subject to seasonal or periodic flooding shall be consistent with all applicable state and federal regulations.
>
> **Policy 2.1.2: [L]** *(Effective 7/16/90)*
>
> Prohibit residential development where physical constraints or hazards exist or require the density and design to be adjusted accordingly. Such constraints or hazards include but are not limited to flood, storm or slope hazards and unstable soil or geologic conditions.

Local land development codes developed to implement these policies address stormwater runoff rates (not volume) in open basins (those that drain eventually to the sea), and runoff rates and volume in closed basins (those that do not drain eventually to the sea). These codes prohibit post-development discharge rates from exceeding predevelopment conditions for storms with recurrence frequencies up to a 25-year event, with variations in selected geographic areas and drainage basins.

Both Leon County and the City of Tallahassee currently have advanced stormwater management regulations and programs. Both jurisdictions charge a monthly stormwater fee for property owners, the proceeds of which help fund stormwater management capital improvements and maintenance programs. The local extra penny sales tax, which was extended for another 20 years in 2014, also funds a significant amount of public stormwater infrastructure.

City of Tallahassee

The City has classified and mapped areas subject to flooding from storms either as "nuisance" or “hazard/damage” flooding. If a property is in a special flood hazard area (SFHA), the odds are that it will be damaged by flooding. Structures located in floodprone areas are more prone to being flooded that those that area not. Subdivisions, apartment complexes, and other residential area that were built prior to existing County and City stormwater management regulations are more prone to flooding.

These subdivisions included older areas within the City, and a few older subdivisions in the unincorporated area.

The City of Tallahassee Stormwater Management program is funded by a stormwater utility fee with nearly 91,580 residential accounts and over 9,084 non-residential accounts. The stormwater utility generates approximately $17.9 million per year, and employs over 90 positions including scientists, biologists, engineers, planners, administrators and maintenance personnel. The City's stormwater program provides the including services:

- Stormwater Planning and Administration Capital Improvements
- Pollution Reduction Floodplain Management
- Infrastructure Maintenance
- Lakes Monitoring
- Street Sweeping Regulatory Compliance
- National Pollution Discharge Elimination System (NPDES)

The Planning and Administration program oversees regulatory compliance, floodplain management, the Stormwater On-site Mitigation Loans (Loan Program) and lakes monitoring. The SW Pollution Reduction Program (SPRP) is responsible for public education and coordinating with DEP on IWR/TMDL/BMAP development and implementation. The City's stormwater infrastructure maintenance program is responsible for approximately 28,408 drainage structures, over 426 stormwater ponds, 24 miles of major outfall canals, 225 miles of roadside ditches, 59 miles of minor to medium outfall ditches and over 426 miles of enclosed storm drains.

Leon County

Leon County's Stormwater Engineering program within the County's Department of Public Works is intended to reduce flooding and improve surface and ground water quality. This program is responsible for program development, capital improvement programming, master planning, and other projects. Professional support includes design, contract administration, monitoring of projects, construction and maintenance, and policy development. The components of this program include:

- Stormwater Planning and Administration Capital Improvements
- Pollution Reduction Floodplain Management
- Infrastructure Maintenance
- Lakes Monitoring
- National Pollution Discharge Elimination System (NPDES)
- Flooded Property Acquisition Program
- Total Maximum Daily Loads (TMDL)
- Water Quality Monitoring Program

The County's Stormwater Maintenance program is responsible for the creation, maintenance, management, and preservation of functional, safe, and effective stormwater systems for the citizens of Leon County and its visitors. This program maintains and retrofits open and enclosed drainage systems along county rights-of-way and easements; provides for water quality and rate control; protects against personal injury, private property loss, and loss to Leon County associated with stormwater

runoff; and responds to public concerns and needs by investigating complaints, writing work orders, obtaining permits, and accomplishing needed facility improvements.

Significant capital improvement projects in the urban area constructed or under construction by both Leon County and the City of Tallahassee since 2015 include (arranged alphabetically):

1. Autumn Woods Area Drainage Improvement (Leon County
2. Baum Road Drainage Improvement (Leon County)
3. Betton-Cline-Chamberlain Stormwater Facility Project (City of Tallahassee)
4. Carter-Howell-Strong Park Stormwater Facility Project (City of Tallahassee)
5. Cascade Park Stormwater Facility Project (Blueprint 2000)
6. Fords Arm South Drainage Improvements (Leon County)
7. Franklin Avenue Road Reconstruction Project (Blueprint 2000)
8. Fred George Park Northeast - Land Re-grading (Leon County)
9. FSU-COT Regional Stormwater Facility Project (City of Tallahassee)
10. Hilaman Outfall Ditch Project (City of Tallahassee)
11. Killarney Way at Shamrock Stormwater Improvements Project (City of Tallahassee)
12. Killearn Lakes Unit I - Drainage Improvements (Leon County)
13. Lake Heritage Dam Improvements (Leon County)
14. Lake Jackson Dredging (LC and NWFWMD)
15. Lake Munson Drawdown and Dam Replacement (Leon County)
16. Meridian Road Cross Drain at John Hancock Road (Leon County)
17. Old Plank Road at Chicken Branch Culvert Replacement
18. Orange Avenue Construction Project (Leon County)
19. Raymond Tucker, Golden Pheasant & Windwood Hills Drainage Project (Leon County)
20. Shamrock North at Edenderry & Bay Shore Stormwater Improvements Project (City of Tallahassee)
21. Stonehouse Road Project (City of Tallahassee)
22. Think About Personal Pollution (TAPP) campaign (City of Tallahassee)
23. Upper Lake Lafayette Nutrient Reduction Facility (City of Tallahassee)

Participation in the National Flood Insurance Program

Flooding is one of the most common natural hazards encountered in Leon County and the City of Tallahassee. Because of the risk it presents to local property owners and others, Leon County and the City of Tallahassee both participate in the National Flood Insurance Program (NFIP).

Flood insurance is not typically provided in a homeowner's policy, and so it must be purchased separately. Depending on a home's location, flood insurance may be a required purchase as a condition of a mortgage. Because the ability to buy or rent a home is critical to the economic and social stability of most community, the NFIP was developed by the federal government to assist homeowners and renters with flood insurance if their community participates in the program. The NFIP is administered by FEMA. The goals of this program include:

1. Decrease the risk of future flood losses,
2. Reduce the costs and adverse consequences of flooding,
3. Reduce the demands and expectations for disaster assistance after floods, and
4. Preserve and restore the natural and beneficial values of floodplains.

To qualify for subsidized federal flood insurance, a community must join the NFIP and agree to enforce sound floodplain management standards.

The City of Tallahassee has been a member of the National Flood Insurance Program (NFIP) since 1976 and of the Community Rating System (CRS) since 1994. The City is currently a Class VI CRS community which exceeds the minimum NFIP standards. The NFIP program is primarily regulated through the City and County's land development codes and the Florida Building Code.

Leon County has been a member of the NFIP since May 2015 and is currently a Class VI CRS community. This program is administered similarly to the City of Tallahassee.

As of September 30, 2018, Leon County has 1,617 policies in-force. As of September 23, 2019, the City of Tallahassee has 1,873 policies in-force.[57] The table below provides a list of losses in Leon County from 1976 through 2019.

Table 28: NFIP Flood Losses and Payments by Jurisdiction, 1976 – March 2019.[58]

Jurisdiction	Total NFIP Losses	Total Payments (in dollars)
City of Tallahassee	438	$6,213,755
Leon County	528	$5,920,934
Countywide Total	782	$9,082,984

Both Leon County and the City of Tallahassee will continue to participate in the NFIP program by continuing the following programs and actions:

- Restricting new development in floodprone areas through maintaining existing floodplain management ordinances that meet minimum NFIP criteria
- Requiring elevation certificates for all new construction and substantial improvements when any portion of a property is located below the flood protection elevation.
- Mitigating existing development in these areas through land and structure purchases and removals
- Protecting, reinforcing, or relocating infrastructure and critical facilities
- Maintaining FIRM maps and data and making these data available to the public
- Continuing participation in CRS program by the City of Tallahassee, including a 2015 Community Assistance Visit that the City successfully passed
- Anticipated participation by Leon County in the CRS program in 2015

[57] City of Tallahassee & Federal Emergency Management Agency, https://bsa.nfipstat.fema.gov/reports/1011.htm#FLT. [58] FEMA NFIP.

Community Rating System

The Community Rating System (CRS) is a federal incentive program for communities which exceed the minimum NFIP requirements. The incentive is up to 45% premium reductions for policyholders. The City of Tallahassee and Leon County both participate in the CRS. The County began its participation as of May 1, 2015.

Other Flood Mitigation Measures

The City of Tallahassee and Leon County developed and adopted Minimum Countywide Environmental Regulations in May 2012, establishing minimum standards, procedures, requirements, and regulations, including protection of conservation and preservation features.

The County's Greenspace Reservation Area Credit Exchange (GRACE) program is aimed at keeping new development from high-risk floodplain areas within Leon County. The program allows certain non-residential development to meet a portion of the landscape area requirements off-site by purchasing flood-prone properties, identified by Leon County, and conveying the property to Leon County. The flood-prone properties conveyed to Leon County are then maintained as open space.

Historical Occurrences

Both Leon County and the City of Tallahassee has compiled information on known flood problem areas from field reports and damage assessments. The City has mapped nuisance and hazard/damage flooding areas throughout the incorporated area.

Both City and County public works departments responsible for addressing stormwater flooding issues maintain lists of flooded structures and properties. The County's list is maintained by the Department of Public Works, and the City's list is maintained by the Division of Water Resources Engineering within the City's Department of Underground Utilities and Public Infrastructure.

Flooding in the City of Tallahassee generally occurs along four waterways: the West Drainage Ditch, the Central Drainage Ditch, the East Drainage Ditch, and the Northeast Drainage Ditch. The volume of runoff in certain areas exceeds the capacity of these channels, during heavy storms, and floods adjacent structures and lands. The West Drainage Ditch floods areas in the vicinity of Springhill Road and Lake Bradford Road. Frequent flooding of the Northeast Drainage Ditch occurs near Centerville Road in the vicinity of Capital Circle NE, Doomar Drive, and Potts Road. The Central Drainage Ditch floods areas in the vicinity of Stadium Drive, Eppes Drive, and Pepper Drive. Flooding of the East Drainage Ditch occurs in the vicinity of Orange Avenue, Blair Stone Drive, and Fleetwood Street. Although the floodwaters are not very deep, they cover streets and yards and can flood garages, cars, basements, and lower floors. Flooding also occurs due to local drainage problems and in several closed basins in the City.

Flooding in all of these areas can come with little warning. Floodwaters of the St. Augustine Branch, a tributary of the Central Drainage Ditch, have been observed to leave its banks and flood Franklin Boulevard within one-half hour after a thunderstorm started. Flooding can be dangerous. Even though

the floodwaters appear to be moving slowly, a flood two feet deep moving at three feet per second can knock people off their feet or float a car off the road.

If a property is in the floodplain, the odds are that someday this property will be damaged by flooding. A property may be high enough that it has not flooded recently. However, it can still be flooded in the future because the next flood could be worse.

The most floodprone area in the southern portion of the County is the Oak Ridge Road/Liberty Ridge area, which is the terminus of the Munson Slough drainage basin.

Localized flooding can occur from hurricanes, tropical storms, and severe thunderstorms that affect Leon County and the City of Tallahassee. Severe thunderstorms can occur both in the summer and the winter. Rainfall in Alabama and Georgia can also cause significant flooding problems in North Florida as experienced during tropical storms Alberto and Beryl in 1994. Tropical storms Helene (September 22, 2000), Allison (June 11-12, 2001), and Barry (August 5-6, 2001), and the infamous No Name Storm (March 2, 2002) in particular caused flooding that resulted in widespread structural damage.

Within Leon County, T.S. Fay was a 100-year flood event that produced sewer main breaks, damaged roadways, down trees, power lines, and necessitated water rescues and evacuations. An average of 15-17 inches of rain (21 inches in some areas) fell within a 72-hour period beginning on August 21, 2008. The heavy rains lasted two days and warranted the County's Leon County Emergency Operations Center (EOC) to remain active for 21 days until September 11, 2008. The Ochlockonee River, which forms the western boundary of Leon County, also rose 12 feet above flood stage on August 24.[59]

Estimated impacts to the City of Tallahassee from T.S. Fay included approximately $30 million in damages and response efforts. Flooding from T.S. Fay caused several breaks in the City's sewer system, discharging millions of gallons of raw sewage. Additionally, several sewer lift stations were inundated with flood water allowing raw sewage to discharge into flood waters. The lift station that serves the Timberlane subdivision was submerged during T.S. Fay, resulting in severe flooded and isolation due to the single access roadway being flooded. Countywide, T.F. Fay affected 600 homes.

The most recent storm events that caused flooding in many areas of Leon County and the City of Tallahassee were hurricanes Hermine and Michael in 2016 and 2018. The major impacts of these storms included wind damage to trees, which caused significant power outages in many areas of the community. Almost six inches of rain fell during Hurricane Hermine which caused localized short-term flooding in Leon County.

[59] The flood stage at the Highway 27 bridge on the county line near Havana is 25'.

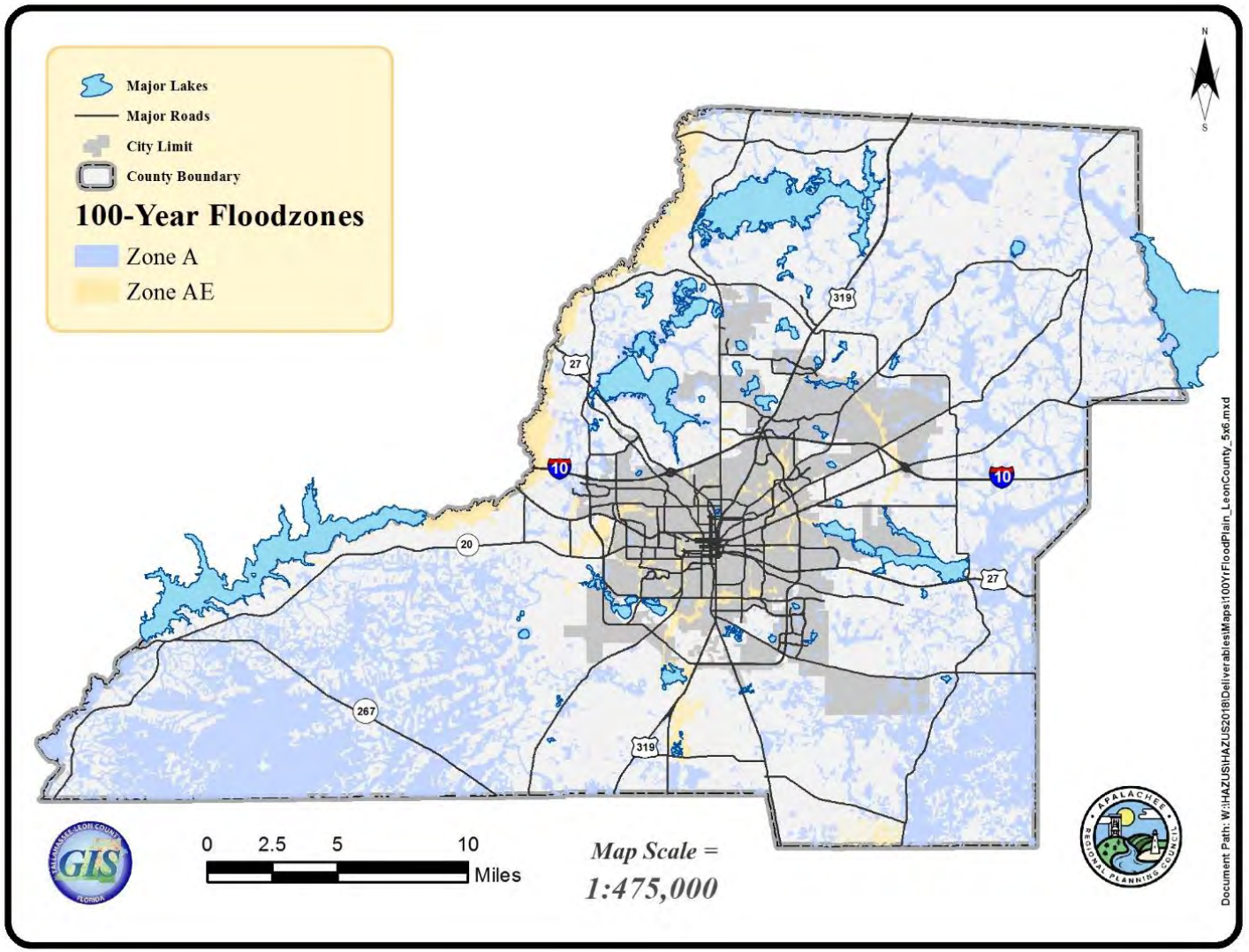
Estimated Impacts, Probability, and Extent

1. Flooding Analysis

The 100-year flood event, which has a one percent chance of occurring in any given year, is used as the base flood for the purpose of flood mitigation planning. The boundaries of the 100-year floodplain as designated by the FEMA Flood Insurance Rate Maps (FIRM), in Leon County and the City of Tallahassee are indicated in the maps below.

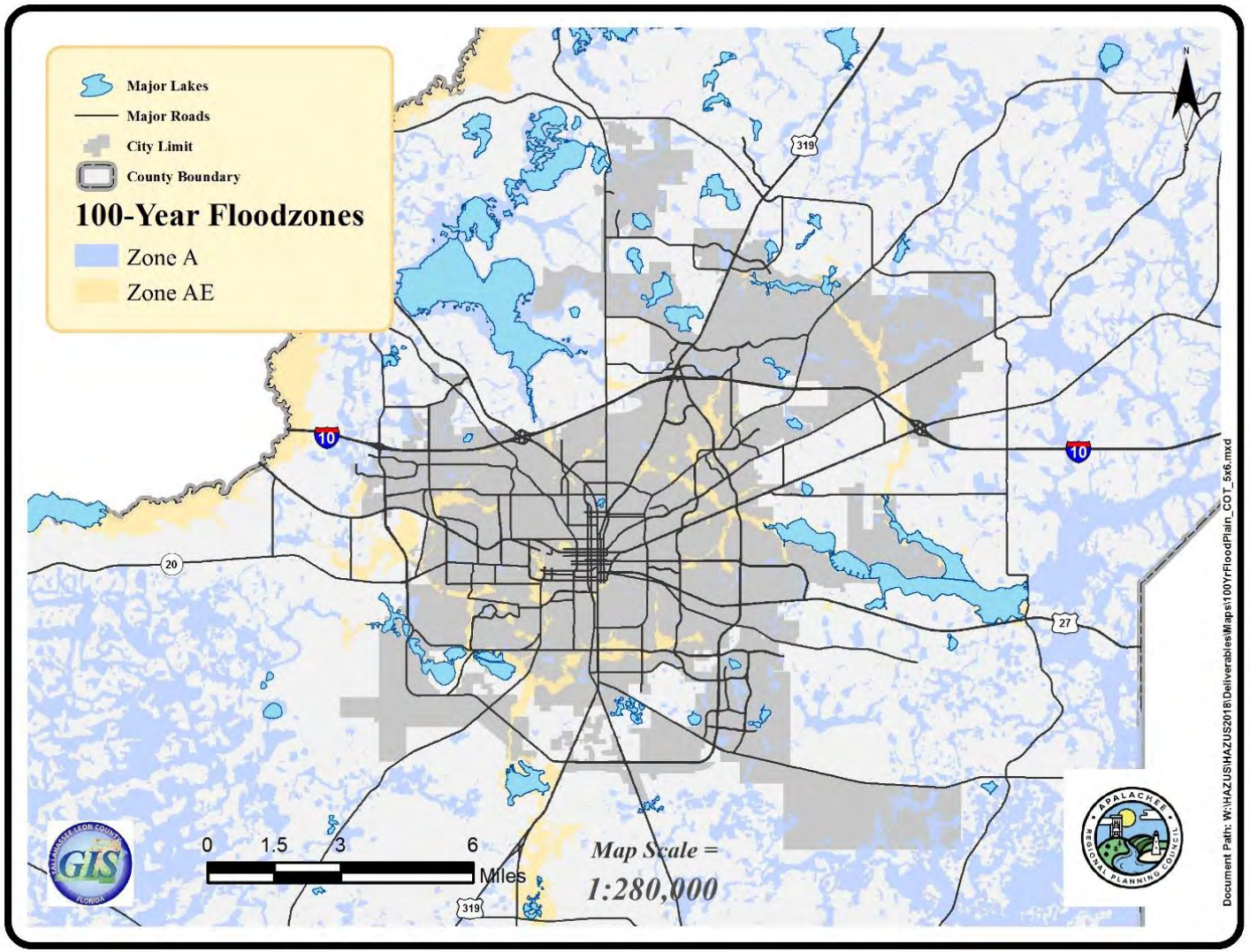
These maps note a distinction between Zones A and AE in the 100-year floodplain. For those areas categorized as Zone AE, engineering data exists that was used to calculate the Base Flood Elevation. This data is necessary for the Hazus-MH 4.2 model to calculate potential economic loss and this process was described in section IIA2c above. The maps below show the depth of flooding for Zone AE.

Figure 19: 100-Year Flood Plain – Leon County



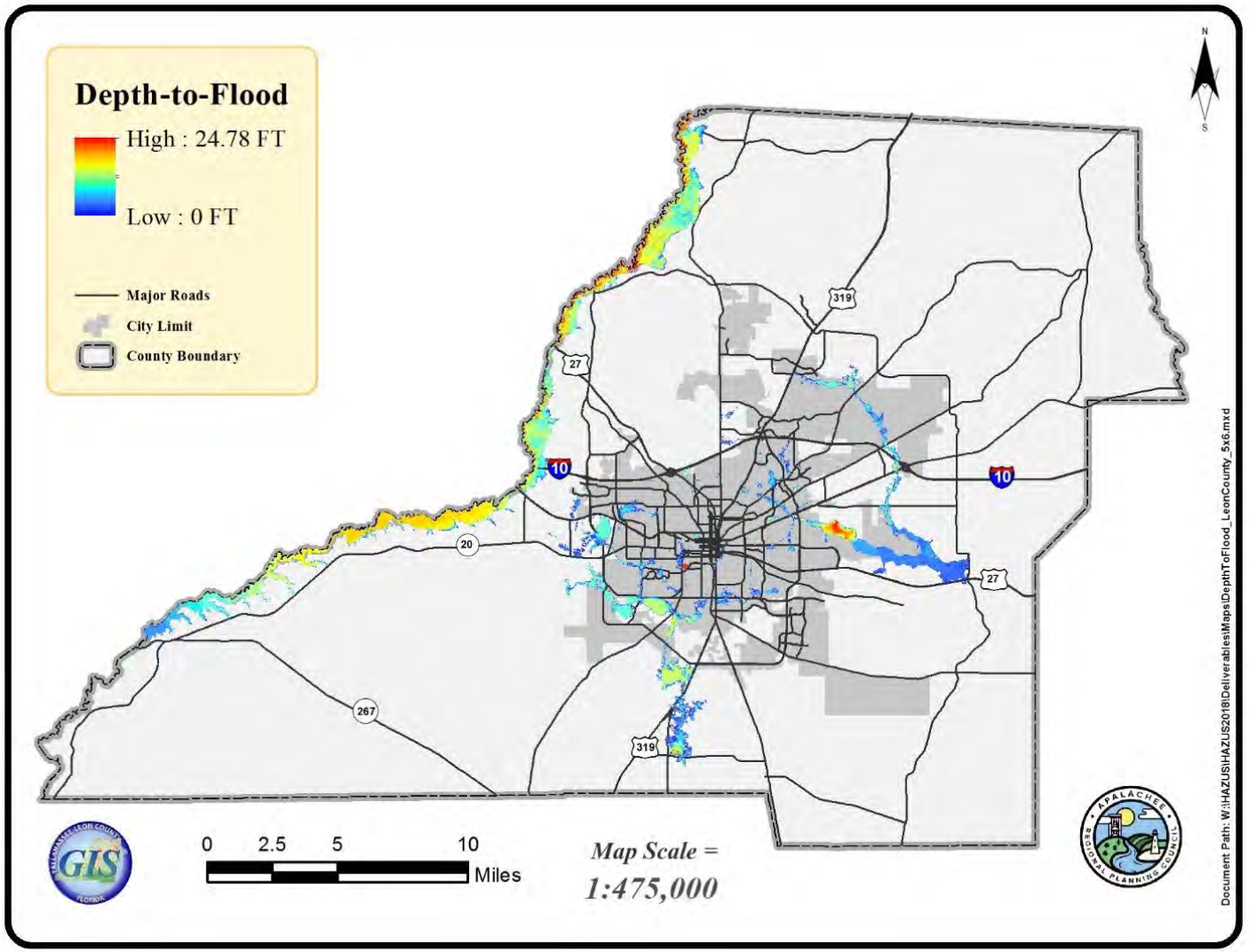
Source: Tallahassee-Leon County GIS

Figure 20: 100-Year Floodplain – City of Tallahassee



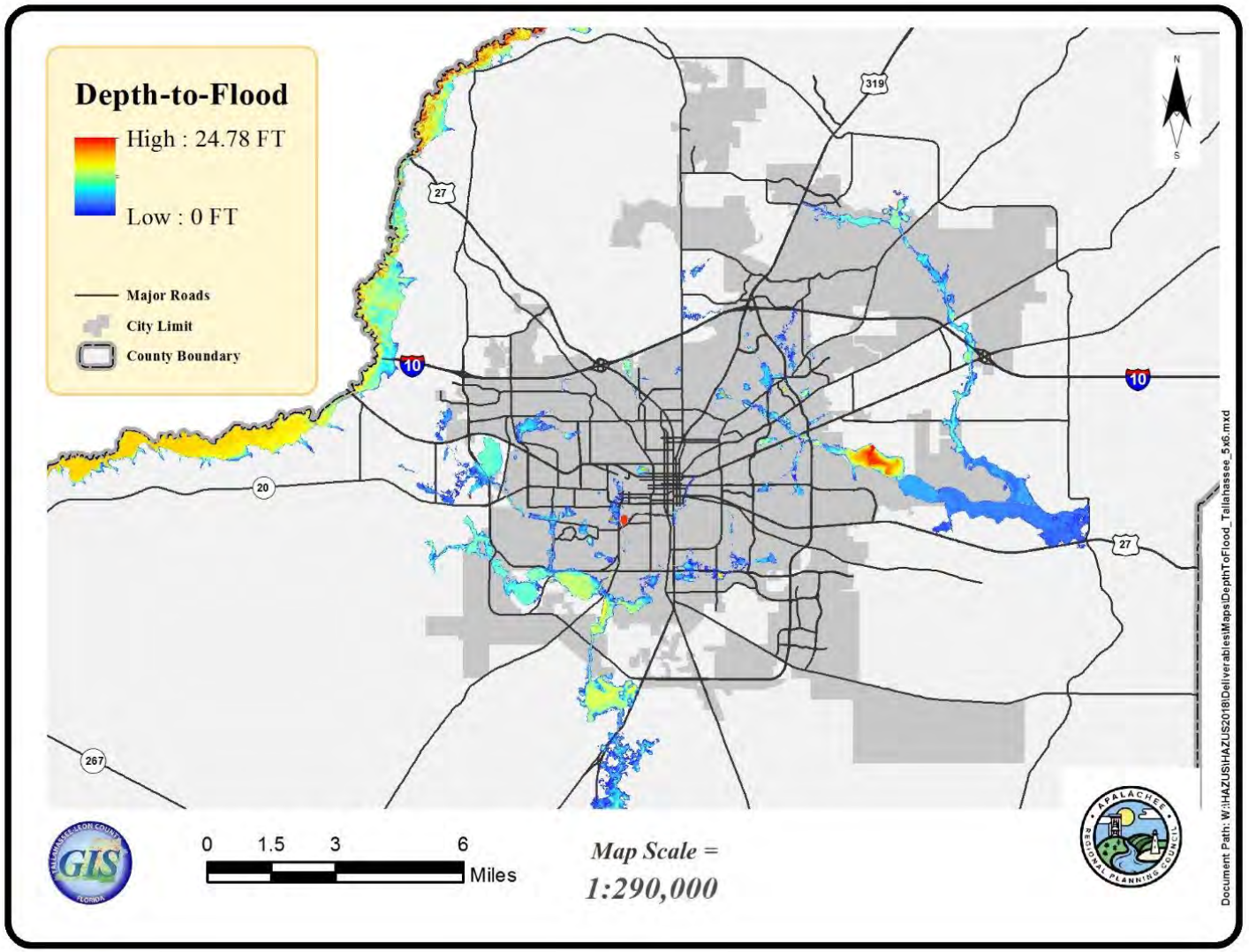
Source: Tallahassee-Leon County GIS

Figure 21: Zone AE Depth-to-Flood – Leon County



Source: Tallahassee-Leon County GIS

Figure 22: Zone AE Depth-to-Flood – City of Tallahassee



Source: Tallahassee-Leon County GIS

Hazus-MH 4.2 estimated that the total economic loss for a 100-year flood event is $269 million. It has been a long-standing land use policy not to develop areas of the floodplain, so the overall percentage of buildings at risk from flooding of this type is lower. However, it must be remembered that a good portion of the 100-year floodplain is not accounted for in these calculations because it is categorized in Zone A. The table below displays the economic loss by pro type. Similar to the hurricane scenarios the greatest impact is to residential properties which make up 55.73% of the total loss.

Table 29: Economic Loss from 100-Year Flood Event

Property Type	Loss
Residential	$149,990,000
Commercial	$83,520,000
Industrial	$13,740,000
Other	$20,600,000
Total Direct Economic Loss	**$267,840,000**

Source: Hazus-MH 4.2

Table 30: Critical Facilities Located in Known Hazard Zones

	Hazard			
Facility	**FEMA Zone A**	**FEMA Zone AE**	**Wildfire**	**Storm Surge**
Pineview Elementary School		X		
Belle Vue Middle School	X			
Florida High School			X	
John Paul II Catholic High School			X	
Station 13				X

Source: Tallahassee-Leon County GIS

1. National Flood Insurance Program (NFIP)

The NFIP is administered by FEMA and assists homeowners and renters with flood insurance if their community participates in the program. To be eligible, a community must enforce sound floodplain management standards. Participation in the NFIP affords some protection for properties located within the 100-year floodplain. There are 10,597 parcels in the 100-year floodplain which account for over $6 billion worth of property and structures with the potential for damage in the event of a 100-year flood event. As of September 30, 2018, 3,502 NFIP policies had been issued in Leon County and the City of Tallahassee.

Table 31: City of Tallahassee/Leon County Parcels in the 100-Year Flood Plain, 2018

Improvement Type	City of Tallahassee			Unincorporated Leon County		
	Number	Percent	Value ($)	Number	Percent	Value ($)
Residential	3,496	84	1,081,360,965	5,674	72	1,653,744,565
Mobile Home	60	1	3,992,190	1,231	16	79,794,403
Commercial	403	10	518,704,129	126	2	97,465,127
Other*	208	5	1,930,229,411	825	10	477,246,661
Total	**4,167**	**100**	**3,534,268,695**	**7,856**	**100**	**2,308,250,756**

Sources: Tallahassee-Leon County GIS Classified Building Data; Leon County Property Appraiser 2018 Tax Roll Data; 100-Year FEMA Special Flood Hazard Data, 2018

There are 3,689 buildings in the City of Tallahassee and Leon County that intersect the FEMA 100-Year floodplain. The summary results are shown below in Table III.15 and the valuations of these structures are included in the valuation summaries shown in the table below.

Table 32: Leon County/City of Tallahassee Count of Building Types in the Flood Plain

Building Type	City of Tallahassee	Leon County
Commercial	257	60
Florida A&M University	1	0
Florida State University	16	2
Government – City	4	0
Government – County	5	0
Government – State	1	0
Hotel	1	0
Park	7	15
Residential – Apartment	107	4
Residential – Condominium	23	0
Residential – Duplex, Quadplex & Triplex	46	20
Residential – Mobile Home	72	470
Residential – Multi-Family	75	0
Residential – Single Family	1,297	1,052
Residential – Townhouse	131	8
School – Elementary & High	4	0
Tallahassee Community College	2	0
Total	**2,049**	**1,631**

Source: Tallahassee-Leon County GIS Classified Building Data

From 1978 to March 2011, there were 782 countywide losses for flood related claims that were paid in the amount of $9.1 million throughout Leon County. The table below provides a list of losses in Leon County.

Table 33: NFIP Flood Losses and Payments by Jurisdiction, 1978 – March 2011

Jurisdiction	Total NFIP Losses	Total Payments (in dollars)
City of Tallahassee	254	$3,162,050
Leon County	528	$5,920,934
Countywide Total	782	$9,082,984

Source: FEMA NFIP

a. Repetitive Flood Loss Properties[60]

It is important to note that not all property within the floodplain is equally vulnerable to flooding. Typically, a small proportion of parcels experience more frequent flooding and are considered a higher priority for flood mitigation actions. A Repetitive Loss (RL) property is any insurable building for which the NFIP paid two or more claims of more than $1,000 within any rolling ten-year period, since 1978. At least two of the claims must be more than 10-days apart but, within ten-years of each other. A RL property may or may not be currently insured by the NFIP. In the City of Tallahassee, there are currently 54 properties identified as repetitive loss properties. Approximately 56 percent of RL properties have reported only two losses. The tables below display the number of repetitive loss properties in the City of Tallahassee and Leon County by type and by hazard.

Table 34: Leon County Repetitive Loss Properties by Type

	Number of Repetitive Loss Properties		
Occupancy	**Leon County**	**City of Tallahassee**	**Total**
Single-Family	62	42	**104**
Multi-Family	1	12	**13**
Non-Resident	1	23	**24**

Source: TLC GIS; Tallahassee-Leon County Planning Department, 2011

Table 35: Leon County Repetitive Loss Properties by Hazard Area

	Number of Repetitive Loss Properties		
Hazard Area	**Leon County**	**City of Tallahassee**	**Total**
FEMA 100-Year Flood Plain	13	58	**71**
Category 3 Storm Surge	1	0	**1**
Category 4 Storm Surge	4	0	**4**
Category 5 Storm Surge	2	0	**2**

Source: TLC GIS; Tallahassee-Leon County Planning Department, 2011

60 A Repetitive Loss (RL) property is any insurable building for which the National Flood Insurance Program (NFIP) paid two or more claims of more than $1,000 within any rolling ten-year period, since 1978. At least two of the claims must be more than 10-days apart but, within ten-years of each other. A RL property may or may not be currently insured by the NFIP.

Flooding Vulnerability

Mobile homes and septic tanks are particularly susceptible to damage from hurricanes and flooding. The following maps depict mobile homes and septic tanks in the 100-year flood plain.

Potential Losses

Hazus-MH 2.0 estimated that the total economic loss for a 100-year flood event is $269 million. It has been a long-standing land use policy not to develop areas of the floodplain, so the overall percentage of buildings at risk from flooding of this type is lower. However, it must be remembered that a good portion of the 100-year floodplain is not accounted for in these calculations because it is categorized in Zone A. The table below displays the economic loss by property type. Similar to the hurricane scenarios the greatest impact is to residential properties which make up 55.73% of the total loss.

Table 36: Economic Loss from 100-Year Flood Event.[61]

Property Type	Loss
Residential	$149,990,000
Commercial	$83,520,000
Industrial	$13,740,000
Other	$20,600,000
Total Direct Economic Loss	$267,840,000

The following table indicates critical facilities located in known hazard zones, including flooding.

Table 37: Critical Facilities Located in Known Hazard Zones.[62]

Facility	Hazard			
	FEMA Zone A	FEMA Zone AE	Wildfire	Storm Surge
Pineview Elementary School		X		
Belle Vue Middle School	X			
Florida High School			X	
John Paul II Catholic High School			X	
Station 13				X

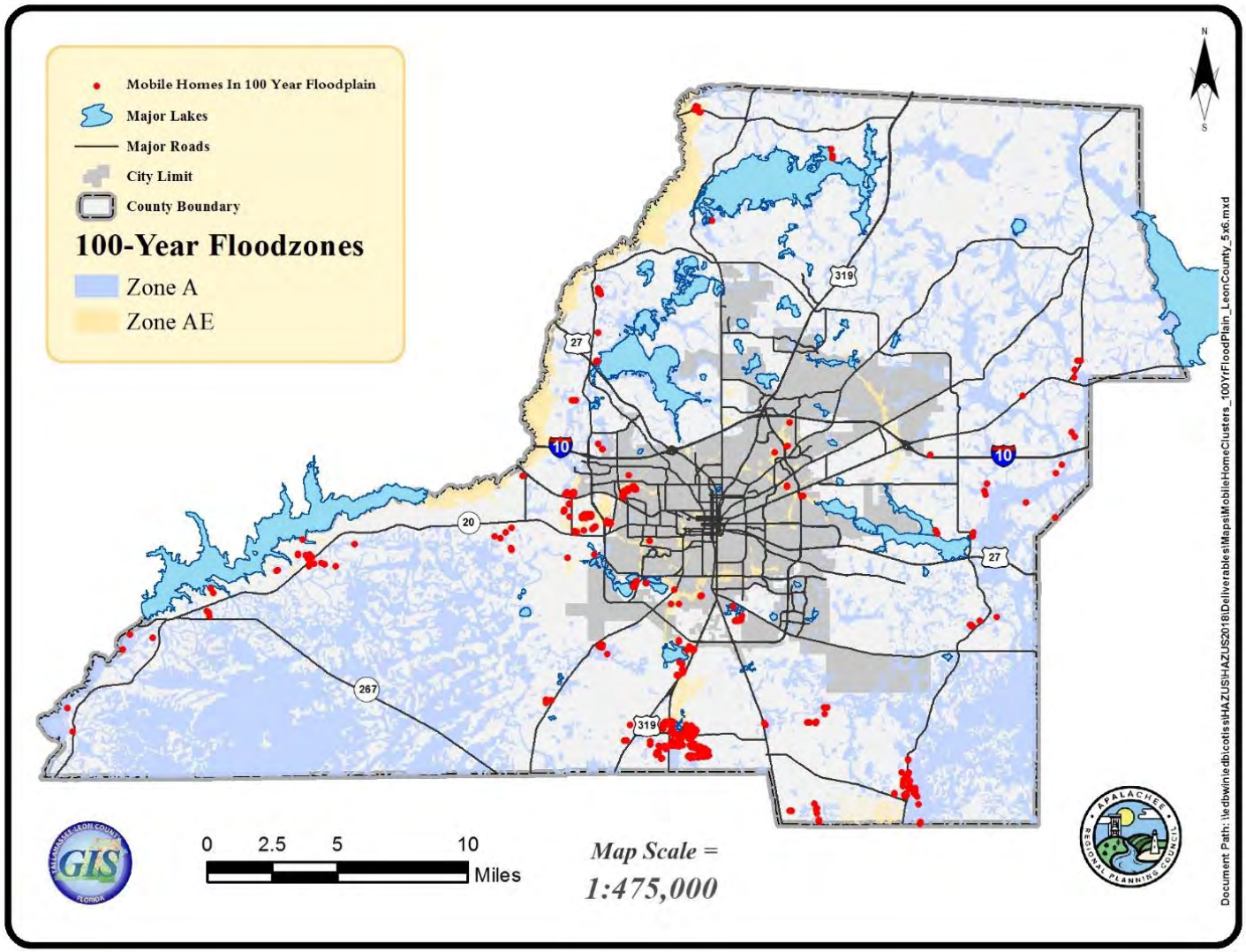
Repetitive Flood Loss Properties

It is important to note that not all property within the floodplain is equally vulnerable to flooding. Typically, a small proportion of parcels experience more frequent flooding and are considered a higher priority for flood mitigation actions.

[61] Hazus-MH 2.0.

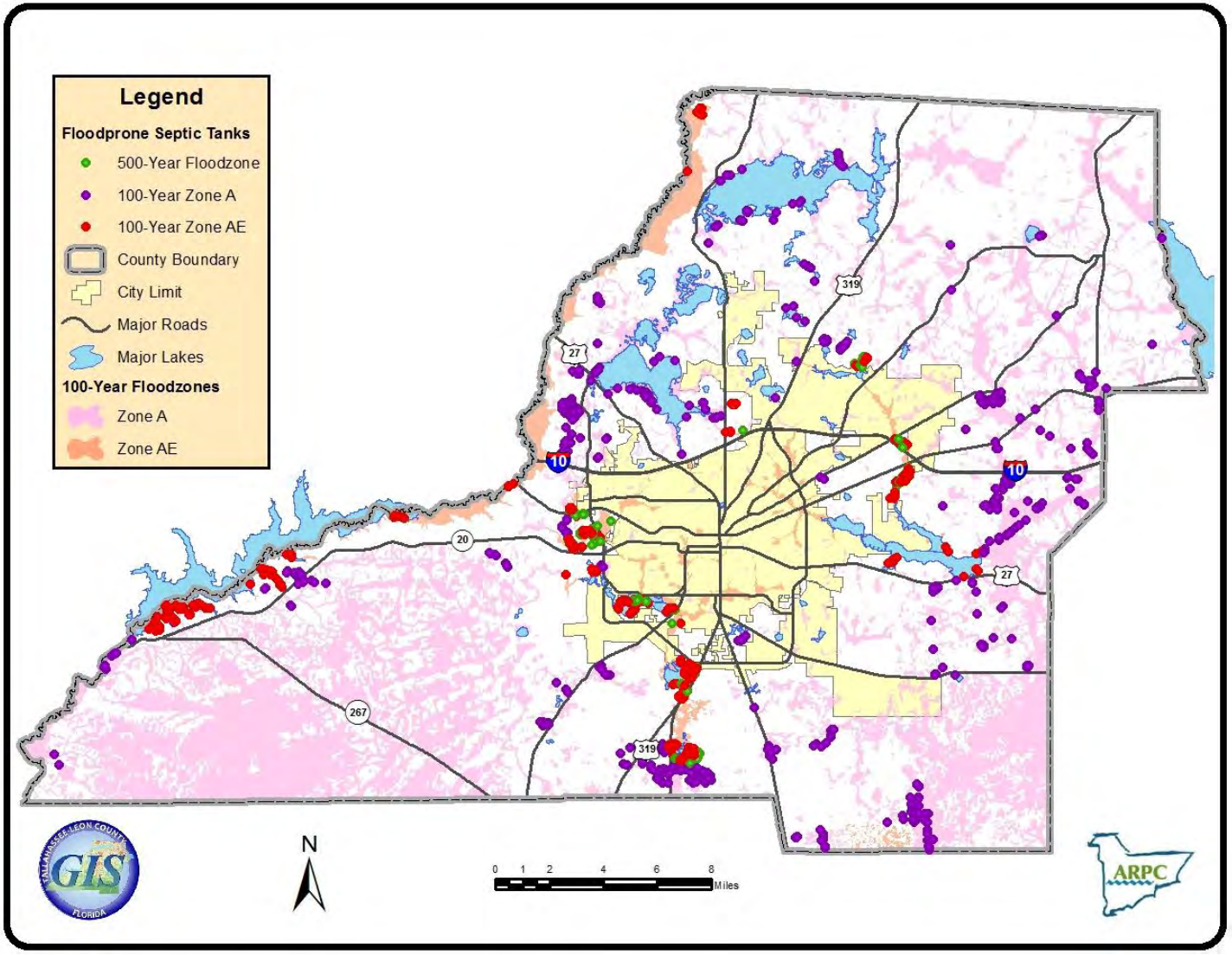
[62] Tallahassee Leon County Geographic Information Systems.

Figure 23: Mobile Home Clusters in the 100-Year Flood Plain



Source: Tallahassee-Leon County GIS

Figure 24: Septic Tanks in the 100-Year Floodplain.



Source: Tallahassee-Leon County GIS

Both Leon County and the City of Tallahassee maintain lists of properties identified as repetitive loss properties. These lists are confidential as required by federal regulations. These identified properties are usually located in areas subject to periodic flooding. The owners of these properties may approach the local government to try to remedy the flooding, or to request the buy-out of these properties. The local government can then apply for flood mitigation funding (pre- or post-disaster) to purchase these properties, which they then designate them as open space. These land acquisitions are always voluntary, and do not utilize eminent domain.

The lists of RL properties are maintained by County Public Works and City Underground Utilities (a division of the City Utilities department). These lists are required under federal law to be confidential, and they are not provided therein. However, at this time, Leon County has identified 14 single-family properties, but no (0) multi-family and non-residential properties on their RL list. The County has recently submitted documentation to transfer five (5) single-family, one (1) multi-family, and one (1) non-residential RL properties over to the City.

The City of Tallahassee has identified 63 RL properties. These include 39 single-family, seven (7) multi-family, 14 non-residential, and three (3) "other residential" properties. There are currently three single-family properties on the City's list that are actually within the unincorporated area (Leon County). These will be transferred to the County's list.

Summary

The amount of rainfall from thunderstorm events in most of Florida is calculated from stormwater design storms along with their probability. These design storms in the following table affect Leon County and the City of Tallahassee.

Table 38: Design Storms Used to Calculate Rainfall.

Design Storm[63]	**Avg. Rainfall**	**Probability**
2 year - 24 hour	4.5"	50 %
5 year - 24 hour	6.5"	20 %
10 year - 24 hour	7.5"	10 %
25 year - 24 hour	8.5"	4 %
50 year - 24 hour	9.5"	2 %
100 year - 24 hour	10.5"	1 %

Flooding in Leon County can occur from all of these events, depending on location and other factors. However, because severe thunderstorms (five year – 24 hour or stronger) are estimated to occur at least four times per year, it is expected that, depending on amount and duration of rainfall, these storms will create nuisance or hazard flooding in many areas, particularly within the 100-year floodplain.

[63] http://www.pdhonline.org/courses/h119/stormwater%20runoff.pdf.

The worst stormwater event anticipated for Leon County and the City of Tallahassee is a 100 year - 24 hour storm that creates an average rainfall of 10.5". All structures (mobile homes and septic tanks) within the 100-year floodplain (Zones A and AE) and the 500-year floodplain as indicated in Figures 22 and 23 would be affected by flooding from this event.

The depth of a flood can vary with these storms and where they occur. Figures 20 and 21 indicate Zone AE depth to flooding; the computed elevation to which floodwater is anticipated to rise during the base flood (0.1' to 25', depending on location). If the base elevation of a structure is lower than the depth indicated on Figures 20 and 21, then this structure may be damaged by flooding. Generally, flooding can cause significant property damage when it exceeds six inches over this elevation.

Overall, the probability based on the historical record of a flooding event affecting Leon County and the City of Tallahassee is **likely** as defined under Section 2.2.1 Risk.

Vulnerability Summary

Leon County and the City of Tallahassee have a record of county-wide vulnerability to flooding primarily related to heavy rainfall and tropical events. Areas and features specifically vulnerable to flooding include:

- land parcels having at least a portion of their property in the 100-year floodplain
- Mobile homes and septic tanks in 100-year floodplains
- All structures and facilities within Special Flood Hazard Areas, Non-Special Flood Hazard Areas, and Undetermined-Risk Areas as identified on local FIRM maps
- Unrecorded subdivisions and all subdivisions built before 1991-92
- Pineview Elementary School and Belle Vue Middle School
- Flood Problem Areas identified in the Leon County Stormwater Master Plan
- Other flooded structures properties identified by the City and County departments of public works (internal data only), including Repetitive Loss properties
- Local flooding areas identified by the City of Tallahassee's Division of Water Resources Engineering
- Parking areas adjacent to Leon High School and the FSU Flying High Circus

Risk Assessment

Based on assessment of historical data, the extent and location of floodprone areas, and the Hazus analysis, flooding is classified as a **high risk** in Leon County and the City of Tallahassee.

2.12 Extreme Temperatures

General Description and Location

Global climate change is affecting Florida and other parts of the U.S. Global climate change has already had observable effects on the environment. Glaciers are shrinking, ice on rivers and lakes is breaking up earlier, plant and animal ranges have shifted, and trees are flowering sooner. Effects that scientists had predicted in the past would result from global climate change are now occurring: loss of sea ice, accelerated sea level rise, and longer, more intense heat waves.

Scientists have high confidence that global temperatures will continue to rise for decades to come, largely due to greenhouse gases produced by human activities. The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, forecasts a temperature rise of 2.5 to 10 degrees Fahrenheit over the next century.

According to the IPCC, the extent of climate change effects on individual regions will vary over time and with the ability of different societal and environmental systems to mitigate or adapt to change.[64]

Regardless of regional variations, the National Air and Space Administration (NASA) and IPCC predict that temperatures worldwide will continue to rise, growing seasons will lengthen, precipitation patterns will change, there will be more droughts and heat waves, and hurricanes will become stronger and more intense. Additionally, sea level will rise 1-4 feet by 2100, and the Arctic will likely become ice-free. The variability in the projected temperatures and related affects is based partly on the response to these projections. For instance, the effects of climate change can be influenced by worldwide efforts to reduce greenhouse gas emissions, as well as other mitigation measures.

The following descriptions of extreme temperatures, including historical climate data, projections, vulnerability, and risk. are intended to be those temperatures and associated effects that affect the area of Leon County and the City of Tallahassee. Although Tallahassee can be an urban heat island on very hot days, the historical data and the projected effects of extreme temperatures apply equally to both urban and non-urbanized areas within Leon County.

Heat

Extreme heat is defined as weather that is "substantially hotter and/or more humid than average for a location at that time of year."[65] The Heat Index, which measures the "apparent temperature" when considering both air temperature and humidity, is used by organizations like the National Weather Service to identify extreme heat days. Extreme heat is particularly dangerous when occurring for a prolonged period (known as a "heat wave"). The higher heat index, the more difficult it is for the body to cool itself. Since Florida is surrounded by the Atlantic Ocean and the Gulf of Mexico, the state is always influenced by tropical moisture, especially in the summer. This can drive the heat index higher than in regions with drier air, such as Colorado.

Extreme heat can also help create the conditions for drought and can exacerbate the impacts of drought by putting additional stress on available water supplies. Extreme heat may lead to increased

64 https://climate.nasa.gov/effects/.

65 https://planningforhazards.com/extreme-heat.

storm activity, which is linked to both high winds and flash flood hazards. It can also contribute to the spread of wildfires.

Extreme hear is often influenced by urban development. An urban heat island (UHI) is an urban area or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities. The temperature difference is usually larger at night than during the day, and is most apparent when winds are weak. UHI is most noticeable during the summer and winter. The main cause of the urban heat island effect is from the modification of land surfaces. Waste heat generated by energy usage is a secondary contributor. As a population center grows, it tends to expand its area and increase its average temperature. The term heat island is also used; the term can be used to refer to any area that is relatively hotter than the surrounding, but generally refers to human-disturbed areas.[66]

Monthly rainfall is greater downwind of cities, partially due to the UHI. Increases in heat within urban centers increases the length of growing seasons, and decreases the occurrence of weak tornadoes. The UHI decreases air quality by increasing the production of pollutants such as ozone and decreases water quality as warmer waters flow into area streams and put stress on their ecosystems.[67]

Historical Occurrences

The following table lists all-time weather records for Tallahassee, Florida through 2019. For temperature and precipitation records, there are two sets of data. The first two columns of data represent extremes recorded at the current observing site at the Tallahassee International Airport (previously the Tallahassee Regional Airport). Prior to March 29, 1961, observations were taken at other locations in Tallahassee and records for these locations are listed in the last two columns. Observations were taken at the Dale Mabry Field from this date back to March 1940. Prior to that, observations were taken at various downtown locations beginning in April 1885.

66 https://en.wikipedia.org/wiki/rban_heat_island.
67 Ibid.

Table 39: Weather Records for Tallahassee, Florida (°F).[68]

	(3/30/61-Present)		(4/1/1885 - 3/29/1961)	
Record	**Reading in F°**	**Date(s)**	**Reading in F°**	**Date(s)**
Hottest Temperature	105	June 15, 2011	104	June 20, 1933 July 15, 1932 July 3, 1931 June 29, 1931 June 24, 1914
Coldest Temperature	6	January 21, 1985	-2	February 13, 1899
Highest Daily Mean	91	July 30, 2010 July 20, 2007 July 18, 2000 July 16, 2000 July 14, 1980	91	July 15, 1932 July 11, 1930 June 29, 1931
Lowest Daily Mean	17	January 21, 1985	10	February 13, 1899
Lowest Daily Maximum	28	January 21, 1985	22	February 13, 1899
Highest Daily Minimum	81	July 15, 1980	79	July 11, 1930
Hottest Month	85.4	July 2015	85.4	July 1932
Coldest Month	43.9	January 1977	41.0	January 1940
Coldest Year	65.5	1979	64.9	1901
Hottest Year	71.8	2015	70.7	1933
Most Days at or above 100	16	1998	12	1931
Earliest 100 Degree Day	100	May 28, 2000	100	May 24, 1941
Latest 100 Degree Day	101	September 18, 2019	100	September 20, 1931
Earliest 90 Degree Day	90	March 15, 1967	90	March 21, 1907
Latest 90 Degree Day	90	October 22, 1993*	90	October 26, 1931
Fewest Freezes	15	2018-2019	N/A	N/A
Most Freezes	56	1977-78 & 1969-70	32	1957-58
Most Hard Freezes	19	2000-01	11	1917-18
Earliest Freeze	32	October 18, 1977	29	November 3, 1954
Latest Freeze	31	April 23, 1993	30	April 13, 1918
Earliest Hard Freeze	21	November 9, 1976	22	November 16, 1940
Latest Hard Freeze	25	March 23, 1986	24	March 10, 1932
Latest First Freeze	32	January 8, 1995	N/A	N/A
Earliest Last Freeze	30	February 17, 1997	N/A	N/A
Average First Freeze		November 16		December 6
Average Last Freeze		March 19		February 27
Hottest Summer	84.4	2011	82.6	1932
Coolest Summer	78.9	1961	77.6	1892
Warmest Winter	58.4	1971-72	64.2	1931-32
Coldest Winter	47.0	1977-78	48.6	1957-58

* denotes last of several occurrences

[68] https://www.weather.gov/tae/extremes.

Estimated Impacts, Probability, and Extent

Heat

The effects of heat on Leon County include increased utility costs, the loss of electricity, drought, plant and tree stress, and negative effects on human health.

Extreme heat conditions can have significant to fatal impacts upon human health. A number of factors contribute to an individual's risk for heat-related illness including age, obesity, illness, medication, temperature, humidity level, time spent in the heat, hydration level, exposure to direct sunlight, pre-existing conditions, and others. The signs and symptoms of heat-related illness are progressively worse. If one fails to heed the signs and seek immediate medical attention, hyperthermia and death may result. First responders are also at higher risk if they are physically exerting themselves or wear bulky personal protective equipment.[69]

The greatest threat for infrastructure damage is through the loss of electrical power generating capacity. During times of excessive heat, air conditioning units work extra hard and demand a lot more electricity. Brownouts and blackouts are possible when electricity demand exceeds the utility's ability to generate it.

In the event of a loss of electrical power or chilled water capacity, the lack of climate control in a building may also necessitate evacuation and closure. Virtually all new buildings, including residential and non-residential, are designed to have climate controlled interior environments as well as be as energy efficient as possible. However, most institutional and apartment buildings often don't have windows that open, natural cross ventilation, or even high ceilings to allow excessive heat to rise. If there is no energy to operate HVAC units or even fans, these buildings can become dangerously hot and stuffy.

The historical probability of occurrence of a Heat Advisory in Leon County is **very likely**. Weather conditions that warrant the issuance of a Heat Advisory occur at least once per year during the summer, May - September. The historical probability of occurrence of an Excessive Heat Warning in Tallahassee is **likely**.

Excessive heat warnings are issued by the National Weather Service when the heat index reaches or exceeds 105°F for 48 hours. At a heat index of 105°F, even healthy adults are at risk of heat-related illness with prolonged exposure. Weather conditions that warrant the issuance of an Excessive Heat Warning historically occur on average once every 3 to 5 years in Tallahassee.[70] According to a recent study by the Union of Concerned Scientists, "Killer Heat in the United States," the number of days with a heat index above 105°F was historically five days per year on average. However, this is expected to increase to 32 to 50 days per year based on climate change projections and the actions (or lack thereof) taken to slow down or stop climate change.[71] This dramatic increase in the number of days with a heat index above 105°F would be considered "extreme" in Leon County.

69 https://emergency.fsu.edu/hazards/extreme-heat/extreme-heat-analysis.

70 Ibid.

71 https://www.ucsusa.org/sites/default/files/attach/2019/07/killer-heat-analysis-full-report.pdf.

Table 40: Southeast and Southern Great Plains Cities Will Face Many More Days per Year with a Heat Index Above 105°F by Midcentury.[72]

Location	Historical	No Action	Slow Action
Austin, TX	5	59	42
Baton Rouge, LA	5	57	37
Columbia, SC	5	37	24
Jackson, MS	6	52	36
Montgomery, AL	4	44	29
Oklahoma City, OK	4	43	29
Raleigh, NC	3	26	16
Tallahassee, FL	5	50	32

Historically, cities in the Southeast and Southern Great Plains regions have experienced fewer than a week's worth of days with a heat index above 105°F in an average year. With no action or slow action to reduce global heat-trapping emissions, the sampling could experience at least quadruple the number days by midcentury.[73]

Vulnerability Summary

If global climate change and its accompanying projected warming (as well as other extremes in temperatures and other weather events) expected to affect the U.S. were not to occur, Leon County and the City of Tallahassee would still be vulnerable to extreme heat and cold, albeit on a limited basis. However, given the preponderance of observable historic and current data and the climate change projections of organizations like NASA and IPCC, it is anticipated that the vulnerability to extreme temperatures in Leon County and the City of Tallahassee is expected to increase, and that the rate of increase is dependent upon significant efforts to curb greenhouse gas emissions, among other efforts to address the causes of global warming. Certainly, there are many actions that government agencies, private businesses, and residents of Leon County and the City of Tallahassee can take to help mitigate this increasing vulnerability, but because climate change affects large areas outside the local jurisdiction, there are limits to what can be mitigated locally.

As previously described, unsheltered homeless persons are particularly vulnerable to extreme temperatures. Very hot temperatures create conditions amenable to heat cramps, exhaustion, and stroke, and very cold temperatures can create conditions under which these persons can develop hypothermia, or even freeze to death.

72 Ibid.
73 Ibid.

Risk Assessment

Based on an assessment of historical data and frequency of reported events, extreme temperatures are generally classified at present as a **low risk** to Leon County residents. However, projections indicate that this risk will increase in the future.

2.13 Wildfires

General Description and Location

Florida is a state vulnerable to wildfire. Our "fire season" extends throughout all 12 months although most fire activity occurs from January through May. The basic forest and shrub ecology of the state has been created by wildfire, and such fires remain a natural feature of the landscape. Prescribed fire mimics the occurrence of natural fire and has been a useful land management tool for many years in Florida. Prescribed fire consumes excess fuels, germinates many native plants, and helps create and maintain natural wildlife habitat.

The Florida Forest Service (FFS) responds to wildfire events outside the city limits. As of November 1998, the FFS's jurisdiction included approximately 214,877 acres in (48 percent of the land area) in Leon County. Of the five counties in Fire District Four (Leon, Gadsden, Jefferson, Wakulla and Franklin Counties) Leon has produced the least number of fires requiring an FFS response. This may be largely due to a lower concentration of combustible fuel types and the significant amount of controlled burning that takes place on a regular basis. Large areas in the north and northeast are held as plantations and frequently utilize fire as a land management tool. A significant portion of the southwestern area of the county is within the Apalachicola National Forest. There is no significant habitation within its borders and the area immediately surrounding the forest contains limited development. While residents may experience a periodic blanketing of smoke, the regular use of prescribed burns by the Florida Forest Service personnel reduces the risk of wildfire.

The following descriptions of wildfires, including historical data, projections, vulnerability, and risk. are intended to be those that affect Leon County and the City of Tallahassee.

Historical Occurrences

Florida's' vulnerability to wildfire was highlighted during the summer of 1998. According to the Governor's Wildfire Response and Mitigation Review Committee, nearly 2,300 wildfires charred 500,000 acres, damaged over 300 homes, destroyed more than $300 million worth of timber resources, and forced the evacuation of an entire county. The damage was concentrated in areas where homes were scattered on the outskirts of existing urban areas—the wildland/urban interface.

Wildfires can affect many areas of Leon County, but it is particularly a hazard on vacant, undeveloped lands within the urban area where individuals are building homes, particularly in areas with heavy concentrations of trees and vegetation, and where existing fire services or facilities are few or nonexistent. Large amounts of dry underbrush require only an ignition source which can come from various sources such as escape yard debris burn piles, lightning or even the wheels of a passing train.

Due to the concentration of residents in rural wooded areas of the county, additional threats to life and property exist, therefore requiring increased mitigation efforts.

As indicated in the table below, the 47 reported wildfires during this time carried a variety of causes. Most of these fires (53%) were caused from debris burns (piles, yard trash, and acreage). Fires caused by non-authorized piles topped the list at nine (19% of total fires). Non-authorized burning of yard trash accounted for eight fires (17% of total fires). Authorized broadcast/acreage burns rounded out the top three causes accounting for four fires (8.5% of total fires).

Table 41: Leon County Fires by Causes 1/01/2015 – 7/31/2019

Cause	Fires	Percent	Acres	Percent
Campfire	1	2.13	6.1	2.28
Children	0	0	0.0	0
Debris Burn*	0	0	0.0	0
Debris Burn--Auth--Broadcast/Acreage	4	8.51	53.3	19.93
Debris Burn--Auth--Piles	0	0	0.0	0
Debris Burn--Auth--Yard Trash	1	2.13	0.1	0.04
Debris Burn--Nonauth--Broadcast/Acreage	3	6.38	20.8	7.78
Debris Burn--Nonauth--Piles	9	19.15	18.0	6.73
Debris Burn--Nonauth--Yard Trash	8	17.02	12.6	4.71
Equipment use*	0	0	0.0	0
Equipment--Agriculture	0	0	0.0	0
Equipment--Logging	1	2.13	0.5	0.19
Equipment--Recreation	0	0	0.0	0
Equipment--Transportation	0	0	0.0	0
Incendiary	0	0	0.0	0
Lightning	1	2.13	6.0	2.24
Miscellaneous --Breakout	1	2.13	1.0	0.37
Miscellaneous --Electric Fence	0	0	0.0	0
Miscellaneous --Fireworks	0	0	0.0	0
Miscellaneous --Power Lines	3	6.38	1.9	0.71
Miscellaneous --Structure	1	2.13	2.0	0.75
Miscellaneous--Other	1	2.13	0.5	0.19
Railroad	0	0	0.0	0
Smoking	1	2.13	0.1	0.04
Unknown	12	25.53	144.5	54.04
Total	**47**		**267.4**	

The Florida Forest Service has addressed this issue in Leon County by educating the public about these causes and proposed actions that may be taken to control and prevent the fires caused by debris burning. The Florida Forest Service has accomplished this through Firewise programs and Ready, Set, Go programs and literature given throughout the county.

Over the past couple of years, Leon County has experienced the effects of climate change with increasingly hot temperatures and elevated drought-like conditions. During these times fire danger risk increased within Leon County.

Hurricane Michael

On October 10, 2018 historic Hurricane Michael made landfall near Mexico Beach in the Florida Panhandle shattering and leveling homes, snapping trees and scattering massive debris throughout the region. Crossing land at nearly a category 5 storm, Michael packed winds of 155mph making it the strongest storm ever to make landfall in Florida's panhandle region.

The effects and devastation of the storm was felt from Mexico Beach east to Tallahassee and north into several counties in Georgia. Damage assessments in Florida have reported up to 72 million tons of downed timber across 1.5 million acres. These findings have significantly increased the risk for wildfires and invasive pests across the northern panhandle region.

Although nearly two hours away from the landfall location, Leon County and the city of Tallahassee experienced an excessive number of downed trees and yard debris. The downed timber provided for large amounts of "Continuous Fuels" increasing the potential risk for wildfire in Leon County. Between the City of Tallahassee and Leon County 300,000 tons of storm debris was removed. Currently, with the amount of debris still in the county, wildfire risk remains elevated. (8/28/19)

<u>Estimated Impacts, Probability, and Extent</u>

The Florida Forest Service recorded 47 wildfires in Leon County from January 1, 2015 to July 31, 2019 (approximately 4.5 years), which is an average of slightly more than ten wildfires per year in Leon County. These fires burned a total area of 267 acres. Although this is equal to an average of 5.7 aces per fire event, approximately 51% of these fires were 1 acre or less. However, the remaining 49 percent averaged 10.6 acres in size.

Although wildfires in or near forested residential areas provide a tangible threat to citizens and property within Leon County and the City of Tallahassee, the impacts of wildfire in Leon County and the City of Tallahassee has historically been minimal. However, the potential impact of wildfires in the wildland urban interface is significant and increasing along with development. The wildland urban interface is an area where "wildlands" (natural or reforested areas) are adjacent to urban areas, including suburban residential areas. Fire is threat in these areas if adjacent or interspersed wildlands are not actively managed with prescribed fire or the physical removal of burnable vegetation.

According to the latest Southern Wildfire Risk Assessment (SWRA) provided by the Florida Forest Service, approximately 272,877 acres within Leon County are located in the wildland urban interface and are at the highest risk of burning. The Wildland Urban Interface Risk Index, a part of the risk assessment, is a rating of the potential impact of a wildfire on people and their homes. According to

this index, approximately 23 percent of the Wildland Urban Interface acreage may experience elevated to major impacts to people and their homes should wildfire occur. The remaining 77 percent of the Wildland Urban Interface acreage within Leon County is considered to be at moderate to low impact on people and their homes should wildfire occur. These findings may reflect upon the solid land management practices (prescribed burning, etc.) carried out by several federal and state agencies; private contractors and plantations within Leon County. Most of this area is located either within the Apalachicola National Forest, or within privately managed hunting plantations. However, a significant amount of this area is within suburban areas that either adjoin wild lands or are heavily forested.

A healthy urban forest provides a valuable aesthetic environment for residents, but it may also contribute to the potential for the spread of fire, particularly if there are fire-dependent tree and shrub species within these areas. This is more so if these "natural" areas are not managed (i.e., burned to remove natural leaf litter). As land development continues, more and more homes are being built in the vegetated or forested areas throughout Leon County. These homes have an increased vulnerability to wildfire since they are often located in areas that are removed from existing fire stations and water distribution systems and have even higher fuel loads near structures.

Leon County has recognized the danger posed by wildfires and has amended policies within the Conservation Element of the Tallahassee-Leon County Comprehensive Plan to include a policy promoting land management practices that utilize prescribe burns as a fire protection strategy:

> **Policy 1.2.3 [Conservation Element]:**
>
> In conjunction with the appropriate state, federal and regional agencies and property owners, local government shall implement, maintain, and promote land management practices that enhance fire protection, wildlife habitat and sustainable silviculture practices. These practices shall include, but not be limited to, the use of prescribed burns, the creation of defensible space buffers, vegetative maintenance, and the control or removal of invasive exotics.
>
> In areas of wildfire hazard, the land development regulations shall require the provision of defensible space buffers surrounding new developments and multiple exits from large developments. To further the effectiveness of these practices, public awareness programs will be developed by 2010 to inform and educate existing and new property owners that these practices, prescribed burns in particular, may be regularly employed nearby and may affect their property. [74]

Existing policies related to controlled burns include Section 11-16 of the Land Development Code, which requires a permit for open burning within the City limits. Prescribed burns are encouraged for large landowners by the FFS to reduce fuel loads, which could contribute to uncontrolled fires. Chapter 590, Florida Statutes, requires burn authorizations from the FFS prior to conducting a prescribed burn anywhere in the state. Burn authorizations are required for acreage burning on all private and public lands, including private plantations, state parks, and national forest lands. This authorization process provides a means of tracking and controlling prescribed burning efforts. Authorizations are not issued

[74] Tallahassee-Leon County Comprehensive Plan, 2015.

if environmental conditions, such as droughts or high winds, would present hazardous conditions or if a location is considered in a smoke sensitive area due to proximity to populated areas. Permitted burns are often site-checked by the FFS for compliance with proper fire procedures.

State and Federal Wildfire Mitigation Programs

After the devastating wildfires of 1998 throughout the state the legislature charged the Florida Forest Service with the task of creating a mitigation program to help manage/ alleviate thick vegetative fuels in communities and around homes to prevent catastrophic wildfire. The FFS identifies project areas annually in mitigation action plans created at the District level. Work to complete these projects occurs throughout each year using both prescribed fire and mechanical (mowing, mulching) applications to reduce wildfire risk.

Firewise is a national program that encourages landowners and communities to take responsibility for their wildfire risk by creating defensible space around homes and implementing various fuel reduction projects to minimize their risk of home ignition. The FFS provides Firewise outreach programs to residents in Leon County throughout the year.

The Ready, Set, Go program enables firefighters to teach individuals to be ready for wildland fire by utilizing existing preparedness tools like Firewise; to have situational awareness when a fire starts; and to leave early for the safety to themselves and firefighters. The program seeks to make residents and fire departments partners in the wildland fire solution. These programs are a part of the larger Fire Adapted Communities Approach to reducing wildfire risk throughout the entire community. The FFS conducts public outreach programs throughout the community and distributes program brochures on a yearly basis in Leon County.

Overall, the probability based on the historical record of a wildfire within Leon County and the City of Tallahassee is likely because of the extent of the wildland urban interface, including adjacent heavily forested areas. However, most of these fires are small and easily controllable because of prescribed burning on public and private lands, and the advanced fire protection offered throughout the County.

<u>Vulnerability Summary</u>

Leon County and the City of Tallahassee has a history of county-wide vulnerability to wildfires. As growth continues, more and more homes are being built in heavily vegetated or forested areas in the county. These homes have increased the wildfire vulnerability since they are often located in areas that are removed from existing fire stations and water distribution systems and have even higher fuel loads close to homes. Although approximately half the wildfire events in the last five years in Leon County have been one acre or less in size, the remaining number of wildfires averaged more than ten acres in size. A one-acre wildfire is relatively easy to control, whereas a ten-acre or larger wildfire is significantly greater in impact and is more difficult and expensive to bring under control. This becomes much more critical in the wildland urban interface area.

Historically, Leon County has experienced very few problems with fire and the wildland urban interface. This is primarily due to prescribed burning practices in large hunting properties in the north end of the county, the Apalachicola National Forest to the south and west, two State Forests located in

the County, as well as in the several units of State wildlife management areas adjoining the Ochlockonee River.

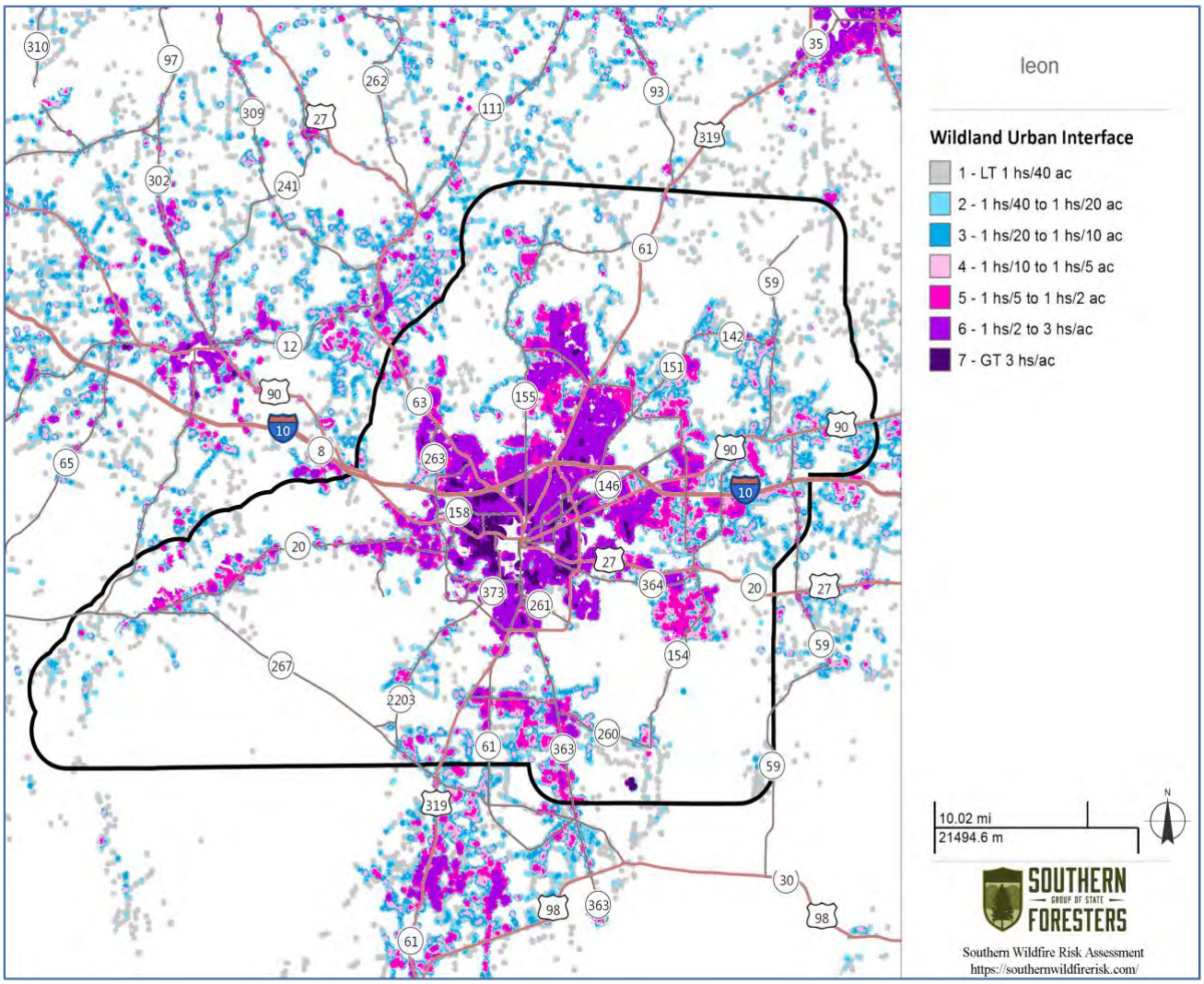
The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. This is the area of Leon County most susceptible to property damage from wildfires. Large fires within this interface area can impact residential areas and other structures, as well as critical facilities and systems. Even smoke from wildfires can present a hazard to citizens, particularly the elderly and those who have respiratory medical conditions.

Many of these areas are residential neighborhoods or subdivisions with heavily forested parcels or open space areas. These parcels and areas are seldom subject to prescribed burning, and so are vulnerable to fire due to crowding of trees and heavy fuel buildup. However, these areas also have fire protection provided by the Tallahassee Fire Department, which also provides services to the County through an interlocal agreement.

Vulnerability to wildfires was estimated from the Wildfire Risk Assessment Summary Report (WRAS). The Summary Report is generated by the Southern Wildfire Risk Assessment (SWRA) Project. The SWRA project reflects the latest wildfire modeling and analysis and regional risk assessment efforts, and provides a consistent, comparable set of results as a foundation for mitigation planning. The SWRA can also be used to locate areas where interagency planning may be of value to effectively manage wildland fire risk. The WRAS was selected for use in this Plan because it represents the key index from the SWRA that can support current fire planning needs of southern fire management agencies.

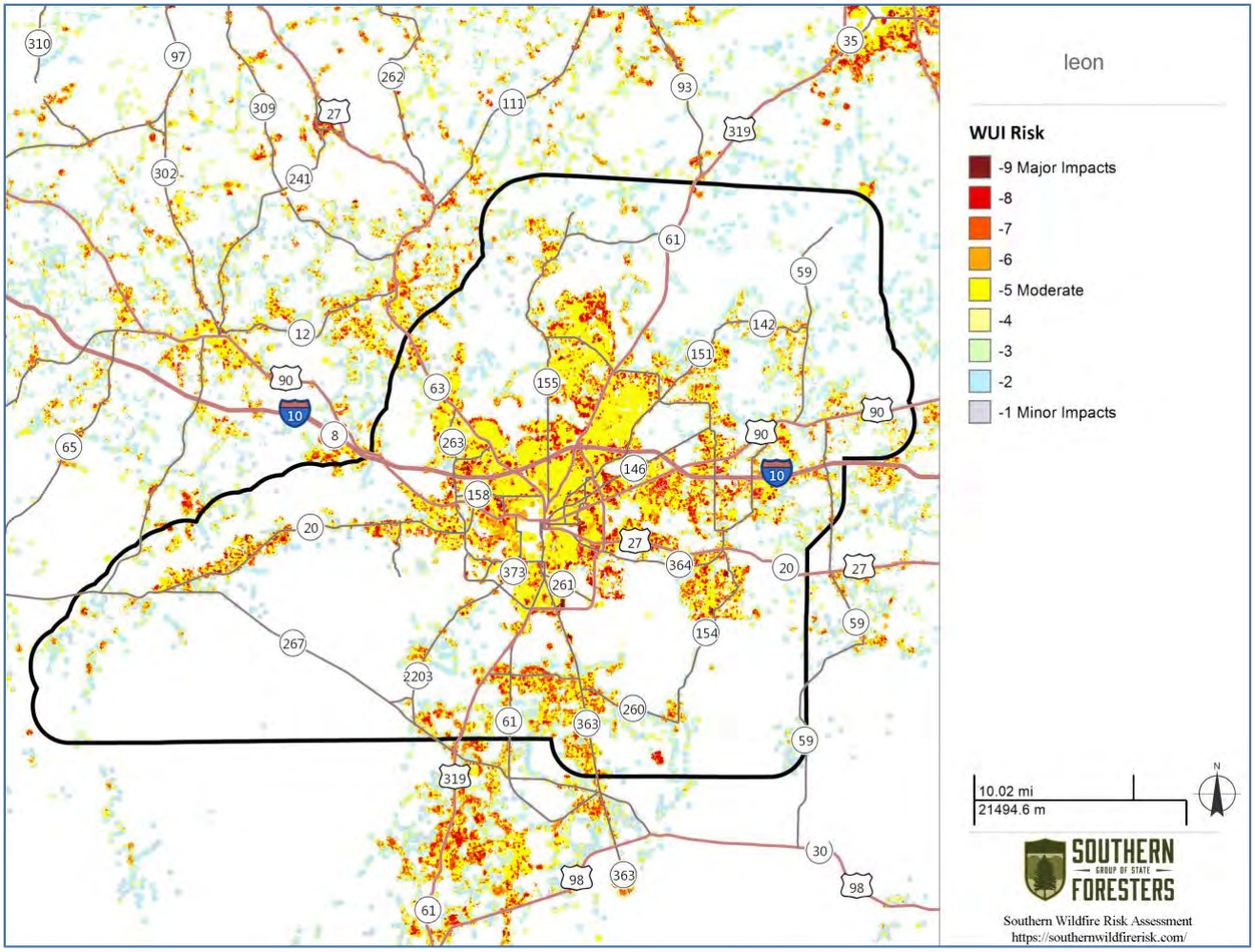
The Southern Wildfire Risk Assessment Portal (SouthWRAP) is the primary mechanism used to deliver assessment results to planners and practitioners in the field in Florida. According to the WRAS Report, it is estimated that 272,877 people or 94.1 percent of the total project area population (289,861) in Leon County live within the WUI.

Figure 25: Wildland Urban Interface in Leon County, Florida.[75]



75 Florida Forest Service, 2019.

Figure 26: Wildland Urban Interface Fire Risk in Leon County, Florida.[76]



This map indicates those areas with the highest vulnerability to wildfire as calculated by the WUI.

Risk Assessment

In early 2019, the Southern Group of State Foresters developed the Southern Wildfire Risk Assessment Portal (SouthWRAP), built upon the success of the Texas Wildfire Risk Assessment Portal (TxWRAP). SouthWRAP is the primary mechanism by which SGSF is creating awareness among the public and arming state and local government planners with information to support mitigation and prevention efforts. SouthWRAP contains data for 13 Southern states, excluding Puerto Rico and the U.S. Virgin Islands that did not participate in the initial SWRA project.

It is imperative that communities located within the Wildland Urban Interface (WUI, for short) learn about their vulnerabilities to wildfire and act to mitigate their risk. But knowing which mitigating actions to take requires onsite assessments of just how "fire adapted" a community is. To help in this

76 Ibid.

process, the Southern Group of State Foresters (SGSF) and Timmons Group have developed the Community Assessor, a new module in SouthWRAP that empowers the 13 southern state forestry agencies and their partners to do mobile field assessments of "Communities at Risk."

In the past, individual SGSF states developed manual ways serve to these Communities at Risk, including paper-based assessment forms and non-digital mapping of community boundaries. Across the region, there was no consistency in the assessment criteria and mitigation strategies recommended to localities, making the development of Community Wildfire Protection Plans (CWPPs) difficult.

With Community Assessor, field assessors can use iOS and Android mobile apps to quickly enter assessment details and capture photos for pre-mapped and ad-hoc communities. Remote communities are no problem, because field assessors can work in online or offline mode and still capture data and use the map. After assessments are synced from mobile to the Community Assessor web app, the Single Community Assessment Report can be downloaded listing automatically generated mitigation strategies tailored for that community. Finally, there is also a Project Report available detailing all communities for the project, including a map and table with the total hazard rating for each community.

The Florida Forest Service is using Community Assessor to conduct a community risk assessment on a mobile device in the field and upload the assessment to SouthWRAP, and then edit or create changes in SouthWRAP based on changes in fuels and mitigation actions. The Community Assessor Application can also help determine where mitigation projects need to be done based on risk and number of structures protected. The following are some of the components listed on the field risk assessment:

- Ingress/Egress
- Road Accessibility
- Street Signs
- Ware Supply
- Local Response
- Road width
- Driveways
- Hazardous Features
- Established HOA
- Structures
- Vegetation
- Defensible Space
- Proximity to Wildlands
- Building Materials
- Setbacks
- Debris on Roof

The goal of the Southern Wildfire Risk Assessment is to provide a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in the Southern States. The Southern Wildfire Risk Assessment Portal (SouthWRAP) is the primary mechanism

to deliver assessment results to planners and practitioners in Florida. Information provided in an assessment can be used to support these key priorities:

- Identify areas most prone to wildfire
- Identify areas that may require additional tactical planning, specifically related to mitigation projects and community wildfire protection planning (CWPP'S)
- Provide the information needed to justify resource, budget and funding requests
- Allow agencies to work together to better define priorities and improve emergency response particularly across jurisdictional boundaries
- Define wildland communities and identify the risk to those communities
- Increase communication with local residents and the public to address community priority and needs
- Plan for response and suppression resource needs
- Plan and prioritize hazardous fuel treatment programs

The larger issue in Florida and in Leon County is the future threat posed by populations encroaching into wildland-urban interface areas. Generally, the risk to humans and their property from wildfires increases with population and the development that accompanies population growth. In Leon County, the threat of such fires is low because of extensive prescriptive burning and comprehensive fire protection throughout the county, yet there is a potential for wildfire in areas of the county adjacent to residential areas and roadways that may increase over time if these areas are not properly managed to reduce the potential for wildfires, particularly if hotter summer temperatures become more common as described in the section addressing extreme temperature. Based on an assessment of historical data and frequency of reported events, wildfires are generally classified at present as a **low risk** to Leon County residents. However, as Leon County and the City of Tallahassee continue to develop and urbanize, and as hotter temperatures increase through time, it is expected that the risk from wildfire will increase as well, particularly during summer months and/or droughts.

2.14 Sinkholes

General Description and Location

Sinkholes are a common feature of Florida's landscape. They are only 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 when they are exposed to acidic water. Most rainwater is slightly acidic and usually becomes more acidic as it moves through decaying plant debris.

Limestones in Florida are porous, allowing the acidic water to percolate through their strata, dissolving some limestone and carrying it away in solution. Over eons of time, this persistent erosional process has created extensive underground voids and drainage systems in much of the carbonate rocks throughout the state. Collapse of overlying sediments into the underground cavities produces

sinkholes. When groundwater discharges from an underground drainage system, it is a spring, such as Wakulla Springs, Silver Springs, or Rainbow Springs. Sinkholes can occur in the beds of streams, sometimes taking all of the stream's flow, creating a disappearing stream. Dry caves are parts of karst drainage systems that are above the water table, such as the Florida Caverns in Marianna.[77]

Other subterranean events can cause holes, depressions or subsidence of the land surface that may mimic sinkhole activity. These include subsurface expansive clay or organic layers which compress as water is removed, collapsed or broken sewer and drain pipes or broken septic tanks, improperly compacted soil after excavation work, and even buried trash, logs and other debris. Often a depression is not verified by a licensed professional geologist or engineer to be a true sinkhole, and the cause of subsidence is not known. Such events are called subsidence incidents.

The development of sinkholes has historically been difficult to predict. Ground Penetrating Radar (GPR) surveys are increasingly used at the site level to locate karst depressions, which may indicate zones of subsidence. These areas can then be checked with a Cone Penetrometer Test (CPT) sounding.

Because the entire state is underlain by carbonate rocks, sinkholes could theoretically form anywhere. However, there are definite regions where sinkhole risk is considerably higher. These include areas of the state where limestone is close to surface, or those areas with deeper limestone but with certain configurations of water table elevation, stratigraphy, and aquifer characteristics conducive to increased sinkhole activity.

Leon County and the City of Tallahassee are located within an area of karst topography where sinkholes occur According to the Florida Department of Environmental Protection, the northern part of the County “consists mainly of cohesive clayey sediments of low permeability. Sinkholes are most numerous of varying size and develop abruptly.” The southern portion is composed of “bare or thinly covered limestone” where “sinkholes are few, generally shallow and broad, and develop gradually.”[78]

Karst, Subsidence, and Expansive soils

Land subsidence occurs when large amounts of ground water have been withdrawn from certain types of rocks, such as fine-grained sediments. Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by ground water circulating through them. As the rock dissolves, spaces and caverns develop underground.[79]

While sinkholes threaten property, a related hazard is the potential impacts on groundwater quality. The local landscape is dotted with sinkholes. Sinkholes are responsible for the periodic dramatic drawdown of several local waterbodies, including Lake Jackson and Lake Lafayette. While water quality issues have not been identified as a hazard issue for the LMS, the interrelatedness of these issues warrants discussion.

[77] https://floridadep.gov/fgs/sinkholes.

[78] http://www.dep.state.fl.us/geology/geologictopics/sinkholedevelopment.htm.

[79] United States Geological Survey, http://ga.water.usgs.gov/edu/earthgwsinkholes.html.

Because sinkholes have a direct or semi-direct conduit to groundwater reservoirs, the possibility of drinking water degradation is a significant concern. Groundwater vulnerability is most evident within the Woodville Karst and Munson Hills regions, where the aquifer is unconfined by a sedimentary barrier between the surficial and Floridan Aquifers and karst features predominate. The maintenance of drinking water quality has been partially addressed by the implementation of several policies including the Leon County Aquifer/Wellhead Protection Ordinance. Future knowledge about county hydrogeology may warrant additional policy initiatives to ensure the protection of drinking water resources.

Historical Occurrences

A spatial database of subsidence incident reports maintained by the Florida Department of Environmental Protection - Florida Geological Survey indicated 145 reported sinkhole events in Leon County from July 1999 to March 2016.[80] Of these events, 22 caused property damage, 83 did not, but 40 were classified as "unknown" concerning property damage. The majority of these sinkholes are small and relatively shallow, and most of these have been filled and stabilized.

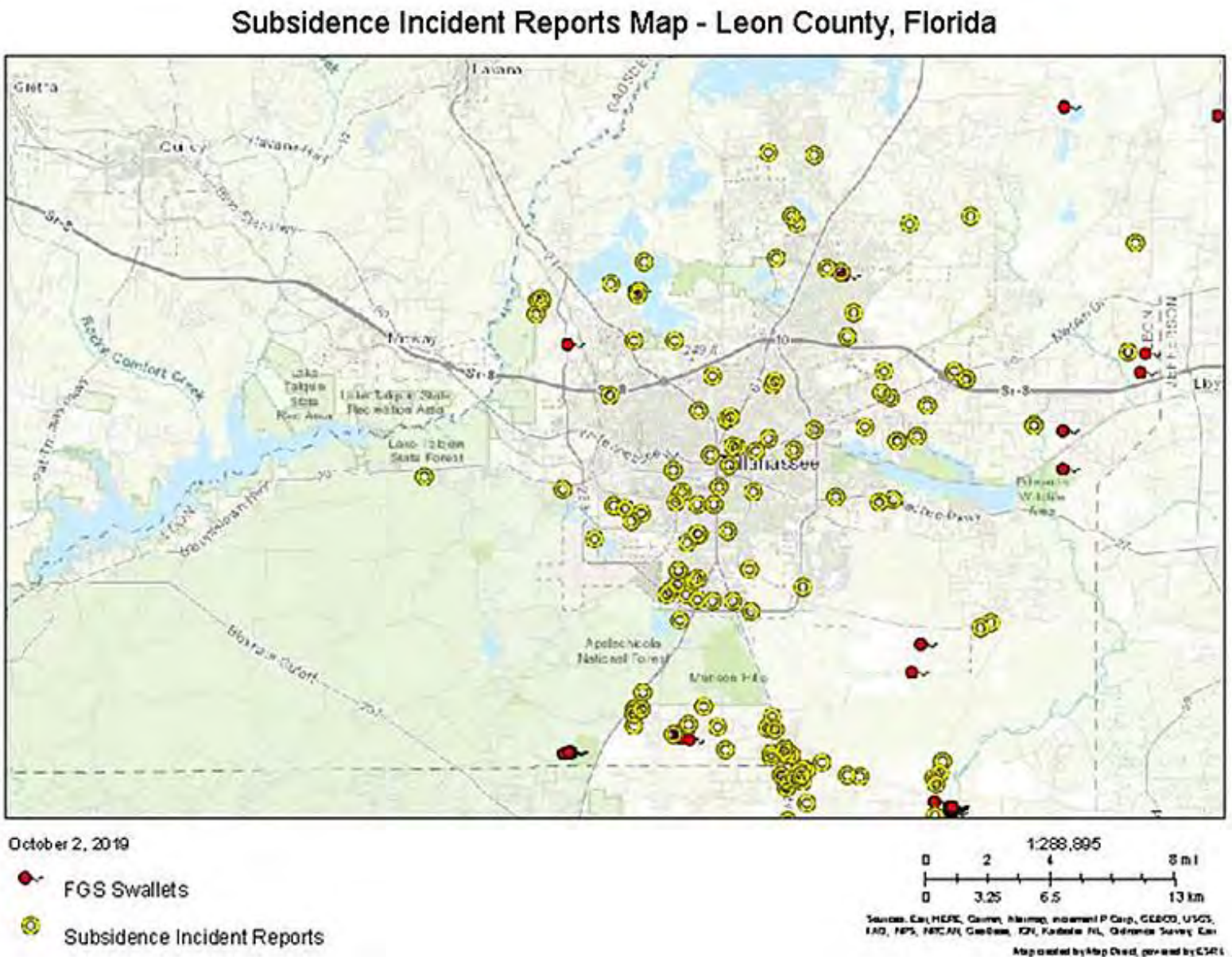
Sinkholes can affect property if they open up near or under building foundations, or they can open up under roadways. There are sinkholes in Leon County that can also completely drain waterbodies such as Lake Jackson, Lake Bradford, Lake Iamonia, and Lake Lafayette when the water table is lowered through drought.

Sinkholes in Leon County and the City of Tallahassee historically have not matched the size and extent of sinkholes in Central Florida, where ground water levels are much more variable due to more variable groundwater levels. The drawdown of ground water in peninsular Florida is a serious issue, particularly from urbanization and large-scale agriculture. Nevertheless, areas within Leon County and the City of Tallahassee have been and continue to be affected by sinkholes.

The following figure depicts the location of these recorded karst subsidence reports (sinkhole occurrences) within Leon County.[81] These tend to be distributed mostly within the developed area of the county with higher concentrations in the southern area of Tallahassee and close to the border of Wakulla County outside of the Apalachicola Forest.

80 Florida Geological Survey, 2019, https://floridadep.gov/fgs/data-maps.
81 Ibid.

Figure 27: Karst Subsidence Reports in Leon County, Florida, 1999 - 2016.



Estimated Impacts, Probability, and Extent

Although there is currently no agency with responsibility and authority for sinkhole inspections in Florida, the Florida Geological Survey (FGS) receives calls from property owners all over the state who have had sinkholes develop on their property. The FGS does not have sufficient staff to visit all new sinkholes, but the agency encourages the submittal of a subsidence incident report that is incorporated into a database that can be accessed at http://www.dep.state.fl.us/geology/gisdatamaps/SIRs_database.htm.

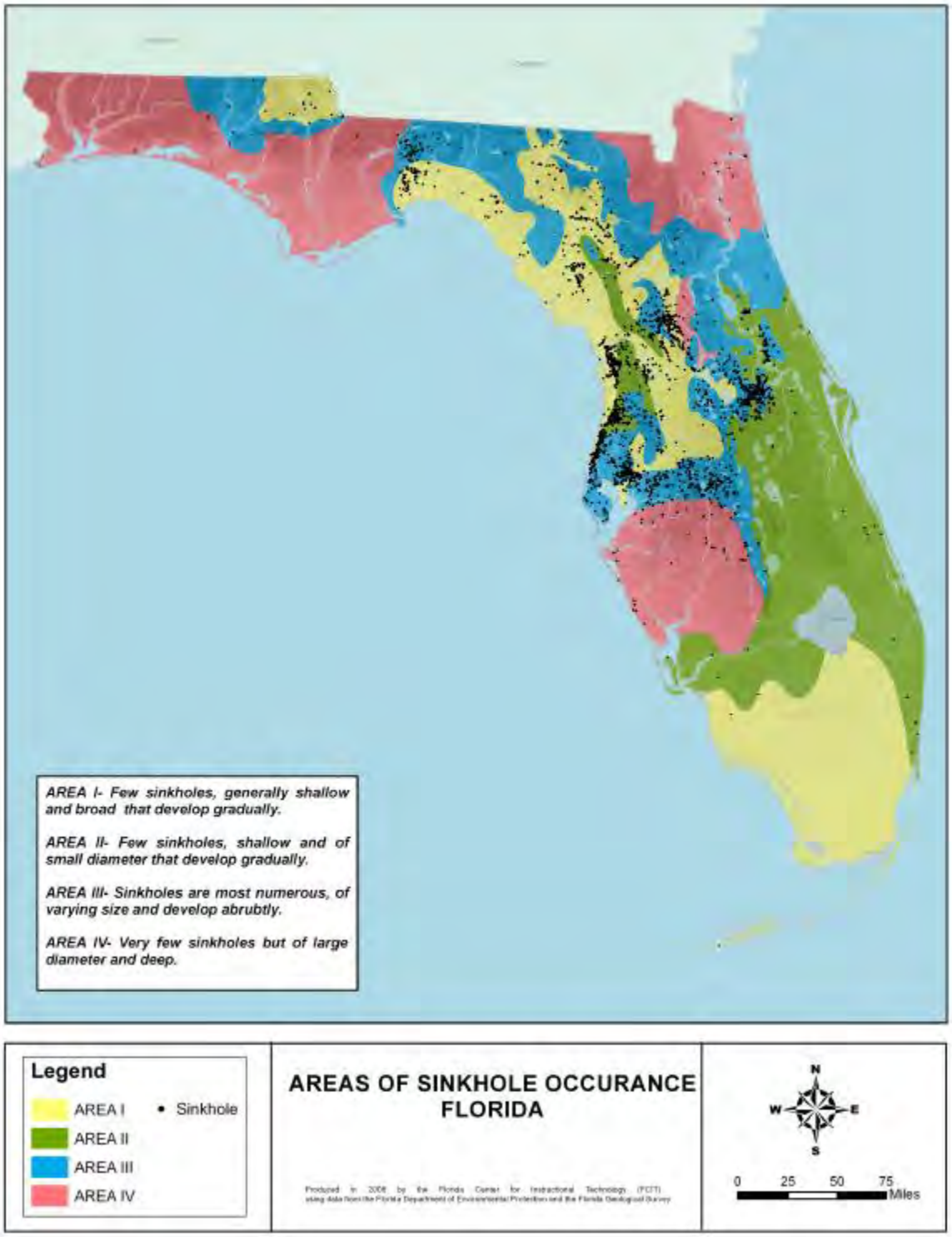
Although sinkholes in Leon County generally have not created property damage, the location and Impacts of sinkholes are difficult to predict, as well as the probability and extent of them.

The following figure indicates the general areas of the state where sinkhole vulnerability is elevated over other areas. This figure represents reported sinkhole events in Florida based on data gathered by the Florida Geological Survey and the Florida Department of Environmental Protection. Leon County is indicated in this figure as being mostly within Area III, where sinkholes are most numerous, vary in size, and develop abruptly. The western third or so of the county is within Area IV, where there are very few sinkholes but those that exist are large and deep. The southern boundary of the county below the Cody escarpment is within Area I, where there are few sinkholes which are generally shallows, broad, and develop gradually.

Even though depressions and sinkholes can be located with ground penetrating radar and other techniques, there is little that can be reasonably done to mitigate the hazard of sinkhole development. Even if known features are identified, this information cannot be used to predict with certainty where additional sinkholes are likely to develop.

Based on the historical record, it is anticipated that future events for this hazard would reflect the historical frequency of drought occurrences, which can lower water tables and promote sinkhole formation. Based on Palmer Index data, a significant drought event has occurred approximately once every six years in the period 1895-2000. Periods of extreme heat in this region of Florida occur on the average of once every five years, and the probability of longer-term drought (such as the 1998-2002 event) would be expected to reflect the record of historical events occurring approximately every 25 years.

Figure 27: Areas of Sinkhole Occurrence: Florida.[82]



[82] Florida Center for Instructional Technology, Sinkholes (Tampa, FL: University of South Florida, 2008).

Based on the data presented above, approximately 2.7 sinkholes open up every year mostly within the urban and southern areas of Leon County. They are likely to occur in the Red Hills portions of Leon County, including the urban area of Tallahassee, and within the southern parts of the county east of the Apalachicola National Forest. Because the area affected by sinkholes includes the urban area of Tallahassee and developed areas outside of the Apalachicola National Forest, all citizens, structures, and critical facilities and systems within these areas may be potentially affected.

Overall, the probability based on the historical record of a sinkhole occurring within Leon County and the City of Tallahassee is **highly likely**.

Vulnerability Summary

Sinkholes tend to affect structures and other improvements rather than people, like severe thunderstorms or lightning do. Figure 28 indicates that all structures, infrastructure, and critical facilities within the urban area of Leon County and the City of Tallahassee north of the Cody Escarpment, and within the southern parts of Leon County east of the Apalachicola National Forest within the Wakulla Coastal Plain, are more vulnerable to sinkholes and karst subsidence than other parts of the county.

Additional areas of the county having shallow soils overlying limestone, including low areas and waterbodies, are more vulnerable than other areas of the county. Development in those areas of the County where sinkholes are prevalent is potentially more vulnerable, because many sinkholes open up into larger caverns or tunnels. Structures and critical facilities built in these areas that do not have ground penetrating radar studies conducted prior to development to establish the presence or lack of sinkholes or karst depressions are also more vulnerable to sinkholes.

The degree of vulnerability described above increases in times of drought as the natural water table decreases in response to the lack of rainfall. As ground water levels (i.e., potentiometric surface) decrease, the hydrostatic pressure of groundwater is lessened on the overlying soil and rock layers, which sets up the conditions under which sinkholes can develop.

Risk Assessment

Based on an assessment of historical data and frequency of reported damages, sinkholes are classified as a **low risk** to Leon County residents. Historical records indicate that the frequency and magnitude of this hazard is tied in part to the frequency of prolonged drought.

2.15 Invasive Plants and Animals

General Description and Location

International travel, trade, population growth, climate change, and other factors have facilitated and intensified infestations of exotic and/or invasive plants and animals, including insects, in Florida. Florida is one of the states most affected by invasive and exotic species, given its hospitable warm climate, the abundance of rain, its diverse ecosystems, its many international visitors and residents, and its highly urbanized areas.

Invasive exotic plants and animals change native plant communities by displacing native species, altering community structures or ecological functions, or hybridizing with native species. The key term is "invasive;" many exotic species don't thrive in Florida, but those that do are considered invasive. Conversely, invasive species aren't always exotic. Fire suppression or other disturbances like major weather events or even development can create a welcome environment for some native species to behave invasively.

In response to concerns about exotic plants, the Florida Exotic Pest Plant Council was formed. The mission of the Florida Exotic Pest Plant Council is to support the management of invasive exotic plants in Florida's natural areas by providing a forum for the exchange of scientific, educational and technical information. The Florida Exotic Pest Plant Council is a non-profit organization and is not a regulatory agency. The council publishes an annual List of Invasive Plant Species (see Appendix __). The purpose of this list is to focus attention on the following:

- adverse effects exotic pest plants have on Florida's biodiversity and native plant communities
- habitat losses in natural areas from exotic pest plant infestations
- impacts on endangered species via habitat loss and alteration
- need for pest plant management
- socio-economic impacts of these plants (e.g., increased wildfires or flooding in certain areas)
- changes in the severity of different pest plant infestations over time, and
- providing information to help managers set priorities for research and control programs.

More than 500 fish and wildlife nonnative species, also known as exotic species, have been observed in Florida. Not all nonnative species present a threat to native species, but some have become invasive by causing harm to native species, posing a threat to human health and safety, or causing economic damage. Many invasive plant and animal species that thrive in the hot, moist Everglades don't fare as well in the state's more northern pine-dominated forests, where freezing temperatures can occur on a more regular basis than in south Florida.

An insect of concern in Leon County is the Southern Pine Beetle (SPB). The SPB is a native insect that ordinarily attacks stressed and dying pines. Under certain environmental conditions, however, SPB outbreaks can occur, during which vast acreages of pines in both forests and residential landscapes are mass-attacked and killed. Florida has experienced devastating SPB outbreaks in the recent past.

According to the Florida Division of Forestry, the SPB is one of five common species of pine bark beetles that occur throughout the Southeastern United States. While not strictly invasive nor exotic, the SPB, *Dendroctonus frontalis Zimmermann*, is the most destructive insect pest of pine in the southern United States. A recent historical review estimated that SPB caused $900 million of damage

to pine forests from 1960 through 1990. This aggressive tree killer is a native insect that lives predominantly in the inner bark of pine trees. Trees attacked by SPB often exhibit hundreds of resin masses (i.e., pitch tubes) on the outer tree bark. SPB feed on phloem tissue where they construct winding S-shaped or serpentine galleries. The galleries created by both the adult beetles and their offspring can effectively girdle a tree, causing its death. SPB also carry, and introduce into trees, blue-stain fungi. These fungi colonize xylem tissue and block water flow within the tree, also causing tree mortality. Consequently, once SPB have successfully colonized a tree, the tree cannot survive, regardless of control measures.[83] The table below describes stages and symptoms associated with a southern pine beetle infestation.

Table 42: Stages of Southern Pine Beetle Attack.[84]

Symptom	**Stage 1** **Fresh attacks**	**Stage 2** **Developing broods**	**Stage 3** **Vacated trees**
Foliage	Green	Green; fade to yellow before beetles emerge	Red; needles falling
Pitch tubes	Soft; white to light pink	Hardened; white	Hard; yellow; crumble easily
Checkered beetles	Adults crawling on the bark	Larvae in SPB galleries; pink or red; 1/2 inch long	Larvae and pupae are purple; occur in pockets in the outer bark
Bark	Tight; hard to remove	Loose; peels easily	Very loose; easily removed
Color of wood surface	white, except close to new adult galleries	Light brown with blue or black sections	Dark brown to black; may have sawyer galleries
Exit holes	----	May appear where parent beetles left the tree	Numerous; associated with brood adult emergence
Ambrosia beetle dust	----	White; begins to appear around the base of trees	Abundant at the base of trees

[83]University of Florida, Entomology and Nematology Department, http://entnemdept.ufl.edu/creatures/trees/southern_pine_beetle.htm·

[84] Forest Encyclopedia Network (2009), http://www.forestencyclopedia.net/p/p2901.

Other invasive plants and animals in Leon County at present include the following:

- Coral Ardisia or Scratchthroat (*Ardisia crenata*)
- Wild Taro (*Colocasia esculenta*)
- Water Hyacinth (*Eichhornia crassipes*)
- Hydrilla (Hydrilla verticillata)
- Glossy Privet (*Ligustrum lucidum*)
- Chinese Privet (*Ligustrum sinense*)
- Japanese Climbing Fern (*Lygodium japonicum*)
- Heavenly Bamboo (*Nandina domestica*)
- Torpedo Grass (*Panicum repens*)
- Tallow Tree or Popcorn Tree (*Sapium sebiferum*)
- Alligator Weed (*Alternanthera philoxeroides*)
- Island Apple Snail (*Pomacea maculata*)
- Camphor Tree (*Cinnamomum camphora*)[85]

Although these species are not life-threatening, they can become serious agricultural pests that can also create significant natural resource impacts, as well as increasing the cost of public land management. Invasive plants and animals can crowd out or even eliminate over time natural species. As an example, the Channeled or Island Apple Snail, which exists in Leon County, poses a potentially serious threat to the ecological health of Florida rivers, lakes, and wetlands, due to their affinity for aquatic plants, their extremely high fecundity (reproductive capability), and their tolerance for a range of environmental conditions.

Historical Occurrences

Southern pine beetle infestations have been a widespread occurrence throughout the southeastern United States, including throughout the state of Florida. Millions of dollars' worth of lumber has been destroyed in Florida as a result of southern pine beetle infestations. In response, the Florida Forest Service (previously the Division of Forestry) within the Florida Department of Agriculture and Consumer Services annually surveys the state to determine the level of infestations. The table below describes the historical occurrences of SPB infestations in Florida between 1995 and 2011.

85 https://cms.leoncountyfl.gov/Portals/0/publicworks/engservices/docs/Common%20Invasive%20Plants%20of%20Leon%2 0County_Aquatic.pdf.

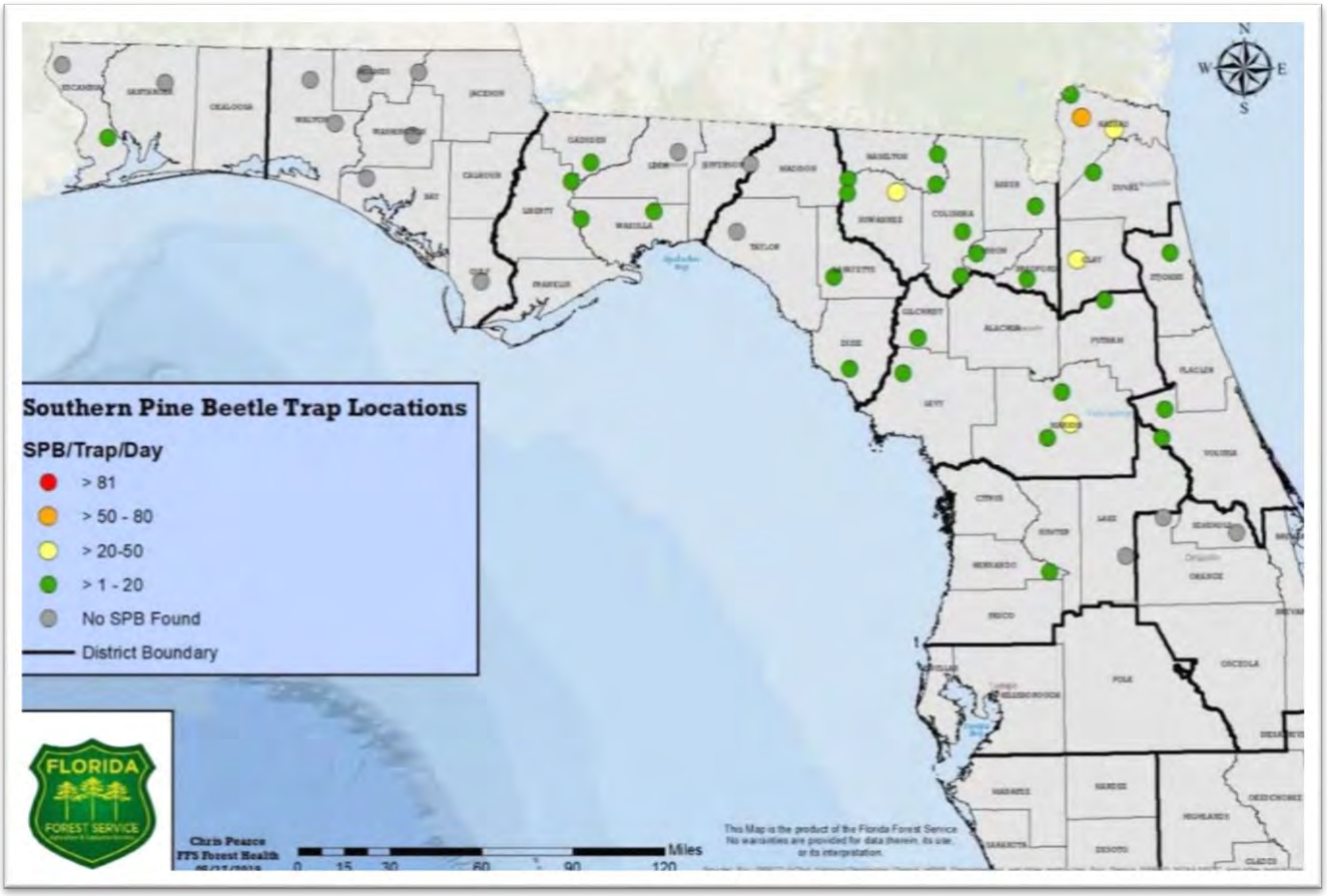
Table 43: Historical Occurrences of Southern Pine Beetle Infestations in Florida, 1995 – 2011.[86]

Year	No. of Counties Trapped	SPB/Trap/Day	% SPB	Prediction Trend/Level	No. of Infestations
1995	10	21.0	66	Increasing/Moderate	718
1996	19	0.3	34	Declining/Low	61
1997	19	0.5	22	Static/Low	863
1998	19	7.2	59	Increasing/Low	34
1999	20	1.4	38	Declining/Low	220
2000	21	13.2	62	Increasing/Moderate	1,172
2001	23	45.0	69	Increasing/High	2,892
2002	26	47.0	80	Increasing/High	650
2003	27	2.0	45	Declining/Low	2
2004	27	0.6	19	Static/Low	16
2005	26	4.8	36	Static/Low	7
2006	25	1.0	15	Static/Low	3
2007	26	0.4	25	Static/Low	46
2008	26	0.4	27	Static/Low	?
2009	26	0.7	21	Static/Low	15
2010	26	0.2	25	Static/Low	1
2011	26	0.2	25	Static/Low	

These data indicate that Southern Pine Beetle infestations in Leon County and throughout Florida have declined in recent years. The 2012 survey results suggest that SPB populations will remain low at all but one trap location in the 26 counties surveyed across northern and central Florida (Figure 35). Both the total number of SPB/trap/day and %SPB remained static and relatively unchanged from 2011. This suggests that the generally low levels of SPB activity that the state has experienced since 2003 will continue.

[86] Florida Department of Agriculture and Consumer Services (2015), http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Forest-Insects/Southern-Pine-Beetle/Spring-Pheromone-Trap-Forecast.

Figure 29: 2019 Southern Pine Beetle Forecasted Infestation Levels.[87]



Other invasive species identified above have existed in Leon County for a decade or more. The Channeled Apple Snail as an example occurs in the Lake Munson, Lake Lafayette, and Lake Jackson watersheds. It has eliminated nearly all natural aquatic vegetation in Lake Munson, which affects fish and other wildlife habitat, and is also found in portions of Lake Jackson, a State Aquatic Preserve.

In the early 1990s, the dominant submersed plant species in Lake Munson, a 250 acre freshwater lake south of Tallahassee, were Coontail (*Ceratophyllum demersum*) and Southern Naiad (*Najas guadalupensis*). This vegetation blanketed 80% of the lake, necessitating the use of an airboat by biologists to conduct surveys. However, in 1993, Hydrilla (*Hydrilla verticillata*), an invasive exotic plant, was accidentally introduced to the lake. By 1995, hydrilla was found throughout Lake Munson. When the exotic snails first appeared in 2002, biologists mapped 150 acres of Hydrilla. In two years, the

[87]Florida Department of Agriculture and Consumer Services (2019), https://www.fdacs.gov/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Forest-Insects/Southern-Pine-Beetle.

Hydrilla was completely gone, having been eaten by the apple snail. No submersed, vascular plants have been found in Lake Munson since 2004.[88]

Emersed and floating vegetation in Lake Munson has fared little better, according to biologists. A sixty-acre stand of the beautiful, native, American Lotus (*Nelumbo lutea*) vanished between 2003 and 2004. The invasive exotic Water Hyacinth (*Eichhornia crassipes*) has nearly disappeared. From 2002 to 2006, hyacinths were controlled in Lake Munson. Such control is no longer necessary. Only a trace of Water Hyacinths remains in Lake Munson. A favorite food for *Pomacea insularum*, Wild Taro (*Colocasia esculenta*) declined but rebounded on the east side of the lake in 2009, while *Pomacea insularum* egg deposition was concentrated on the west side of the lake.[89]

The terrestrial species listed above, including Coral Ardisia, Glossy Privet, Chinese Privet, Japanese Climbing Fern, Heavenly Bamboo, Tallow Tree, and Camphor Tree, are found on uplands and bottomlands locally. Both Leon County and the City of Tallahassee have spent public funds to try to control these plants on public lands, including parks and greenways.

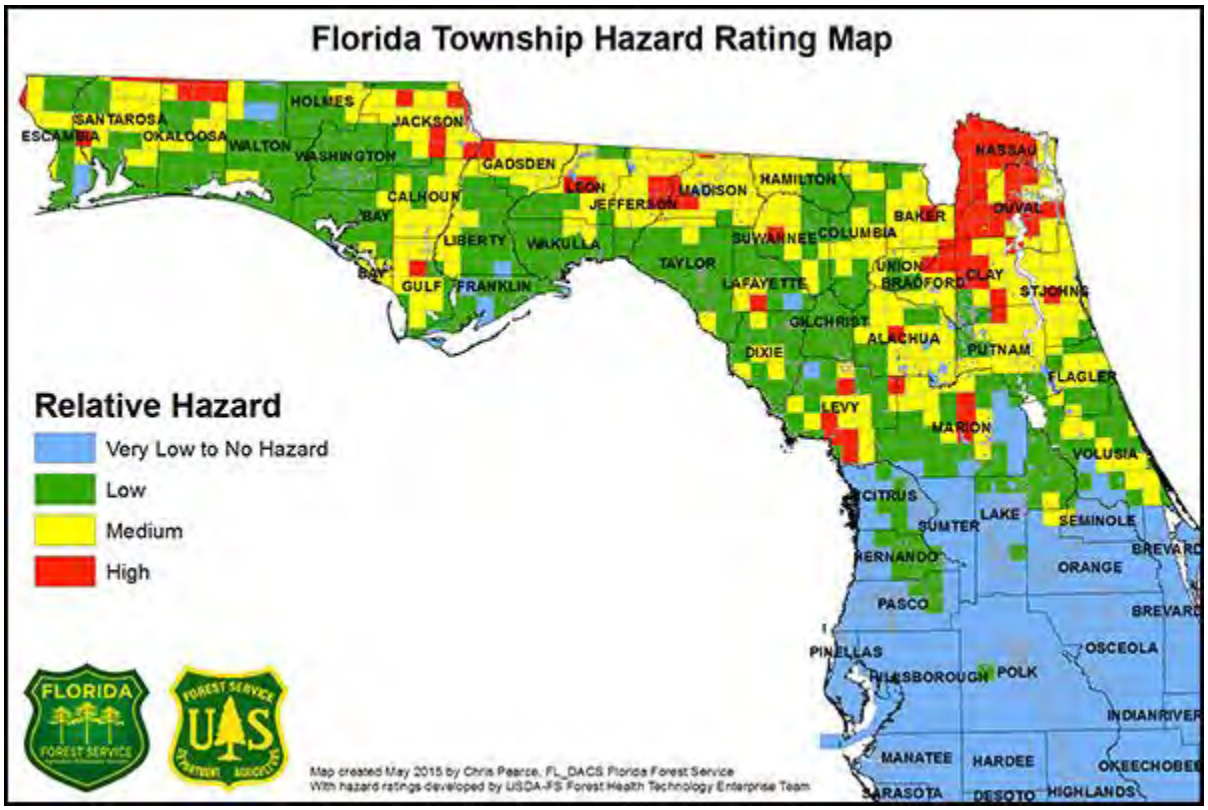
Estimated Impacts, Probability, and Extent

SPB outbreaks are periodic events that occur roughly on 6-12 year cycles and in general last two to three years. Between outbreaks, there can be several years with very few or no infestations, characteristic of the past six years in Florida.

The Southern Pine Beetle Florida Township Hazard Rating Map is based on a model developed by the USDA Forest Service - Forest Health Technology Enterprise Team as part of a hazard mapping project for the southeastern United States. The model computes hazard scores based on input variables that estimate the density and basal area of the most susceptible host pine species (e.g., loblolly and shortleaf pine) and soil drainage characteristics. Each township score represents an average for the forested areas within the township. The hazard map is subject to change from year to year with changing forest conditions and improvements made to the hazard model. Hazard is an estimate of where SPB infestations may be likely to develop based on forest conditions; it does not mean that SPB infestations are predicted for a certain area in a given year.

88 https://snailbusters.wordpress.com/2009/08/24/lake-munson-a-case-study-of-the-impact-of-exotic-apple-snails-on-aquatic-vegetation/.
89 Ibid.

Figure 30: Southern Pine Beetle Florida Township Hazard Rating Map 2015.[90]



The FFS classifies and describes the risk of SPB activities as follows:

1. **High Hazard**: Areas where current forest conditions are exceptionally conducive to chronic SPB activity and/or an area-wide SPB epidemic at virtually any time.
2. **Moderate Hazard**: Areas where current forest conditions may periodically harbor SPB activity and occasionally incur and sustain relatively numerous, enlarging, and/or widespread SPB activity that has a moderate potential of attaining outbreak proportions.
3. **Low Hazard**: Areas where current forest conditions are capable of sustaining some scattered infrequent or otherwise local/limited occurrences of SPB, and there is little chance of an area-wide outbreak.
4. **No Hazard**: Areas where there currently is virtually no known potential for any SPB activity.

Other invasive species identified above are well-established in many areas of Leon County and the City of Tallahassee at present. Many terrestrial species exist within lands managed by the federal government and the State of Florida, as well as those managed by local government. Different plant

90 Florida Department of Agriculture and Consumer Services (2015), https://www.fdacs.gov/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Forest-Insects/Southern-Pine-Beetle/Southern-Pine-Beetle-SPB-Hazard-Rating-Map-for-Florida.

species in different ecological niches or habitats, but they are present and expanding in some areas. Land and waterbody managers have a variety of programs to try to manage these species, but complete eradication of these species is unlikely.

With the exception of the Southern Pine Beetle, there have been no formal countywide surveys to date of other invasive plant or animals. Individual Land and waterbody managers have tallied invasive species for those areas or features they manage, but there are no known summaries of impacts and extent for these species. Nonetheless, the probability based on the historical record of an exotic pest infestations affecting Leon County and the City of Tallahassee is **highly likely**.

Vulnerability Summary

Most forested areas of Leon County, including the urban area of the City of Tallahassee, are vulnerable to SPB infestations, which is exacerbated by drought, particularly during the summer. Over half the land area of Leon County is heavily forested with various mixed and pure stands of pine trees of various species, which increases the risk for SPB infestation.

Other species as previously described have established themselves in Leon County. As climate change continues and extreme temperatures increase (and with it, events like drought, stronger storms, and other climatic changes), it is very possible that additional species will establish themselves as climatic conditions favorable to these species (such as increased heat and/or rainfall) continue, or if these species are brought to this area via wild birds (in the case of seeds), conveyances such as boats, trucks, or other vehicles, or by humans (such as exotic landscape plants).

Risk Assessment

Despite the recent decline in rates of SPB infestations and the results of the 2012 statewide survey, there remains a threat to forest resources within Leon County from SPBs. In response, management plans for state-owned conservation lands within Leon County, including the Alfred B. Maclay Gardens State Park Unit Management Plan, require the regular monitoring of forestry conditions for SPBs and other exotic invasives, as well as outlining procedures for preventing southern pine beetle infestations.

The presence of exotic invasive plants and animals does not present a significant health threat to humans or to structures at present and is therefore considered a **low** risk.

2.16 Diseases, Epidemics, and Pandemics

General Description and Location

According to the Centers for Disease Control and Prevention (CDC), an *epidemic* refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area. An *outbreak* carries the same definition of epidemic, but is often used for a more limited geographic area. A *cluster* refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known. A *pandemic* refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.[91]

These definitions can apply to other infections subject to global spread, e.g. cholera and HIV. There are no elements of severity in them; while some pandemics are severe in the disease they cause in some individuals or at a population level, not all epidemics, outbreaks, clusters, or pandemics are severe.

The World Health Organization (WHO) has developed a more technical set of requirements for a pandemic. These criteria, which apply to the organisms that create disease, include:

- Ability to infect humans
- Ability to cause disease in humans
- Ability to spread from human to human quite easily.

Influenza is an example of an interpandemic (seasonal) pandemic. According to WHO, pandemic outbreaks or incidences of influenza occur approximately every 35 years. These outbreaks typically last a duration of one to three years. Influenza pandemics are usually transmitted worldwide in six to nine months and are typically characterized by one to three waves lasting four to eight weeks per wave. The table below describes the phases of a pandemic, as identified by WHO.

91 https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html.

Figure 31: Pandemic Phases.[92]

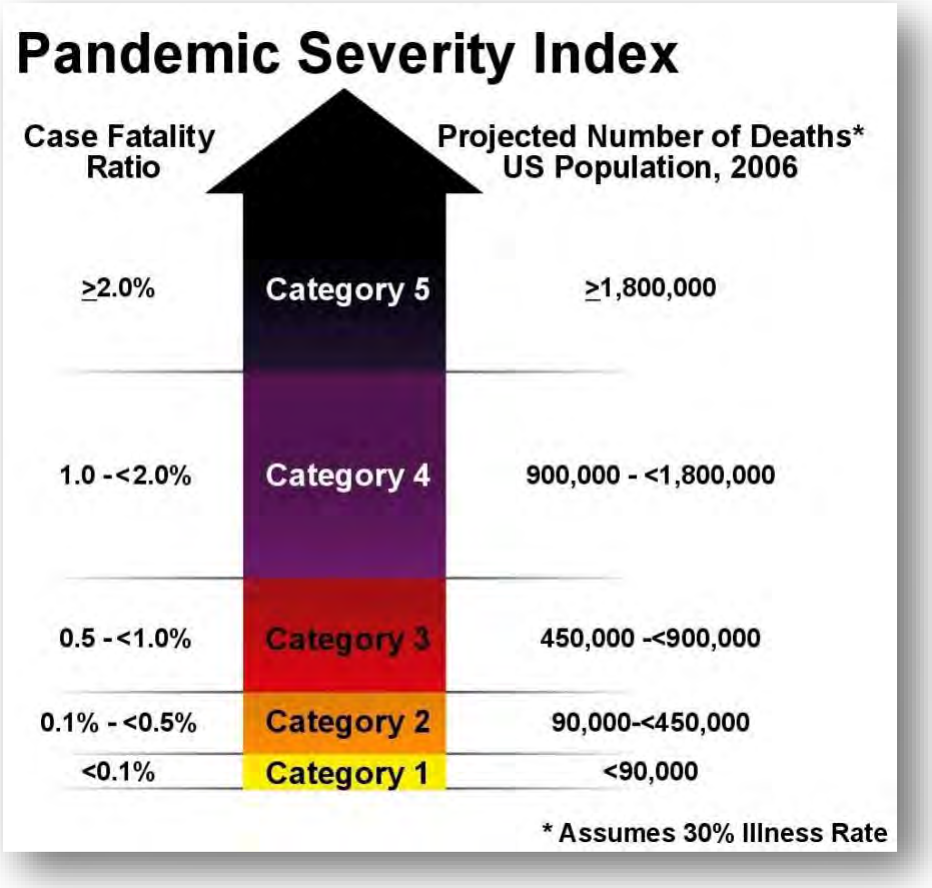
Phases	Description
One	No animal influenza virus circulating among animals has been reported to cause infection in humans.
Two	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
Three	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Four	Human-to-human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.
Pandemic	
Five	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
Six	In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region.
Post-peak	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
Possible new wave	Level of pandemic influenza activity in most countries with adequate surveillance rising again.

The increased morbidity (sickness) and mortality (death) associated with severe pandemics can result in social disruption and economic disruption. The CDC created a rational planning tool for communities to measure pandemics, for use by states, communities, businesses and schools, as part of a drive to provide more specific community-level prevention measures, created the Pandemic Severity Index (PSI). The PSI is a proposed classification scale similar in structure to the Saffir-Simpson Hurricane Scale for reporting the severity of influenza pandemics in the United States.

The following figure summarizes the PSI. The PSI is intended to guide local pandemic preparedness efforts based on scenario-based contingency planning. This planning tool is also intended to define which pandemic mitigation strategies are appropriate for implementation based on case fatality ratio, excess death rate, and illness rate caused by the pandemic.

92 WHO pandemic phases (WHO 2009), http://www.ecdc.europa.eu/en/healthtopics/pandemic_preparedness/basic_facts/pages/who_pandemic_phases.aspx.

Figure 32: Pandemic Severity Index, 2007.[93]



The PSI is accompanied by a set of guidelines for communities to follow in potential pandemic situations. These guidelines include:

- Isolation and treatment of people who have suspected or confirmed cases of pandemic influenza
- Voluntary home quarantine of household contacts of those with suspected or confirmed pandemic influenza
- Dismissing school classes and closing daycare centers
- Changing work schedules and canceling large public gatherings

These guidelines when implemented can have an overall effect of reducing the number of new cases of the disease, but they can create potentially adverse consequences in terms of community and social disruption. The measures should have the most noticeable impact if implemented uniformly by organizations and governments across the US. A more detailed description of these guidelines is presented in the following table.

[93] Centers for Disease Control and Prevention, 2007.

Figure 33: Community Strategies by Pandemic Influenza Severity.[94]

	Pandemic Severity Index		
Interventions by Setting	**1**	**2 and 3**	**4 and 5**
Home			
Voluntary isolation of ill at home (adults and children); combine with use of antiviral treatment as available and indicated	Recommend	Recommend	Recommend
Voluntary quarantine of household members in homes with ill persons (adults and children); consider combining with antiviral prophylaxis if effective, feasible, and quantities sufficient	Generally not recommended	Consider	Recommend
School			
Child social distancing –dismissal of students from schools and school-based activities, and closure of child care programs	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks
–reduce out-of-school contacts and community mixing	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks

(Continued on next page)

[94] Handbook for Pandemic and Mass-casualty Planning and Response. Volume 100 NATO Science for Peace and Security Series - E: Human and Societal Dynamics Edited by Elin A. Gursky, Boris Hrečkovski. 2012.

	Pandemic Severity Index		
Interventions by Setting	**1**	**2 and 3**	**4 and 5**
Workplace/Community **Adult social distancing**			
–decrease number of social contacts (e.g., encourage teleconferences, alternatives to face-to-face meetings)	Generally not recommended	Consider	Recommend
–increase distance between persons (e.g., reduce density in public transit, workplace)	Generally not recommended	Consider	Recommend
–modify, postpone, or cancel selected public gatherings to promote social distance (e.g., stadium events, theater performances)	Generally not recommended	Consider	Recommend
–modify workplace schedules and practices (e.g., telework, staggered shifts)	Generally not recommended	Consider	Recommend

Diseases and Pandemics can affect all or portions of Leon County and the City of Tallahassee. There are many diseases that can spread wide enough to be an epidemic or pandemic. These include:

- Chikungunya
- Cholera
- Novel Coronavirus (SARS-CoV-2)
- Crimean-Congo haemorrhagic fever
- Ebola virus disease
- Hendra virus infection
- Influenza (pandemic, seasonal, zoonotic)
- Lassa fever
- Marburg virus disease
- Meningitis
- MERS-CoV
- Monkeypox
- Nipah virus infection
- Plague
- Rift Valley fever
- SARS
- Smallpox
- Tularaemia
- Yellow fever
- Zika virus disease

Only a few of these diseases may affect Leon County and the City of Tallahassee. Certainly, due mainly to centralized sewer systems and other regulated methods of water treatment and distribution and wastewater treatment, cholera is no longer an issue. Thanks to the success of vaccination, the last natural outbreak of smallpox in the United States occurred in 1949. In 1980, the World Health Assembly declared smallpox eradicated (eliminated), and no cases of naturally occurring smallpox have happened since.[95]

The yellow fever virus is found in tropical and subtropical areas of Africa and South America. The virus is spread to people by the bite of an infected mosquito. Yellow fever is a very rare cause of illness in U.S. travelers. Illness ranges from a fever with aches and pains to severe liver disease with bleeding and yellowing skin (jaundice). Yellow fever infection is diagnosed based on laboratory testing, a person's symptoms, and travel history. There is no medicine to treat or cure infection.[96] Yellow fever is not an issue in the U.S. at present.

Many of the other diseases above are not an issue in the U.S., including Florida. However, Influenza can be, as well as Meningitis, and Chikungunya and Zika are being closely watched by public health authorities as they could be brought into parts of the U.S. where tropical conditions are found, including Florida. In late 2013, Chikungunya virus was found for the first time in the Americas on islands in the Caribbean. There is a risk that the virus will be imported to new areas by infected

95 https://www.cdc.gov/smallpox/index.html.
96 https://www.cdc.gov/yellowfever/index.html.

travelers. There is no vaccine to prevent or medicine to treat Chikungunya virus infection. Zika is a similar disease in that it is transmitted by mosquitoes and that there is no vaccine or medicine available to treat Zika.[97]

An ongoing pandemic of Novel Coronavirus disease 2019 (COVID-19), caused by the SARS-CoV-2 virus, started in December 2019. It is currently ongoing, and no vaccine currently exists.[98]

Historical Occurrences

Influenza

Annual influenza epidemics are estimated to affect 5–15% of the global population. Although most cases are mild, these epidemics still cause severe illness in 3–5 million people and 250,000–500,000 deaths worldwide. On average 41,400 people die of influenza-related illnesses each year in the United States, based on data collected between 1979 and 2001. In industrialized countries, severe illness and deaths occur mainly in the high-risk populations of infants, the elderly and chronically ill patients, although the H1N1 flu outbreak (like the 1918 Spanish flu) differs in its tendency to affect younger, healthier people.

Throughout the 20th century, there were three influenza pandemics occurring in 1918, 1957, and 1968. Though estimates vary, the influenza epidemic that swept the world in 1918 is estimated to have killed 50 to 100 million people. The 1918 pandemic, or the “Spanish Flu,” affected approximately one-fifth of the world’s population. Within months, it had killed more people than any other illness in recorded history. The plague emerged in two phases. In late spring of 1918, the first phase, known as the "three-day fever," appeared without warning. Few deaths were reported. Victims recovered after a few days. When the disease surfaced again that fall, it was far more severe In the U.S., about 28% of the population suffered, and 500,000 to 675,000 died.

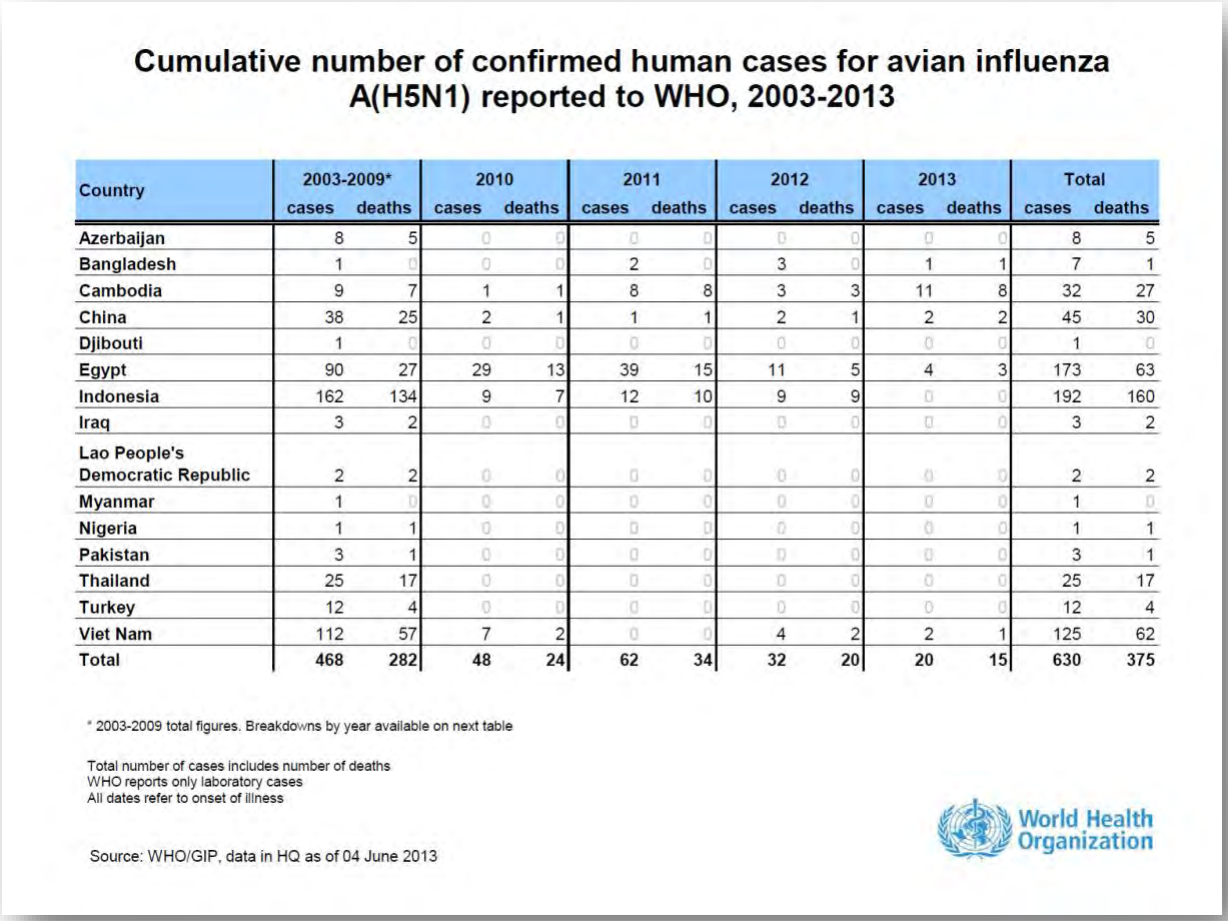
Recently, concerns have been raised as to the potential for a global avian influenza (A-H5N1) pandemic. The first time that influenza A-H5N1 infected humans occurred in Hong Kong in 1997 followed by a resurfacing of the virus in Vietnam and Thailand in late 2003. The westward spread of the virus began in 2004. While person to person transmission of the disease has been limited, health experts are concerned that as H5N1 continues to evolve it will become better adapted to humans and result in sustained and efficient person-to-person transmission with a global impact similar to 1918 pandemic levels. In November 2004, the director for the western region of the World Health Organization said that an influenza pandemic was inevitable and called for urgent plans to combat the virus.

WHO has reported 630 cases of human cases of H5N1 from 15 countries since 2003, with 375 confirmed fatalities. The following table indicates the number of cases and deaths by time, and Figure 39 depicts the spread of H5N1 avian influenza across the African and Asian continents and the number of confirmed cases as of 2013.

97 https://www.cdc.gov/chikungunya/.

98 https://en.wikipedia.org/wiki/2019%E2%80%9320_coronavirus_pandemic.

Figure 34: Cumulative Number of Confirmed Human Cases for Avian Influenza A(H5N1) Reported to WHO, 2003-2013.[99]



Cumulative number of confirmed human cases for avian influenza A(H5N1) reported to WHO, 2003-2013

Country	2003-2009*		2010		2011		2012		2013		Total	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
Azerbaijan	8	5	0	0	0	0	0	0	0	0	8	5
Bangladesh	1	0	0	0	2	0	3	0	1	1	7	1
Cambodia	9	7	1	1	8	8	3	3	11	8	32	27
China	38	25	2	1	1	1	2	1	2	2	45	30
Djibouti	1	0	0	0	0	0	0	0	0	0	1	0
Egypt	90	27	29	13	39	15	11	5	4	3	173	63
Indonesia	162	134	9	7	12	10	9	9	0	0	192	160
Iraq	3	2	0	0	0	0	0	0	0	0	3	2
Lao People's Democratic Republic	2	2	0	0	0	0	0	0	0	0	2	2
Myanmar	1	0	0	0	0	0	0	0	0	0	1	0
Nigeria	1	1	0	0	0	0	0	0	0	0	1	1
Pakistan	3	1	0	0	0	0	0	0	0	0	3	1
Thailand	25	17	0	0	0	0	0	0	0	0	25	17
Turkey	12	4	0	0	0	0	0	0	0	0	12	4
Viet Nam	112	57	7	2	0	0	4	2	2	1	125	62
Total	**468**	**282**	**48**	**24**	**62**	**34**	**32**	**20**	**20**	**15**	**630**	**375**

* 2003-2009 total figures. Breakdowns by year available on next table

Total number of cases includes number of deaths
WHO reports only laboratory cases
All dates refer to onset of illness

Source: WHO/GIP, data in HQ as of 04 June 2013

World Health Organization

According to the WHO, A total of 24 laboratory-confirmed cases of human infection with influenza A(H5N6) virus have been reported to WHO from China since 2014.

Swine Influenza

Swine influenza (swine flu) is a respiratory disease of pigs caused by type A influenza viruses that regularly cause outbreaks of influenza in pigs. Influenza viruses that commonly circulate in swine are called "swine influenza viruses" or "swine flu viruses." Like human influenza viruses, there are different subtypes and strains of swine influenza viruses. The main swine influenza viruses circulating in U.S. pigs in recent years are:

[99] http://www.who.int/influenza/human_animal_interface/EN_GIP_20130604CumulativeNumberH5N1cases.pdf.

- swine triple reassortant (tr) H1N1 influenza virus
- trH3N2 virus
- trH1N2 virus[100]

Swine flu viruses do not normally infect humans. However, sporadic human infections with swine influenza viruses have occurred, including within the United States.

The H1N1 flu virus caused a world-wide pandemic in 2009. It is now a human seasonal flu virus that also circulates in pigs. According to the latest WHO statistics (July 2010), the virus has killed more than 18,000 people since it appeared in April 2009.[101] Several of these fatalities have occurred in Florida.

The Leon County Health Department confirmed in early 2014 that there have been one or more cases of H1N1 in Leon County. However, it is not currently possible under the federal Health Insurance Portability and Accountability Act to gather statistics from local hospitals regarding the specific number of cases and possible deaths from H1N1. Furthermore, H1N1 is not a recordable illness in the state of Florida, meaning cases of death specifically relating to H1N1 involving people 18 or older are not recorded or required to be reported to the FDH in Leon County.[102]

Ebola[103] [104]

Ebola virus disease (EVD), Ebola hemorrhagic fever (EHF), or simply Ebola is a disease of humans and other primates caused by a virus. Symptoms start two days to three weeks after contracting the virus, with a fever, sore throat, muscle pain and headaches. Typically, vomiting, diarrhea and rash follow, along with decreased function of the liver and kidneys. Around this time, affected people may begin to bleed both within the body and externally.

The virus may be acquired upon contact with blood or bodily fluids of an infected animal. Spreading through the air has not been documented in the natural environment. Fruit bats are believed to be a carrier and may spread the virus without being affected. Once human infection occurs, the disease may spread between people, as well. Male survivors may be able to transmit the disease via semen for nearly two months. To make the diagnosis, typically other diseases with similar symptoms such as malaria, cholera and other viral hemorrhagic fevers are first excluded. To confirm the diagnosis, blood samples are tested for viral antibodies, viral RNA, or the virus itself.

Prevention includes decreasing the spread of disease from infected animals to humans. This may be done by checking such animals for infection and killing and properly disposing of the bodies if the disease is discovered. Properly cooking meat and wearing protective clothing when handling meat may also be helpful, as are wearing protective clothing and washing hands when around a person with the disease. Samples of bodily fluids and tissues from people with the disease should be handled with special caution. No specific treatment for the disease is yet available.

[100] U.S. Centers for Disease Control and Prevention < http://www.cdc.gov/flu/swineflu/>.
[101] http://en.wikipedia.org/wiki/2009_flu_pandemic.
[102] http://www.thefamuanonline.com/news/view.php/774999/Health-department-confirms-H1N1-cases-in.
[103] http://en.wikipedia.org/wiki/Ebola_virus_disease.
[104] http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/index.html.

The 2014 Ebola outbreak is the largest in history and the first Ebola epidemic the world has ever known —affecting multiple countries in West Africa. A small number of cases in Lagos and Port Harcourt, Nigeria, have been associated with a man from Liberia who traveled to Lagos and died from Ebola, but the virus does not appear to have been widely spread in Nigeria. The case in Senegal is related to a man who traveled there from Guinea.

CDC has issued a Warning, Level 3 travel notice for three countries. U.S. citizens should avoid all nonessential travel to Guinea, Liberia, and Sierra Leone. CDC has issued an Alert, Level 2 travel notice for Nigeria. Travelers to Nigeria should take enhanced precautions to prevent Ebola. CDC has also issued an Alert, Level 2 travel notice for the Democratic Republic of the Congo (DRC). A small number of Ebola cases have been reported in the DRC, though current information indicates that this outbreak is not related to the ongoing Ebola outbreaks in Guinea, Liberia, Nigeria and Sierra Leone.

As of October 2014, at least one confirmed Ebola case has been reported in the United States. Another four U.S. health workers infected with Ebola virus in West Africa were transported to hospitals in the United States. Two of the patients have recovered and been released from the hospital after laboratory testing confirmed that they no longer have Ebola virus in their blood. CDC has advised that there is no public health concern with their release and that they do not pose a risk to household contacts or to the public.

Although the risk of an Ebola outbreak in the United States is very low, CDC is working with other U.S. government agencies, the World Health Organization (WHO), and other domestic and international partners and has activated its Emergency Operations Center to help coordinate technical assistance and control activities with its government, non-profit, profit, and other partners. CDC has also deployed teams of public health experts to West Africa and will continue to send experts to the affected countries.

2019 Novel Coronavirus

As of April 2020, the 2019–20 Novel Coronavirus pandemic is ongoing, caused by the SARS-CoV-2 Novel (new) Coronavirus. It was first identified in Wuhan, the capital of Hubei, China. As of April 17, 2020, more than 2.17 million cases of COVID-19 (the disease caused by the coronavirus) have been reported in 210 countries and territories, resulting in more than 146,000 deaths. More than 554,000 people have recovered, although there may be a possibility of relapse or reinfection. The deaths per diagnosed cases varies significantly between countries.[105] Also as of this date, there are 24,119 total confirmed cases in Florida with 164 confirmed total cases of COVID-19 in Leon County (22 hospitalizations and one fatality reported).[106]

At this time, the Leon County Emergency Medical Services department has initiated their Emergency Infectious Disease Assessment Protocol to do extra screening on callers reporting symptoms associated with the coronavirus.[107] The local Emergency Operations Center has also been activated for use by those agencies and departments involved in pandemic operations.

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105 https://en.wikipedia.org/wiki/2019%E2%80%9320_coronavirus_pandemic.

106 Florida Department of Health, Division of Disease Control and Health Protection, April 15, 2020.

107 https://www.wctv.tv/content/news/Leon-County-first-responders-prepare-for-coronavirus-568572951.html.

Estimated Impacts, Probability, and Extent

The potential impact of a pandemic on the local population was previously estimated for the 2010 LMS using a Center for Disease Control (CDC) computer model. This model is available online at http://www.cdc.gov/flu/pandemic-resources/tools/flusurge.htm. FluSurge 2.0, a program created by the CDC, was utilized by local government staff in 2009 to assess the potential impacts of a pandemic influenza outbreak on the local population in Leon County. This program calculates the likely number of hospital admissions and death based on local healthcare facilities and equipment and the age of the local population. Young children and older adults (65 years and older) are considered particularly vulnerable groups of the population.

FluSurge 2.0 was used to model and analyze several Leon County scenarios with varying attack rates or exposure levels. A 15 percent attack rate was used to create a low-impact scenario and a 25 percent attack rate was used to create a medium-impact or moderate scenario. Lastly, a high-impact or severe scenario was created using a 35 percent attack rate, which is similar to conditions experienced during the deadly 1918 influenza pandemic. Because no new hospitals have been constructed in the last decade, it is anticipated that these scenarios and the data supporting them are still valid.

Leon County Pandemic Influenza Vulnerability Analysis

Based on analysis of current population and local healthcare facilities, FluSurge 2.0 was used in 2009 to generate a pandemic influenza scenario in Leon County.

Based on the results of this analysis, a pandemic modeled on conditions during the 1918 influenza pandemic lasting six to eight weeks with a 35 percent impact rate would result in 1,140 hospitalizations and 210 deaths in Leon County. The results of this analysis for the 35 percent impact rate (similar to the 1918 influenza pandemic) only are displayed the following table below for Leon County, the incorporated area, and the unincorporated area only.

Table 44: Leon County Pandemic Influenza Impact, 2009 (Assumes 35% of Population Affected for a Duration of 6 -8 Weeks).

Pandemic Influenza Impact / Weeks		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Hospital Admission	Weekly admissions	137	194	239	239	194	137		
	Peak admissions/day			37	**37**				
Hospital Capacity	# of influenza patients in hospital	101	143	176	182	161	127		
	% of hospital capacity needed	11%	16%	20%	**20%**	18%	14%		
ICU Capacity	# of influenza patients in ICU	21	38	49	53	51	42		
	% of ICU capacity needed	20%	38%	48%	**52%**	50%	41%		
Ventilator Capacity	# of influenza patients on ventilators	10	19	25	26	26	21		
	% usage of ventilator	12%	23%	30%	**32%**	31%	25%		
Deaths	# of deaths from influenza			25	36	44	44	36	25
	# of influenza deaths in hospital			18	25	31	31	25	18

City of Tallahassee Pandemic Influenza Vulnerability Scenario

Based on the results of this analysis, a pandemic modeled on conditions during the 1918 influenza pandemic lasting six to eight weeks with a 35 percent impact rate would result in 723 hospitalizations and 131 deaths in the City of Tallahassee. The results of this analysis for the City of Tallahassee are displayed in the tables and figures below.

Table 45: City of Tallahassee Pandemic Influenza Impact, 2009 (Assumes 35% of Population Affected for a Duration of 6 -8 Weeks).

Pandemic Influenza Impact / Weeks		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Hospital Admission	Weekly admissions	87	123	152	152	123	87		
	Peak admissions/day			24	**24**				
Hospital Capacity	# of influenza patients in hospital	64	90	112	116	102	81		
	% of hospital capacity needed	9%	13%	16%	**17%**	15%	12%		
ICU Capacity	# of influenza patients in ICU	13	24	31	33	33	27		
	% of ICU capacity needed	16%	30%	38%	**41%**	40%	32%		
Ventilator Capacity	# of influenza patients on ventilators	7	12	16	17	16	13		
	% usage of ventilator	13%	24%	31%	**33%**	33%	27%		
Deaths	# of deaths from influenza			16	22	28	28	22	16
	# of influenza deaths in hospital			11	16	19	19	16	11

Unincorporated Areas of Leon County Pandemic Influenza Vulnerability Scenario

Based on the results of this analysis, a pandemic modeled on conditions during the 1918 influenza pandemic lasting six to eight weeks with a 35 percent impact rate would result in 417 hospitalizations and 78 deaths in the unincorporated areas of Leon County as indicated in the following table.

Table 46: Unincorporated Areas of Leon County Pandemic Influenza Impact, 2009 (Assumes 35% of Population Affected for a Duration of 6 -8 Weeks).

Pandemic Influenza Impact / Weeks		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Hospital Admission	Weekly admissions	50	71	88	88	71	50		
	Peak admissions/day			14	**14**				
Hospital Capacity	# of influenza patients in hospital	37	52	64	67	59	47		
	% of hospital capacity needed	18%	25%	31%	**33%**	29%	23%		
ICU Capacity	# of influenza patients in ICU	8	14	18	19	19	15		
	% of ICU capacity needed	38%	70%	90%	**97%**	94%	76%		
Ventilator Capacity	# of influenza patients on ventilators	4	7	9	10	9	8		
	% usage of ventilator	11%	21%	27%	**29%**	29%	23%		
Deaths	# of deaths from influenza			9	13	16	16	13	9
	# of influenza deaths in hospital			7	9	11	11	9	7

Based on the data presented above and the historical record, the probability based on the historical record of a global disease outbreak or pandemic affecting Leon County and the City of Tallahassee is **occasional**. However, when a novel virus such as the 2019 Novel Coronavirus reaches Leon County and

the City of Tallahassee, all citizens can be potentially affected. At this time, the probability of this virus affecting citizens is highly likely if no mitigation measures are put into place. However, there are a number of such measures already implemented, including social distancing, state and local stay-in-place measures, requirements to wear masks in certain public places, and other mitigation actions.

Vulnerability Summary

Based on the information presented above, Leon County residents are considered vulnerable to a pandemic influenza outbreak, as are the rest of Florida and the United States in general. Special needs and homeless populations have an increased vulnerability to this pandemic. Special needs individuals in group homes cannot easily social distance, and homeless people cannot be easily tested unless they are staying at a shelter and show symptoms that would warrant a test. Asymptomatic and symptomatic individuals who are homeless and not living or staying in a shelter can easily infect other individuals, which spreads viruses further. Crowded shelters are very vulnerable to virus infections due to a lack of social distancing and potential hygiene issues.

A discussion of vulnerability should include global climate change--with its anticipated warming and associated sea level rise—as a driver of changing ambient environmental conditions that could create conditions under which mosquito-borne diseases such as Meningitis, and Chikungunya and Zika could be brought into parts of the U.S. where tropical conditions are found, including Florida. The risk that these viruses could be imported to new areas by infected travelers only adds to this potential increased vulnerability.

Although the vulnerability to COVID-19 is high at this time, Leon County has several significant medical facilities that are equipped to provide testing and other health services, as well as the Leon County Health Department and the Florida State University and Florida Agricultural and Mechanical University student health clinics. Tallahassee Memorial Hospital and Capital Regional Medical Center are currently organized to treat COVID-19 cases, as well as several other hospitals in the North Florida region.

Risk Assessment

Although flu season occurs annually, an influenza pandemic has historically been considered at this time to be a **low** risk for Leon County residents. However, the 2019 Novel Coronavirus pandemic and the COVID-19 disease it creates in humans has affected every county in Florida. Therefore, for a pandemic like the 2019 Novel Coronavirus, Leon County is already affected.

The other pandemic that is currently of concern to many citizens is Ebola, but it is considered a **low** risk at present for Leon County residents. CDC has activated its Emergency Operations Center (EOC) to help coordinate technical assistance and control activities with partners. CDC has deployed several teams of public health experts to the West Africa region and plans to send additional public health experts to the affected countries to expand current response activities.

In late September 2014, the first case of Ebola in the United States was confirmed as the result of an ill traveler having arrived in the U.S. CDC has existing protocols in place to protect against further spread of disease. These protocols include having airline crews notify CDC of ill travelers on a plane before arrival, evaluation of ill travelers, and isolation and transport to a medical facility if needed. CDC, along

with Customs & Border Patrol, has also provided guidance to airlines for managing ill passengers and crew and for disinfecting aircraft. In addition, CDC has issued a Health Alert Notice reminding U.S. healthcare workers about the importance of taking steps to prevent the spread of this virus, how to test and isolate patients with suspected cases, and how to protect themselves from infection. The Leon County Health Department, the local hospitals, clinics, and other health facilities will utilize these guidelines and protocols as necessary if an outbreak of Ebola occurs locally.

The Centers for Disease Control and Prevention offers information to states and local governments to assist in planning for an influenza pandemic such as the 2019 Novel Coronavirus at https://www.cdc.gov/flu/pandemic-resources/planning-preparedness/state-local-government-planning.html.

2.17 Technological and Societal Hazards

As part of the 2020 LMS update, technological and societal hazards in the previously adopted plan were reviewed and reordered. Those that were selected by the Steering Committee include:

1) Public Infrastructure Failures
   (a) Telecommunications
   (b) Cybersecurity
   (c) Electricity, Water, and Sewer
   (d) Dams
2) Hazardous Materials (Storage and Transportation)
3) Transportation Incidents
   (a) Roadways
   (b) Railways
   (c) Aviation
4) Terrorism
   (a) Violent Acts
   (b) Biohazards
   (c) Cyber Attacks

Although the purpose of the LMS is to address community vulnerability to natural hazards, plans for addressing local vulnerability to societal and technological hazards are developed, maintained, and updated by other local agencies and departments. For example, the City of Tallahassee Utilities maintains plans to address power and gas loss during hazard events, regardless of their cause. The Leon County Comprehensive Emergency Management Plan addresses the period immediately following any significant emergencies, which include natural, technological, and societal hazards.

Although there are other planning and procedural documents that address all or a portion of the technological and societal hazards listed here, updated hazard profiles for the above hazards are included here.

2.18 Public infrastructure Failures

Public infrastructure is the skeleton, sinews, and nerves of an urban area. Public infrastructure includes basic services such as roads, bridges, and highways; electric and natural gas generation, transmission, and distribution systems; freshwater distribution and wastewater collection and treatment systems; waste collection, recycling, and disposal systems; and fire, police, and communication systems.

Based on experiences gained in hazardous events like hurricanes, Leon County and the City of Tallahassee have learned which systems are vulnerable to particular hazards, and how to generally mitigate these hazards. Examples include staging generators at major road intersections and critical facilities, trimming trees around power lines, prepositioning utility trucks, lowering water levels of major reservoirs and stormwater detention ponds, and arranging schedules of government staff and volunteers. Other measures include the permanent installation of generators, rebuilding and upgrading building components such as windows and roofs, and

The failure of public infrastructure from hazards can occur suddenly or slowly, depending on the event and its effects, and it can affect different populations in different areas. Loss of electricity is perhaps the most significant cause of public infrastructure failure, followed by flooding. The loss of electricity locally is usually cause from trees falling onto transmission and distribution powerlines. The loss of electricity can also cause traffic lights at intersections to fail, as well as wastewater collection facilities.

Critical facilities can include public infrastructure elements. They include one or more of the following:

- Hospitals, nursing homes, medical service facilities, convalescent and assisted living facilities
- Police stations, fire stations, storage of critical records
- Publicly-owned dams
- Electric generating stations and transmission and distribution lines and other relative facilities
- Government buildings and law enforcement offices
- Evacuation shelters and emergency operation centers that are needed for flood response activities before, during, or after a flood
- Public and private utility (water and wastewater) facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood
- Telecommunications facilities, including radio, cellular, and/or television transmission towers
- Schools and universities
- Landfills, and
- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.

The explosive growth of the use of computers and the use of the Internet to connect them together has increased the ability to manage complex systems such as traffic management, water and sewer and energy management and distribution, emergency management systems, fire and police responses, and other types of infrastructure. These computerized systems and their physical connections through fiber optic or other types of cables have become another aspect of infrastructure itself. At the same time, the potential of these computerized systems to be hacked by amateurs and professions intent on harassment, extortion, or worse has grown. Cybersecurity is a growing need in an ever-increasingly connected world.

When critical facilities that comprise elements of public infrastructure are affected by hazards, this can create life safety issues for our community. Those public infrastructure elements most vulnerable to hazards are discussed below.

General Description and Location

Telecommunications

Telecommunication is the transmission of signs, signals, messages, words, writings, images and sounds or information of any nature by wire, radio, optical or other electromagnetic systems.[108]

A telecommunications network is a collection of transmitters, receivers, and communications channels that send messages to one another.[109] Telecommunication technologies may primarily be divided into wired and wireless methods. The former includes fiber optic cables, telephone wires, cable wiring (for both TV and internet), and the later can include microwave transmissions, satellite transmissions, and cell phone data and voice service via cell towers. Examples of all of these forms of wired and wireless communication can be found various locations in Leon County and the City of Tallahassee. Examples of local economic activities, industries, infrastructure systems, and other organizations include:

- Financial systems
- Utilities and industrial equipment
- Aviation
- Consumer devices
- Corporations
- Automobiles
- Government
- Medical systems
- Energy sector

As the “Internet of things” increases its reach, these activities and the computers and telecommunications systems we increasingly rely on become more critical to our economy, and possibly more vulnerable to failures from natural and other hazards.

Cybersecurity

Computer security, cybersecurity, or information technology security (IT security) is the protection of computer systems from the theft of or damage to their hardware, software, or electronic data, as well as from the disruption or misdirection of the services they provide.[110]

The field is becoming more important due to increased reliance on computer systems, the Internet and wireless network standards such as Bluetooth and Wi-Fi, and due to the growth of "smart" devices, including smartphones, televisions, and the various devices that constitute the "Internet of things."

108 https://en.wikipedia.org/wiki/Telecommunication#Wireless_telecommunication.
109 Ibid.
110 https://en.wikipedia.org/wiki/Computer_security.

Owing to its complexity, both in terms of politics and technology, cybersecurity is also one of the major challenges in the contemporary world.[111]

Cybersecurity is a rapidly increasing necessity in Leon County and the City of Tallahassee. Many local institutions have been experiencing security issues for years because of vulnerabilities to online and other forms of attacks on computer systems through email and the internet. A vulnerability is a weakness in design, implementation, operation or internal control. Vulnerabilities are often hunted or exploited with the aid of automated tools or manually using customized scripts. To secure a computer system, it is important to understand the kinds of threats that exist. These are typically classified into one of the categories below:[112]

- Backdoor (bypassing of authentication or security protocols)
- Denial-of-service attack
- Direct-access attacks
- Eavesdropping (between computer servers)
- Multi-vector, polymorphic attacks
- Phishing (deceiving users)
- Privilege escalation
- Social engineering (fraud)
- Spoofing (masquerading)
- Tampering

Systems vulnerable to attack from one or more of these threats include:

- Financial systems
- Utilities and industrial equipment (telecommunications, power grid, nuclear power plants, valve in water and gas networks, etc.)
- Aviation
- Consumer devices (Desktop computers, laptops, smartphones, tablet computers, smart watches, and other mobile devices such as activity trackers)
- Large corporations
- Automobiles
- Government and military computer systems
- Local and regional government infrastructure such as traffic light controls, police and intelligence agency communications, personnel records, student records, and financial systems
- Medical systems
- Energy sector

While both the City of Tallahassee, Leon County, local universities and colleges, hospitals, state agencies, and larger corporations have all instituted comprehensive cybersecurity programs, hackers, criminals, and others who are employed by adversarial governments and other institutions are

111 Ibid.
112 Ibid.

constantly looking for vulnerabilities and opportunities to damage or disable computer systems and the infrastructure they increasingly control. As more computer-controlled infrastructure comes online (such as autonomous vehicles), the threat may increase with time.

Electricity, Water, and Sewer Failures

The City of Tallahassee owns and operates its own utilities, including electric, potable water, natural gas, and wastewater treatment (sewer) systems. There are also areas within the unincorporated area of the county where other utility providers have franchises, including Talquin Electric Cooperative and Duke Energy. However, the major of centralized utilities are provided by the City.

The failure of these utilizes can vary depending on the hazard, event, vulnerability, and other factors. The recent experiences in hurricanes Hermine and Michael indicated that gas and water utilities did not fail during these events, but wastewater and electric infrastructure are vulnerable and co-dependent (i.e., sewer lift stations won't work without reliable electricity). Many so-called high performance septic tanks can also be affected by the lack of electricity following a storm or other energy failure because the pumps these systems use are powered by electricity.

Although a full description of the electric system (generating facilities, transmission, and distribution grids) and wastewater treatment systems is not available for this plan due to security protocols, the failure of these systems, as well as the computer systems they rely on, can be quite significant.

Energy Failures

The City of Tallahassee provides the majority of energy resources to the citizens, businesses, and other establishments in the urban area of Leon County, including the City. The City's Utility department provides electricity and natural gas, in addition to potable water, wastewater treatment, and waste management. The City operates three power generating plants:

1. Arvah B. Hopkins Power Generation Station
2. C.H. Corn (Hydroelectric) Power Generation Station
3. Sam O. Purdom Power Generation Station

The City purchases natural gas that is delivered via specialized pipelines that provides natural gas from other areas of the state or from other states. The main source of gas is delivered via pipelines owned by the Florida Gas Transmission Company. These pipelines also provide natural gas to the Talquin Electric Cooperative, Inc.

The other major energy provider within Leon County is the Talquin Electric Cooperative (TEC), Inc., a Domestic Non-Profit Corporation in the State of Florida. TEC provides electricity and potable water, in addition to wastewater treatment, to rural and selected suburban areas of Leon County. TEC purchases electricity from the Seminole Electric Cooperative. Seminole's primary resources include the Seminole Generating Station (SGS) in northeast Florida and the Richard J. Midulla Generating Station (MGS) in south central Florida. Seminole also receives power from renewable energy facilities, including waste-to-energy, landfill gas-to-energy, and a biomass facility.

Dam Failures

A dam is defined as an artificial barrier with the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water. A dam failure is a catastrophic type of failure, characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release.

Dam failures are usually a secondary effect of massive rainfall and flooding, and occur when too much water enters the spillway system. This will occur with little or no warning. Severe thunderstorms and heavy rainfall are contributory factors. Additionally, poor engineering or poor maintenance may also cause dam failures. According to the Federal Emergency Management Agency, dam failure can be attributed to one or more 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; and
- inadequate maintenance and upkeep.

The largest earthen dam facility in Leon County is the Corn Hydroelectric Generating facility, which was previously owned and operated by the City of Tallahassee's Electric Utility. Additionally, there are several smaller earthen dams throughout the City and the County. Information on these earthen dams is maintained by the Northwest Florida Water Management District (NWFWMD), which reported 79 earthen dams in a 2009 inventory of dams in Leon County. There have been no new dams constructed since that time. The Tallahassee – Leon County Geographic Information Systems department maintains a combined list of 170 dams and water impoundment structures.

The C.H. Corn Hydroelectric Power Plant is located at the Talquin Dam (sometimes also known as the Jackson Bluff Dam) at the south end of Lake Talquin. This artificial lake is located on the Ochlockonee River in the far western part of Leon County. The waters of Lake Talquin come from the Ochlockonee River, the Little River, and local stormwater runoff. The drainage basin of the lake is approximately 1,720 square miles in size and includes portions of South Georgia. There are no dams or other flow control devices upstream of the Corn facility.

Downstream, the flood stage is 22 feet at the Bloxham gauge station. The Ochlockonee River downstream of the facility is the boundary between Leon and Liberty Counties. The east side of the river is Leon County, and the west side of the river is Liberty County.

The facility was originally constructed in the late 1920s by what is now known as Progress Energy Florida (PEF), formally known as Florida Power Corporation. PEF surrendered the license for the facility and transferred ownership of the facility to the state in the 1970s. The state operated this facility in order to maintain the lake as a recreational facility until 1981, when the City leased the facility. The City re-licensed it through the Federal Energy Regulatory Commission (FERC) for hydroelectric operation and refurbished the facility. It was previously rated for 11 megawatts (MW) of electrical generation capacity. The plant provided less than one percent of the city's power, providing an average

of 18,000 megawatt-hours of power per year depending on rainfall in river basin extending into South Georgia. The Corn facility consists of the following components:

- Powerhouse: Consists of three generating units with a total rating of 11 MW. The generating units were operated when there is sufficient water available.
- Concrete Spillway: The concrete spillway is approximately 196 feet long and equipped with seven (7) floodgates and one (1) smaller trash gate. The floodgates are utilized during periods where the water flow was previously insufficient to operate the generating units and during periods of high flow when the flows exceeded the generating unit flow capacity.
- Earthen Dam: The main earthen dam is a 3,600-foot long earthen dam, with a crest elevation of 77.0 feet. At the northern end of the earthen dam, there is an emergency spillway, crest elevation of 72.3 feet, equipped with a fuse plug, crest elevation 74.3 feet. In order to protect the main portion of the earthen dam, the fuse plug is designed to erode away if water passes over the fuse plug. If this were to occur, there would be an uncontrolled release of water from the lake, similar to what occurred in the 1950's when a portion of the dam failed.

The City developed an emergency action plan (EAP) designed to address the failure of the dam. The EAP also addresses normal high-water event responses and provides for the communication routines in the event of a failure of the dam. In addition, the manager of the dam is supposed to coordinate with emergency management personnel from potentially impacted counties (Leon, Liberty, Gadsden, Wakulla and Franklin) during any high-water events to ensure that they are aware of the operations.

The City leased the dam and site of the power plant from the State of Florida under a 30-year lease with two (2) 10-year renewal options. In 2019, the City surrendered its operational license to operate the power plant, and "mothballed" the generating station and its facilities in place. The Florida Department of Environmental Protection (DEP) assumed control of the dam and reservoir for the state. The generating turbines would be closed and locked and water releases from Lake Talquin through the dam will be maintained by DEP.[113]

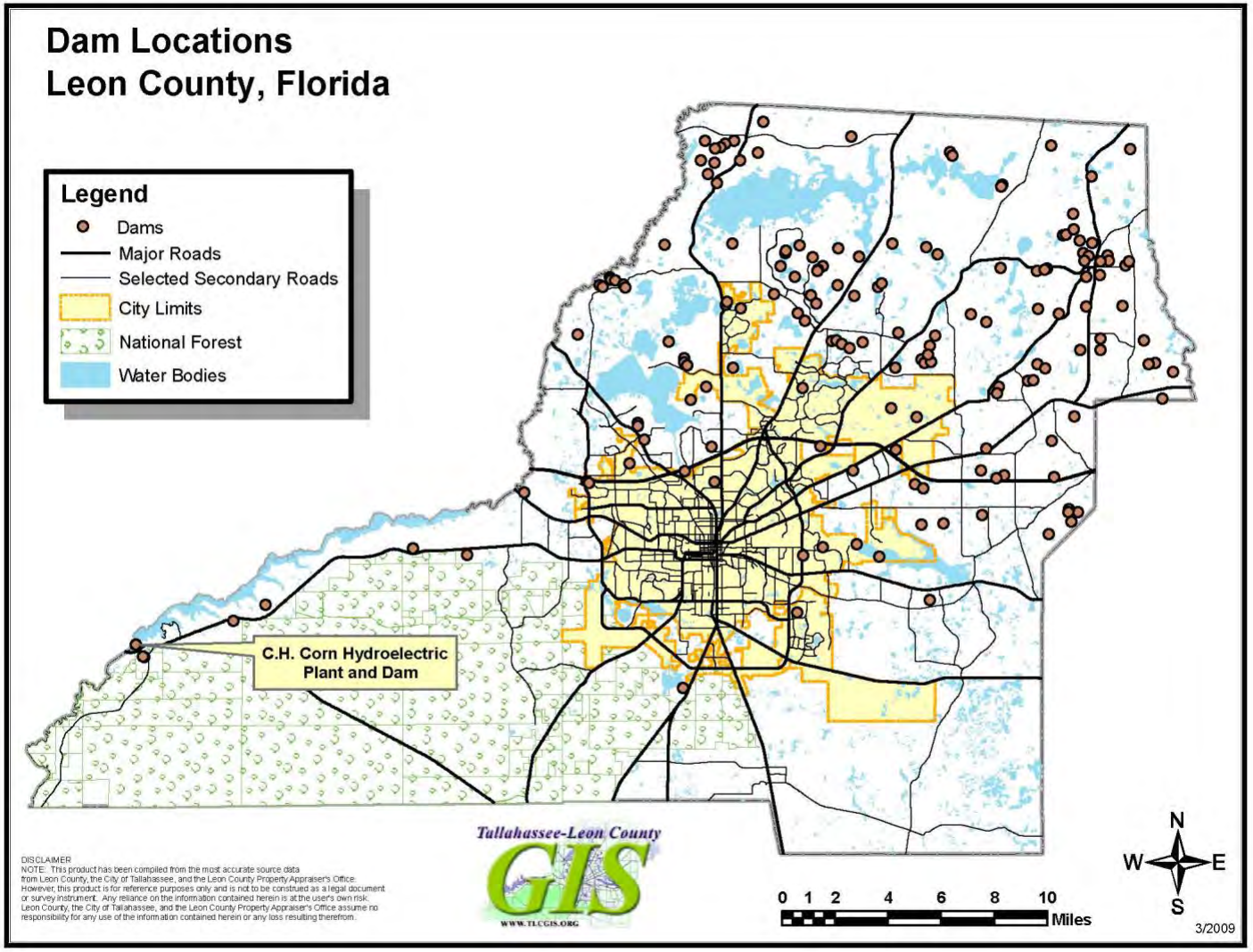
Leon County Earthen Dams

Earthen dams are the primary (but not only) type of dam facility within Leon County. Florida state law defines an earthen dam as "…a barrier to the flow of liquids which is constructed of naturally occurring soil and which is a component of a clay settling area."[114] In addition to the Corn Hydroelectric Power Plant, there are a significant number of earthen dams located throughout Leon County. According to the Northwest Florida Water Management District (NWFWMD), there are 79 earthen dams in Leon County. Generally, an earthen dam refers to any artificial or natural barrier that impounds waters of the state. Most earthen dams in Leon County are constructed for water retention serving agricultural functions. These dams are exempt from the NWFWMD's permitting system.

[113] https://www.politico.com/states/florida/story/2017/07/20/tallahassee-to-shut-down-one-of-two-hydroelectric-plants-in-florida-113512.

[114] Florida Statute, Chapter 62-672, Minimum Requirements for Earthen Dams; 62-672.200

Figure 35: Dam Locations, Leon County, Florida, 2014.[115]



115 TLCGIS.

Table 47: Leon County Dams as of 2014.[116]

Dam Name	River	Height (ft.)	Storage (acre-ft.)	Year Completed	Hazard
MONKEY BUSINESS POND DAM	TR-LAKE IAMONIA	15	183	1958	L
UPPER DIANA LAKE DAM	TR-LAKE IAMONIA	27	624	1958	L
LOWER DIANA LAKE DAM	TR-LAKE IAMONIA	12	540	1973	L
PETTY GULF LAKE DAM	TR-LAKE IAMONIA	25	233	1972	L
PINEHILL LAKE DAM	TR-LAKE IAMONIA	12	150	1958	L
LAKE JEAN DAM	UNNAMED STREAM	14	214	1951	H
LOWER HUGGLE POND DAM	TAYLOR-HAMMOCK STREAM	23	417	1948	L
UPPER HUGGLE PON	TAYLOR-HAMMOCK STREA	20	426	1955	L
JACKSON BLUFF	OCHLOCKONEE	60	150000	1928	H
IRELAND DAM	TR-FOSHALEE SLOUGH	20	106	1958	L
EMMA LEE POND DM	TR-GOPHER BRANCH	22	51	1956	L
ALBERTA LAKE DAM	GOPHER STREAM	16	227	1946	L
LAKE LOUISE DAM	TR-PANTHER CREEK	12	115	1940	L
SHOMONIE LAKE DA	CARMINE BRANCH	16	227	1958	L
LAKE HERITAGE DAM	LAKE LAFAYETTE-OFFSTREAM	14	97	1952	L
DOUGLAS DAM	TR-ROBERTS POND	12	59	1962	L
PINEY"Z"LAKE DAM	ST MARKS RIVER	18	1129	1970	L
ALFORD POND DAM	TR-ST MARKS RIVER VA	8	80	1955	L
GULLY DAM	TR-OCHOCKNEE	18	65	1970	L
ROBERTS POND DAM	ROBERTS POND	15	50	1959	L
LANGLEY DAM	ALFORD ARM	17	340	1959	L
EDGE DAM	LAKE MICCOSUKEE	20	59	1950	L

Historical Occurrences

Telecommunications & Cybersecurity

Data for telecommunications & cybersecurity failures are not easily obtainable. Many of these types of disruptions are not publicized for various reasons, including organizations not wanting to publicly state that their computer hardware and/or software systems are vulnerable to particular attacks. However, on April 5, 2019, the Tallahassee Democrat reported that “Almost half a million dollars was diverted

[116] National Dam Inventory (2009) and Tallahassee – Leon County Geographic Information Systems (2014). It is assumed that this list is still valid for 2019.

out of the city of Tallahassee's employee payroll Wednesday after a suspected foreign cyber-attack of its human resources management application. Hackers attempt every day to breach the city's security, officials say, but this week's operation netted about $498,000."[117] A month earlier, a Dropbox link was sent out from the email account of a City official. The phishing email, which originated externally, contained a virus. Emails with executable attachments can shut down whole computer systems if they spread malware or other programs. According to computer network administrators, these kinds of attacks are increasingly common, and have been so for at least a decade or more.

Electricity, Water, and Sewer Failures

Data for electricity, water, and sewer failures and disruptions are not easily obtainable. Nevertheless, based on local experience, most energy disruptions and failures are usually weather-related, affect relatively small areas, and are usually quickly resolved. These small disruptions occur from a variety of impacts to the electric system, including storm impacts (e.g., trees, flooding, wind), overloads in areas where development has approached the capacity of existing facilities, or from trees or branches falling on power lines, animals such as squirrels, or even automobiles or truck accidents involving utility poles. Given Tallahassee's extensive tree canopy, it is not uncommon for disruptions to occur from trees falling over, or branches falling onto electrical line. The City and Talquin Electric Cooperative both have ongoing programs to trim tree canopies away from power lines.

Larger failures and/or disruptions can and often do occur with major weather events, including severe thunderstorms and tropical cyclones, including tropical storms and hurricanes. One of the most severe events in recent memory was Hurricane Kate in 1985. This hurricane downed power poles and lines throughout Tallahassee and the surrounding area. About 90 percent of the population of Tallahassee at that time, or about 80,000 people, lost power for up to a week. Along the coast from Panama City to Apalachicola, the storm left about 30,000 homes and businesses without electricity.[118] Based on the reliance of the City and TEC on overhead lines in older developed areas, it is anticipated that electrical energy failures or disruptions can be expected within major weather events.

Major electric outages were also associated with hurricanes Hermine in 2016 and Michael in 2018. Following Hurricane Hermine, approximately 75,000 electric utility customers in the Tallahassee area experienced electric outages, and many were without power for a week. Following Hurricane Michael, nearly 97 percent (>114,000) of all homes and businesses in the City of Tallahassee was without electric power for at least a few days.[119] Talquin Electric and Duke Energy also experienced significant outages during these events, although data on exactly how many is not available. The damage to these systems was varied and including wind and tree damage to various parts of the transmission and distribution systems.

There are no data indicating that the power plants themselves that provide electric energy to the City of Tallahassee and Leon County are subject to disruptions. These are physically secure facilities that can use several fuels (e.g., natural gas and fuel oil), and there are backup generators at each facility.

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117 https://www.tallahassee.com/story/news/2019/04/05/almost-500-k-swiped-city-tallahassee-payroll-hack/3379242002/.

118 http://en.wikipedia.org/wiki/Hurricane_Kate_%281985%29.

119 https://www.tallahassee.com/story/news/2018/10/11/long-winding-road-power-restoration-begins/1599734002/.

The C.H. Corn (Hydroelectric) Power Generation Station is powered by water flowing over a dam, and unless there is a severe drought or catastrophic flood, it is expected that this facility is relatively immune to failure or disruption.

There are also no data suggesting that the provision of natural gas to residents, businesses, and other consumers of this energy source are subject to failures or disruptions. The City does not shut down the provision of gas as a rule during tropical cyclones and other storm events, and most of the gas infrastructure in place is buried underground under streets and dedicated gas pipeline corridors.

In order to minimize disruptions of the City's potable water, wastewater treatment, and traffic management systems by hurricanes and tropical storms, City staff deploy portable generators at critical potable water wells and pumps, sewer lift stations, and traffic lights in ensure that these systems remain functional.

Dam Failures

The only recorded occurrence of a dam failure in Leon County has been at the Jackson Bluff Dam. A breach of this facility occurred in 1957 while it was being operated by PEF. There are no other records indicating a failure of the dams listed above since that time.[120]

More recently, there have been two high water events that resulted in downstream flooding from the release of floodwaters. These events occurred during Tropical Storm Fay in 2008 and the heavy rain events in March and early April of 2009. These are not considered failures, but releases to avoid a potential failure event. No such additional events have occurred since 2009.

Estimated Impacts, Probability, and Extent

Telecommunications

The City of Tallahassee and Leon County are vulnerable to telecommunications failures associated with hurricanes and tropical storms. Other hazards may affect portions of these systems (e.g., a tornado or lightning takes out a cell phone or microwave transmitting tower), but these would be relatively sporadic events.

As experienced by residents of Mexico Beach and Panama City and its nearby towns such as Lynn Haven, Hurricane Michael damaged or destroyed a number of cell phone and other communication towers, as well as power and telephone lines, and thus citizens could not obtain information, request services, or maintain contact with their friends, families, employers, and others. The probability of such events has been discussed in that part of this plan describing hurricanes and tropical storms. The extent of such impacts would be consistent with the degree of impacts by these events but may vary depending on the local impacts of such storms. Subsequently, the probability of a telecommunications failure based on the historical record locally is **occasional**.

[120] Association of State Dam Safety Officials, http://www.damsafety.org/news/?p=412f29c8-3fd8-4529-b5c9-8d47364c1f3e.

Cybersecurity

Thanks to the increased use of antiviral software, security designs, architecture, and measures, vulnerability management, hardware protection, and end user training and enhanced digital hygiene, many organizations are less vulnerable than they were previously to traditional online and email attacks. However, there are many examples of ongoing vulnerabilities being exploited, including unauthorized releases of data, phishing, digital extortion, and other breaches. These activities are continuing and, in many ways, growing. Voting machines and databases are increasingly vulnerable to disruptions and hacking, and privacy laws and practices are continuing to evolve, often as a result of these breaches and unauthorized releases. This is an area that is quite complex, difficult to quantity, and subject to rapid change as the use of computerized technologies continues to evolve as well. Nevertheless, the probability of a cyberattack on the institutions described above in Leon County is **highly likely**.

Electricity, Water, and Sewer Failures

If generators are prepositioned in advance of significant weather events such as hurricanes and tropical storms, water wells and distribution networks and wastewater collection and treatment systems are relatively impervious to significant damages from these events. (The exception would be those systems or components located in area vulnerable to flooding.) Natural gas storage and distribution systems are also relatively invulnerable from damage due to the fact that ost of the elements of these systems are underground. However, those elements of the electric transmission and distribution systems in Leon County and the City of Tallahassee that are not buried underground are vulnerable to damage from weather events. Sustained high winds and heavy rains can bring down large branches and trees onto elements of the electric system which can deny electricity to thousands of customers for periods of a week or more.

As previously indicated, most small electric power failures or disruptions are resolved relatively quickly, and so are considered nuisance events rather than life-threatening. They can affect a few houses, hundreds of houses, or even whole parts of town. However, larger events are relatively rare. Of course, the lack of traffic lights can be life-threatening if drivers fail to stop and yield, but local police and sheriff's deputies can be assigned to provide traffic control if necessary.

Larger, longer events can present significant impacts to citizens, including residents and visitors, if facilities are not prepared (e.g., do not have backup generators) or if shopping, education, and/or employment centers do not have energy resources to operate with. The lack of electricity can render buildings uninhabitable if exterior temperatures are high, create conditions under which mold and mildew can flourish, and can spoil food. It can also bring cable and internet systems down, which can restrict the flow of information and emergency services to and from citizens and others.

Avoiding or mitigating the impacts of losing electricity is why certain critical institutions such as hospitals, emergency operations centers, nursing homes, and other facilities often install industrial generators. Other options may include battery banks, solar panels, and even windmills. Many individual homes have gasoline-powered electrical generators, and it is common for them to be provided to consumers before and after tropical cyclone events.

The probability based on the historical record of energy failures or disruptions affecting portions of Leon County and/or the City of Tallahassee is **occasional**. The probability and extent of electrical outages are strongly correlated to storm hazards, because storms often result in partial or larger outages.

Dam Failures

The hazard potential varies for individual earthen dams, and generally depends upon the volume of water supported by the dam along with the proximity to homes or other vulnerable structures downstream of the waterbody created by the dam. Because many dams are not subject to permitting and regular inspection, the data record is not sufficient to assess the hazard potential of many earthen dams. Nevertheless, dam safety in Florida is a shared responsibility among Florida's five water management districts, the Florida Department of Environmental Protection (DEP), the United States Army Corps of Engineers, local governments and private dam owners. These efforts are coordinated under the Florida Dam Safety Program.

In Northwest Florida, including Leon County, permits for the construction, alteration, repairs or abandonment of most dams are issued through the Environmental Resource Permitting Program, which is administered jointly between the District and DEP.

Owners of existing dams that needs to be repaired or who plan to build a new dam may need a permit to authorize the work. An individual Environmental Resource permit is required for the construction, alteration, repair, or abandonment of dams. There are additional safety and design criteria when the dam exceeds a height of 10 feet or impounds more than 50 acre-feet of water. This can apply to dams that create recreational ponds or lakes, as well as stormwater treatment facilities.

As of 2009, the National Dam Inventory listed far fewer structures in Leon County, but did include estimates of height, storage capacity, and drainage areas for listed dams. According to the Inventory, two farm pond dams were identified as high hazard potential, as indicated in Table 2.38. (The National Dam Inventory does not list dams by county at present due to security concerns.) These two dams include the Lake Jean Dam and the Jackson Bluff Dam. However, the Jackson Bluff Dam was evaluated approximately 13 years ago, and the existing fuse plug and emergency spillways were replaced, with a remote dike at the same crest level as the main embankment. Project construction commenced in September 2010, and was completed in August 2011.

The Florida Dam Safety Program also listed in a 2014 review the Killearn Lakes Dam as a "High Hazard Potential Dam." This is a small dam in a residential area for a shallow lake that receives stormwater runoff from the surrounding area, and no additional information has been found to date concerning this dam.

Jackson Bluff Dam

Floods typically evaluated in dam engineering include frequency-based storms (e.g. 1-year through 500-year flood) and the Probable Maximum Flood (PMF), which is developed based upon the Probable Maximum Precipitation (PMP). The PMP is the greatest depth (amount) of precipitation, for a given storm duration, that is theoretically possible for a particular area and geographic location. The PMF is

the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area.

Dams are designed or required to safely pass what is typically termed the Spillway Design Flood (SDF) or Inflow Design Flood (IDF), which typically ranges from the 100-year flood to the PMF. The selection of a SDF or IDF is usually based on the hazard category of the dam and the potential for loss of life or property damage that would result from a dam failure during a given flood.

There are three different potential flooding cases for the Corn Hydroelectric Generating facility (Jackson Bluff Dam). Two of the three are related to a failure of the dam and one is from high water events. These three types of events are:

1. **Sunny Day Breach:** Failure of the dam during a non-rain event.
2. **Rain Event Dam Breach**: Failure of the dam during a rain event.
3. **High Water Event:** Flooding downstream related to heavy rainfall and inflows.

The original IDF study for the Jackson Bluff was conducted in 1983 and determined the IDF is equivalent to one-half of the PMF.

The area downstream of the Talquin Dam is lightly populated and much of the area east of the Ochlockonee River is within the Apalachicola National Forest. Downstream from Jackson Bluff Dam, the Ochlockonee River travels through four counties before entering into the Gulf of Mexico. A camping area, a mobile home park, and a road with 45 homes are about a half-mile downstream from the dam. These residential developments are on relatively low ground.

A USGS real-time water level monitoring gauge (BLXF1) on the Ochlockonee River near Bloxham (SR 20) is the closest gauge upstream to the area downstream of the dam that is vulnerable to flooding. The following flood stage elevations have been established for this location:

Figure 36: USGS Flood Stage Elevations on the Ochlockonee River near Bloxham (SR 20).

BLXF1 Flood Categories (in feet)[121]

Major Flood Stage:	30
Moderate Flood Stage:	24
Flood Stage:	22
Action Stage:	16

According to the Leon County Property Appraiser's database, as of 2014 there are at least 63 property parcels within the County adjacent to Crooked Road. Of these 63 parcels, 43 parcels have at least one

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http://water.weather.gov/ahps2/river.php?wfo=tae&wfoid=18673&riverid=204345&pt%5B%5D=144211&pt%5B%5D=145549&pt%5B%5D=142249&pt%5B%5D=145546&pt%5B%5D=144493&pt%5B%5D=145993&allpoints=150692%2C144211%2C145549%2C142249%2C145546%2C144493%2C146946%2C151031%2C145993%2C146947&data%5B%5D=hydrograph.

residential structure onsite, and 20 parcels are vacant. The City's Electric Utility division maintains a notification list of Crooked Road residents, including their names, address and multiple contact phone numbers, as part of the Emergency Management Plan for the Power Plant.

The Franklin County CEMP states that "In the event of dam failure [of the Jackson Bluff and Jim Woodruff dams on the Ochlockonee River], the corresponding flooding would be similar to that of heavy rainfall." Nevertheless, in the event of a breach of the dam, the main impact will occur on Crooked Road, a residential area downstream of the facility on the Leon County side of the river. The USGS gauge record indicates that a flow slightly above the five-year flood would cause the river stage at a residential area half a mile downstream to rise to the flood stage, and some houses in this area would be flooded. The five-year flood is equivalent to only 12% of the total project capacity. Therefore, a catastrophic dam failure would exceed the five-year flood, and would affect this residential area. The maximum flood level, depending on the level of water behind the dam, could exceed 30' and be as high as 35'. This flood would be temporary only as the floodwaters would quickly move downstream.

Overall, the probability based on the historical record of a dam failure event affecting Leon County and the City of Tallahassee is **unlikely**.

Vulnerability Summary

Telecommunications

The City of Tallahassee and Leon County are vulnerable to telecommunications failures associated with hurricanes and tropical storms. Other hazards may affect portions of these systems (e.g., a tornado or lightning takes out a cell phone or microwave transmitting tower), but these would be relatively sporadic events. However, as experienced by residents of Mexico Beach and Panama City and its nearby towns such as Lynn Haven, Hurricane Michael damaged or destroyed a number of cell phone and other communication towers, as well as power and telephone lines, and thus citizens could not obtain information, request services, or maintain contact with their friends, families, employers, and others. The telecommunications systems serving Leon County and the City of Tallahassee are as vulnerable to hurricanes and tropical storms as those in Mexico Beach and Panama City were before Hurricane Michael.

Cybersecurity

The degree of vulnerability of a computer system, including its software, data, hardware, and other elements, to cyberattacks is dependent upon existing safeguards, improvements, and business practices, among other variables. The City of Tallahassee and Leon County, based on recent events and like many other institutions, are vulnerable to cyberattacks under certain circumstances. Whether these attacks succeed or not depends on the defenses present, the sophistication of the attack, and the response of staff to phishing emails and other methods of attack.

Electricity, Water, and Sewer Failures

As previously described, mitigation measures employed by utility providers in Leon County have reduced the vulnerability of water, wastewater, and natural gas systems. However, the City of Tallahassee and Leon County are vulnerable to electrical outages given the vulnerability of this area to thunderstorms and tropical cyclones, and because of the extensive tree canopy present in and around the urban area.

Dam Failures

Due to downstream residents, the Power Plant is classified as a high hazard facility by the Federal Energy Regulatory Commission. Under the terms of the Power Plant's FERC license, the City of Tallahassee's Electric Utility division is required to have an independent safety inspection performed on the facility every five years by an approved dam safety inspector. In addition, FERC itself conducts an annual operational inspection. The City has conducted routine monitoring of the earthen dam to ensure that there are no indications of any structural integrity issues. (It is assumed at this point that once the City is allowed by FERC to give up its obligation to operate the dam and power plant, and if DEP takes over the operation of the dam and power plant, DEP will also take over safety inspections and monitoring to ensure the integrity of the dam.) According to Electric Utility division staff, the Crooked Road area is the only downstream residential community vulnerable in the event of a dam failure at this facility. This includes 63 parcels, of which 43 parcels have at least one residential structure onsite. The remaining 20 parcels are vacant.

The frequency of failure for earthen dams in Leon County is currently unknown. Life spans for earthen dams have generally exceeded fifty years. Further, most local dams are small and located in rural areas, and the downstream impacts of their failure would be relatively minimal, except perhaps during severe flooding events, in which case dam failure would exacerbate these situations. Based on these data, Leon County has limited vulnerability to dam failure.

Risk Assessment

Energy Failures

Based on the above data and analysis, the risk for electric public infrastructure failures or disruptions is considered **medium**.

Dam Failures

Based on the historical data, the low number of dams deemed hazardous (i.e., one farm pond), and the relatively stringent safety inspection requirements for the C.H. Corn Hydroelectric Power Plant and the Talquin Dam, the probability of a dam failure to residents, structures, infrastructure, and any critical facilities is considered to be a **low** risk.

2.19 Hazardous Materials

General Description and Location

There are many potentially hazardous industrial substances used in manufacturing and other industrial and commercial activities. The use, storage, transport, or improper disposal of these substances and/or their byproducts or wastes can present a threat to public health. Although these materials vary in how and to what level they may pose a threat to public health and safety, airborne substances and materials with low combustible temperatures and high toxicity are of particular concern.

Hazardous materials generally fall into two categories: (1) raw and refined hazardous substances, and (2) hazardous wastes. Hazardous materials are identified and regulated by federal law, which is primarily administered by the U.S. Environmental Protection Agency (EPA). Other agencies involved in the regulation of hazardous materials include the U.S. Occupational Safety and Health Administration (OSHA), the U.S. Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC). Each has its own definition of a "hazardous material."

The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. RCRA gives EPA the authority to control hazardous waste from "cradle-to-grave." This includes the generation, transportation, treatment, storage and disposal of hazardous waste. To achieve this, EPA has developed regulations, guidance and policies intended to ensure the safe management and cleanup of solid and hazardous waste, and programs that encourage source reduction and beneficial reuse.

Hazardous materials and wastes regulated by the EPA under RCRA include hazardous wastes, which are regulated by type and quantity, and Extremely Hazardous Substances, which are often stored at fixed facilities. The federal Occupational Safety and Health Administration requires Material Safety Data Sheets for more than 500,000 of these substances, and that these sheets must be posted where these substances are used or stored. Many of these substances are utilized throughout Leon County.

Hazardous Wastes

Hazardous waste has properties that make it dangerous or potentially harmful to human health or the environment. Hazardous wastes (HW) are wastes identified in federal code (40 CFR 261 Subpart D) as hazardous by the U.S. Environmental Protection Agency, or they are wastes characterized (40 CFR 261 Subpart C) as hazardous by exhibiting one of four characteristics: ignitability (i.e., an oxidizer or flash point < 140°), corrosivity (i.e., pH < 2 or > 12.5), reactivity, or toxicity.

Hazardous waste generators are classified into three categories:

1. *Very Small Quantity Generators (VSQGs):* VSQGs generate less than 220 pounds of hazardous waste per month and less than 2.2 pounds of acute hazardous waste (such as some pesticides, toxins or arsenic and cyanide compounds) per month.
2. *Small Quantity Generators* (SQGs) - SQGs generate 220 to 2,200 pounds of hazardous waste per month, and
3. *Large Quantity Generators* (LQGs) - LQGs generate 2,200 pounds or more of hazardous waste per month or 2.2 pounds or more of acute hazardous waste per month.

These generators produce a variety of wastes, and the number of active facilities (waste generators) and pounds or kilograms of waste produced varies constantly.

The disposal of hazardous wastes has been a concern of federal, state, and local governments for some time now. The improper disposal of hazardous wastes, or exposure to hazardous wastes through spills, improper storage, or other means, is also of great concern. Transportation of these materials also presents a risk to the community, whether they are transported on public roads via truck or tanker, or on fixed railroad lines that run through Leon County and the City of Tallahassee.

The hazardous waste program, under RCRA Subtitle C, establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal—in effect, from “cradle to grave.” In any given State, EPA or the State hazardous waste regulatory agency enforces hazardous waste laws. EPA encourages States to assume primary responsibility for implementing a hazardous waste program through State adoption, authorization, and implementation of the regulations. The RCRA hazardous waste program regulates commercial businesses as well as federal, State, and local government facilities that generate, transport, treat, store, or dispose of hazardous waste.

State and Federal Agencies are required to provide biennial reports to the EPA which includes information on the generation, management and final disposition of hazardous waste regulated by the Resource Conservation and Recovery Act.

DEP has developed rules, regulations, and programs that address various forms of hazardous waste. These materials include electronic wastes; universal wastes such as batteries, pesticides, mercury-containing equipment and lamps, and pharmaceutical wastes generated by various types of medical facilities; and used oil and mercury. Transporters and transfer facilities and all other handlers are also regulated.

These regulations and programs specifically require that hazardous wastes must be identified, recycled, treated to reduce their hazard to humans and the environment, properly stored, or properly disposed at a licensed HW facility. HW cannot be disposed on or in the ground, or in local landfills, septic tanks, or injection wells. Also, regardless of quantity, the generator of HW is ultimately responsible for the waste from "cradle to grave" and can be held liable for improper management of HW even though it may have been sent to a HW management facility using a licensed transporter.

Extremely Hazardous Substances

Currently, the U.S. Environmental Protection Agency classifies 366 Extremely Hazardous Substances (EHS). EHSs are chemicals with acutely toxic properties that pose the most significant threat to public health. Facilities using EHSs above threshold planning quantities are required to report to the Florida Division of Emergency Management under the federal Emergency Planning and Community Right to Know Act of 1986 (EPCRA).

The federal Emergency Planning and Community Right-To-Know Act of 1986 created and imposed planning and preparedness requirements upon Local Emergency Planning Committees (LEPCs) for emergencies involving the release of hazardous materials.

In response to this federal mandate, the *District II Local Emergency Planning Committee Hazardous Materials Emergency Plan* was prepared by the Apalachee Regional Planning Council Information and

released to the public on June 2014. This Plan addresses hazardous materials and the facilities where these materials are stored or handled within Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty and Wakulla Counties. It also provides detailed operating procedures for first response public safety agencies charged with the responsibility of protecting the public's health and safety from the discharge or release of extremely toxic chemicals. The areas addressed by this Plan include:

- Organizations and responsibilities
- Notification and activation
- Communication
- Public information and education
- Emergency facilities and equipment
- Accident assessment
- Exposure control for emergency workers
- Protection actions
- Medical and public health support
- Recovery and re-entry exercises, and
- Training.

Tallahassee/Leon County Aquifer Protection Program

The type of disposal method, active facilities, and quantities of wastes disposed are tracked on an annual basis in Leon County through the Tallahassee/Leon County Aquifer Protection Program.

The Aquifer Protection Program was developed by local government in response to concerns about protecting the quality of drinking water provided to the citizens of the City of Tallahassee and Leon County. The purpose of this program is to regulate the use, handling, storage, and disposal of regulated substances and hazardous wastes at the local level, as well as provide pollution prevention strategies, assistance, and assessments incompliance with Federal, State and Local regulations. This program is implemented through Chapter X, Article 10 of the Leon County Aquifer/Wellhead Protection Ordinance, which is administered by the City of Tallahassee's Aquifer Protection Program staff.

Program activities include the review of new construction and development, inspection of industrial/commercial facilities, educating facility operators, consultants, and the public of the best management practices to prevent contaminated discharges into the Aquifer. Aquifer Protection staff provide environmental information to decision makers, and the program has established cooperative partnerships with local, state and regional agencies in order to establish and further environmental stewardship to protect the groundwater resources in Leon County.

Generally, about half of the facilities where hazard materials are stored and/or utilized are within the City of Tallahassee. Most of these facilities are associated with water production wells and wastewater treatment plants. Chlorine is the most common chemical, followed by sulfuric acid.

Chlorine is a greenish-yellow gas used to purify water, bleach wood pulp, and make other chemicals. For shipping purposes it is classified as a poisonous gas. It is normally shipped as a liquid, readily vaporizes to a gas, and is toxic by inhalation. A concentration of 1,000 parts per million (PPM) may be fatal after a few deep breaths. As little as 50 PPM may be dangerous after short exposure. Chlorine

also reacts violently with many common chemicals and poses a firefighting hazard in that it may combine with water or steam to produce dangerous hydrochloric acid.

Sulfuric acid is a colorless, oily liquid used in the manufacture of fertilizers and other chemicals. In liquid form it is corrosive to metals and organic tissue. Sulfuric acid emits highly toxic fumes when heated and inhalation may lead to severe lung damage. It reacts violently with water.

Hazardous Materials Commodity Flow Study[122]

The Apalachee Regional Planning Council (ARPC) serves as staff to the Local Emergency Planning Committee (LEPC), which includes Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty and Wakulla counties. The Apalachee LEPC is responsible for implementing the federal Emergency Planning and Community Right-to-Know Act (EPCRA) through hazardous materials planning, training, exercises and public outreach activities. In compliance with EPCRA, the LEPC:

- Collects required hazmat facility reports for public access
- Coordinates hazardous materials training classes and exercises
- Provides community outreach on EPCRA and Shelter-in-Place
- Provides technical assistance to facilities reporting under EPCRA

The LEPC also annually updates the regional hazardous materials emergency plan, which identifies facilities that use, produce and/or store hazardous substances within the jurisdiction of the ARPC.

In February of 2016, the LEPC began a transportation flow study of the hazardous materials shipped through the nine-county district. Survey data collection occurred over a six-month period. Although the original Hazardous Materials Emergency Preparedness (HMEP) scope of work for the project called only for a highway placard survey, the Apalachee LEPC included an analysis of CSX Transportation rail data.

For the highway placard survey, data was collected and analyzed from nearly 800 vehicles carrying hazardous materials on Interstate 10, US 98 and US-90 (east-west routes), and US-19, US-319, US 27 and US-231 (north-south routes). During the data collection, it was observed that Interstate 10 is the major road corridor of hazardous materials transport within the Apalachee District, including Leon County. Although hazardous materials are transported on almost all major roads within the District, the bulk of the hazardous materials were observed on Interstate 10. However, the majority of the gasoline and diesel fuel was observed coming into the District on US 27, assumedly from Bainbridge, Georgia. US 27 is one of the major federal highways that traverses Leon County and the City of Tallahassee.

Historical Occurrences

Hazardous Wastes

Leon County collects household hazardous wastes on a regular basis and processes these wastes at the Leon County Hazardous Waste Center at 7550 Apalachee Parkway. The Waste Center is a one-stop

[122]2016 Apalachee Local Emergency Planning Committee Hazardous Materials Commodity Flow Study.

location for household hazardous waste and electronics disposal. Its services are free for all Leon County households. In FY 18-19, the center processed 461.1 tons of potentially hazardous material from 17,655 residents, of which 250.7 tons (53.3%) were recycled or reused.[123]

The Florida Department of Environmental Protection is the lead state agency in Florida that provides biennial reports to the EPA about the generation, management and final disposition of hazardous waste regulated by RCRA. The following table indicates hazardous wastes reported by the City of Tallahassee's Aquifer Protection program, which serves all of Leon County.

Table 48: Hazardous Waste Summary Reported by the City of Tallahassee from 1/1/14 through 11/14/19.[124]

Site RCRA[125] Status	No. of Sites	No. of Sites w/ Wastes	Average Pounds Waste/ Site/Year	Total Pounds Waste/ Year	Number w/RCRA Waste	% Sites w/RCRA Waste	Average Pounds RCRA Waste/Site/ Year	Total Pounds RCRA Waste/Year
Large Quantity Generator	12	12	481,356	5,776,266	11	91.67%	328,778	3,616,557
Small Quantity Generator	52	50	39,802	1,990,103	49	94.23%	6,770	331,717
Cond Exempt Small Quantity Generator	500	494	13,009	6,426,351	493	98.6%	484	238,716
NOT A HAZARDOUS WASTE GENERATOR	1,057	620	116,326	72,122,415	127	12.02%	0	16
Totals	**1621**	**1,176**	**73,397**	**86,315,135**	**680**	**41.92%**	**6,157**	**4,187,006**

As of 2019, Leon County had 12 Large Quantity Generators (LQGs) of hazardous waste. An LQG is defined as a facility producing greater than 2,205 pounds of waste in any one month. These facilities are required to undergo annual inspection. Between 2014 and 2019, LQGs in Leon County produced approximately 2,888 tons of waste. The two most common types of waste by amount during this period were concentrated non-halogenated solvents and contaminated debris.

123 http://cms.leoncountyfl.gov/Home/Departments/Office-of-Resource-Stewardship/Solid-Waste/Hazardous-Waste-Center.
124 https://fldep.dep.state.fl.us/chaz_sqg/filter.asp.
125 The Resource Conservation and Recovery Act (RCRA) is the federal law that creates the framework for the proper management of hazardous and non-hazardous solid waste. The law describes the waste management program mandated by Congress that gave EPA authority to develop the RCRA program. The term RCRA is often used interchangeably to refer to the law, regulations and EPA policy and guidance.

Transportation of Hazardous Materials

As previously noted, transportation related incidents are a major cause of the release of hazardous material. The county is crossed by several major highways and a freight rail line that provide access for the shipment of hazardous substances. In addition, Tallahassee's international airport presents another opportunity for a transportation-related disaster involving hazardous material.

Hazardous material spills are reported to the State Emergency Response Commission at the Florida Division of Emergency Management and recorded in the Hazardous Materials Information System (HMIS) database. For the purpose of this report, data were provided by the Apalachee Regional Planning Council for Leon County from 2015 through mid-2019. There were 77 reported releases of hazardous materials in this time period. Seventeen (17) of these were located at fixed facilities (e.g., industrial, commercial, residential, or development sites), and the remaining 60 releases are transportation-related. Except for seven (7) of the 77 releases, all other releases were composed of various petrochemicals, the majority of them diesel fuel, followed by gasoline and hydraulic oil. The non-petrochemical releases included mercury, sodium hydroxide, transformer/mineral oil, sodium azide, latex paint, hydrogen sulfide, and ethylene.

Hazardous Materials Commodity Flow Study[126]

According to the results of the updated 2016 Hazardous Materials Commodity Flow Study, the majority (75.1%) of the hazardous materials being transported throughout the District are Flammable Liquids (Non-Polar/Water-Immiscible). This category includes petroleum products such as gasoline, gasohol and motor spirits. The second most abundant category, far behind that of the top grossing category is Gases - Flammable (Including Refrigerated Liquids). This category also includes petroleum products, such as propane, LPG and hydrogen. Overall, petroleum-based hazardous materials account for the overwhelming majority of surveyed hazardous materials placards within the region traveling on the highway. In addition, it may be important to note that some of the Flammable Liquids (Polar/Water-Miscible) category may include petroleum products such as resin solution. Beyond petroleum products, the survey revealed nineteen other general hazard categories as found in the 2012 ERG ranging from 2.7% to less than 1% of the total number of surveyed trucks. These survey results show the wide diversity of hazardous materials traveling through the ARPC district.

Railroads[127]

Three active railroads operate in the Apalachee Regional Planning Council's district. The only railroad operating through Leon County is CSXT. CSXT is a division of CSX Corporation and it runs through Jackson, Gadsden, Leon, and Jefferson counties in the ARPC district.

A hazardous materials density study was performed by CSX Transportation to identify the hazardous materials most frequently transported through the District. The study, the results summarized in the ARPC's Flow Study, excludes intermodal shipments (trailer or container on flat cars). Molten sulfur,

[126] 2016 Apalachee Local Emergency Planning Committee Hazardous Materials Commodity Flow Study.
[127] Ibid.

environmentally hazardous substances, sodium hydroxide solution, liquefied petroleum gases and ammonium nitrate were the five most frequently shipped hazardous materials commodities in 2015 by rail by CSX Transportation. The top four commodities have stayed the same since the last study in 2007. The fifth most common commodity, ammonium nitrate, was previously refrigerated liquid carbon dioxide.

A comparison of the Highway Placard Survey and the CSX Density Study reveals that both Flammable Liquids (Non-Polar/Water-Immiscible), Substances – Toxic and/or Corrosive (Non-Combustible), and Substances (Low to Moderate Hazard) are listed in the 'Top 5' hazard materials being transported within the ARPC district, including Leon County.

Overall, according to the Flow Study, molten sulfur, environmentally hazardous substances, sodium hydroxide solution, liquefied petroleum gases and ammonium nitrate were the five most frequently shipped hazardous materials commodities in 2015 by rail by CSX Transportation. The top four commodities have stayed the same since the last study in 2007. The fifth most common commodity, ammonium nitrate, was previously refrigerated liquid carbon dioxide.

Extremely Hazardous Substances

As part of the aforementioned *District II Local Emergency Planning Committee Hazardous Materials Emergency Plan*, the Apalachee Regional Planning Council maintains a detailed descriptions and locations of facilities that handle and/or store Extremely Hazardous Substances (EHSs). These data include the name, location, ownership, and contact person for each facility, as well as the facility's vulnerable zone (VZ), vulnerable population, evacuation routes, type and amount of EHS, and other known critical facilities within the VZ.[128] This information and other related data used for the Hazards Analyses that are part of this Plan, is organized with a CAMEOfm[129] database that is maintained by the Apalachee Regional Planning Council. This database is updated annually and is available to emergency responders upon request. The Hazards Analyses conducted as part of the *Hazardous Materials Emergency Plan* are also located at the Apalachee Regional Planning Council. This information is not included in this document for reasons of brevity and security.

<u>Estimated Impacts, Probability, and Extent</u>

The 2009 Hazardous Materials Commodity Flow Study and the 2007 CSX Hazardous Materials Commodity Summary indicates that both flammable gases (Including refrigerated gases in liquid state) and toxic and/or corrosive (non-combustible) substances are the most common materials associated with the transportation of hazardous materials.

Overall, petroleum-based hazardous materials account for 49% of surveyed hazardous materials placards within the region. Beyond petroleum products, the survey also revealed nineteen other general hazard categories as found in the 2008 ERG ranging from 5% to less than 1% of the total

[128] The VZ is the geographical area that is at risk of exposure to concentrations of an airborne EHS at levels dangerous to life or health in the event of a chemical release.

[129] CAMEO*fm* is a database application intended to track of information (such as chemical inventories and contact information for facilities in a community) to assist in emergency response and planning.

number of surveyed trucks. These survey results show the wide diversity of hazardous materials traveling through the District II region.

The majority of local incidents involving spills of hazardous materials include petroleum-based substances, such as gasoline, diesel, oil or hydraulic fluid spills. Transportation related incidents accounted for more than 41 percent of known sources and included automobile accidents in which small amounts of gas or oil were released.

The above data suggests that hazardous material spills frequently involve the transportation of these substances, and that responders are most likely to find themselves addressing a petroleum spill incident along county roadways.

Hazardous Materials Response

The Tallahassee Fire Department (TFD) is the only Regional Hazardous Materials Response Team between Jacksonville and Panama City. While the North Florida and Apalachee regions are sparsely populated, several major transportation routes used to move hazardous materials run through these areas. If two traffic accidents involving hazardous materials were to occur in disparate locations, the resources of the TFD could easily be stretched beyond their capacity to effectively respond. The TFD regularly reassesses their capacity to serve as a Regional Hazardous Materials Response Team. These assessments help determine the equipment, personnel and training needs that are essential for TFD to continue to adequately serve the hazardous material response needs of the region.

Hazardous Materials Response Issues

As of 2019, four hazard materials response teams serve all of north Florida. These teams are based in Okaloosa County, Panama City, Tallahassee, and Jacksonville. Several high-profile incidents which required teams to travel up to 75 miles have served to highlight the challenge of responding to the hazardous material response needs of rural areas.

The probability based on the historical record of release of hazardous materials affecting portions of Leon County and/or the City of Tallahassee is **highly likely**.

Vulnerability Summary

Portions of Leon County and the City of Tallahassee are vulnerable to accidental releases of hazardous materials being stored or transported. These portions tend to be clustered around facilities or industrial areas where these materials are stored, or along major transportation corridors where they are regularly transported.

Vulnerability to hazardous materials releases (including wastes), whether onsite or in route, is not particularly easy to determine due to the materials and amount released, location, weather, and other variables. Nevertheless, in order to try to determine the vulnerability of Leon County to potential hazardous material incidents, it is necessary to determine the “vulnerable zone” or area of each facility using or storing extremely hazardous substances.

A hazards analysis for each of these facilities is updated annually by the Apalachee Regional Planning Council that provides worst-case estimates of populations at risk from a hazardous materials release. The Local Emergency Planning Committee and the county emergency management agency maintain these data, and they can provide detailed information to responders and other agencies regarding vulnerability areas which can be determined in real time using the specific chemical, amount of release, wind direction and wind speed.[130]

Although, due to the specificity of each hazardous material release, it is not possible to determine a comprehensive vulnerable zone or population exposure for Leon County. Nevertheless, Leon County and the City of Tallahassee are highly vulnerable to exposure to hazardous materials, largely because of the quantities transported through the county by truck and rail. These incidents can occur at either fixed facilities or from the transportation of hazardous material through the County and City. Railroad transportation of commodities that are hazardous is a concern because of the fact that railroad corridors in Tallahassee traverse residential neighborhoods, downtown Tallahassee, and along environmentally sensitive areas such as Lake Lafayette.

Nationwide, there are more transportation accidents involving hazardous materials and wastes than those that occur at fixed facilities. These transportation accidents can occur on roadways, railways, waterways, in the air, and within pipelines. In addition, the numbers of large and small quantity generators are significant, and they are correlated with the ranges of services and manufacturing in county's economy. These generators are registered with the FDEP and have control plans in place in accordance with permit procedures, and the City is equipped to address spills and accidental releases. However, the number of generators and the quantity and types of materials handled may be expected to increase proportionately with population and general economic growth.

The fixed facility study reports no history of accidents and a low probability of release for all facilities, with the exception of potential valve leakage at roughly half the sites. Nevertheless, if the vulnerability zones were combined for all critical facilities, they would encompass large areas of the county. A worst-case scenario release of hazardous gases on a windy day would expose one or more critical facilities within the City of Tallahassee and/or the unincorporated area of Leon County to this hazard. Critical facilities vulnerable to exposure included hospitals, public schools, universities, group homes, and day care centers.

Risk Assessment

Based on the 2009 Hazardous Materials Commodity Flow Study and 2007 CSX Hazardous Materials Commodity Summary and the historical record of releases of these materials, there is a **medium** risk to residents of Leon County and/or the City of Tallahassee from the accidental release of hazardous materials.

[130] Statewide Regional Evacuation Studies Program, Volume 1-2 Apalachee, Apalachee Regional Planning Council, 2012.

2.20 Transportation Incidents

General Description and Location

Transportation incidents can be classified into three general categories:

1. Roadways
2. Railways
3. Aviation

The transportation of hazardous materials on roadways and rail have been addressed under the previous section of this document describing Hazardous materials. The focus in this section is on aviation incidents.

Aviation

An aviation accident is defined by the Convention on International Civil Aviation Annex as an occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight until all such persons have disembarked, where a person is fatally or seriously injured, the aircraft sustains damage or structural failure or the aircraft is missing or is completely inaccessible. If the accident includes damage to the aircraft such that it must be written off, or in which the plane is destroyed. it is further defined as a hull loss accident. [131] There is one existing public and two private airports and two heliports in Leon County. These include:

1. Tallahassee Regional Airport (TLH)
2. Angel's Field Airport (FL52)
3. Black Creek Pass Airport (FA25)
4. Tallahassee Memorial Hospital Heliport (FD18)
5. Capital Regional Medical Center

Another private airport previously known as the Tallahassee Commercial Airport is currently closed. In 2013, the FAA Airport/Facility Directory data described Tallahassee Commercial Airport as having a single 3,249' asphalt Runway 16/34"in poor condition", with "surface cracking." The field was said to have 10 based aircraft, and as of 2010 was said to conduct an average of 50 takeoffs or landings per week.

There are also several private landing strips, including one on Ayavalla Plantation and another on Ring Oak Plantation.

Historical Occurrences

United States civil aviation incidents are investigated by the National Transportation Safety Board (NTSB). NTSB officials piece together evidence from the crash site to determine likely cause, or causes. The NTSB also investigates oversea incidents involving US-registered aircraft, in collaboration with local

[131] http://en.wikipedia.org/wiki/Aviation_accidents_and_incidents..

investigative authorities, especially when there is significant loss of American lives, or when the involved aircraft is American-built. The NTSB is an independent federal agency.

The Office of Accident Investigation and Prevention is the principal organization within the Federal Aviation Administration (FAA) with respect to aircraft accident investigation and all activities related to the National Transportation Safety Board (NTSB). The FAA keeps a database of aviation incidents and accidents. This database was queried for incidents and accidents in Leon County, Florida.

This database has a record of 47 aviation incidents and accidents since March 11, 1982 through October 8, 2013. Within this time period, there were 14 fatalities and nine "serious injuries."

Estimated Impacts, Probability, and Extent

The estimated impacts of aircraft incidents and accidents vary widely. A single incident involving a single, small, private plane on a wide, paved runway with no injuries can be relatively inexpensive to the public, or even negligible if it occurs on a private runway. However, a major incident involving a commercial flight, particularly if it occurs outside of an established airport, can be a genuine catastrophe. Although the latter has not occurred in Leon County, such incidents have occurred in other parts of the U.S. The impacts, probability, and extent of such an incident are difficult to estimate, given the many variables involved. Worldwide, aircraft incidents have generally declined over the last decade. The total number of fatalities worldwide from aviation incidents and accidents in 2013 was 173, which is the smallest number of fatalities since 2000, even though the total number of departures in 2013 was with 32.1 million as high as never before. This corresponds to 5.39 fatalities per one million departures in 2013.[132]

A simple calculation indicates that there have been approximately 1.5 aircraft incidents or accidents per year in Leon County for the period 1982-2013. The probability of an incident based on this average would be three incidents within a two-year period, which would also qualify as **likely** as defined under Section 2.2.1 Risk.

This probability may increase as the total number of flights from Tallahassee Regional Airport increases based on City efforts to attract additional vendors and flights to and from this facility. Other impacts could arise from the continued and even expanded use of Life Flight aircraft and facilities, and perhaps even from expanded civilian aviation activities if a major manufacturer of aircraft or aircraft parts located here, or if a major shipper was to locate a hub here.

Vulnerability Summary

Certainly, the City of Tallahassee and Leon County are vulnerable to some degree to aviation incidents and accidents. Such incidents and accidents have and will likely continue to occur, given the continued growth of the city and region and its continuing status as the capital of a highly populated state. Based on the number of flights per day of a variety of aircraft, it is simply a matter of time that an incident or accident will occur again. However, because the vast majority of recorded incidents have resulted in

[132] http://en.wikipedia.org/wiki/Aviation_safety..

relatively few fatalities and injuries, the actual vulnerability of most citizens and visitors to the impacts of an aviation incident or accident is quite low.

Risk Assessment

Based on the above data and analysis, the risk for aviation incidents is considered **low**.

2.21 Terrorism

General Description and Location

Under the federal Homeland Security Act of 2002, terrorism is defined as activity that involves an act dangerous to human life or potentially destructive of critical infrastructure or key resources, and is a violation of the criminal laws of the United States or of any State or other subdivision of the United States in which it occurs, and is intended to intimidate or coerce the civilian population or influence a government or affect the conduct of a government by mass destruction, assassination, or kidnapping.[133]

In analyzing the vulnerability of the community to domestic terrorism, it is important to separate criminal activities from terrorist activities. Generally speaking, terrorist activities involve the use or threat of terror to achieve an objective, often a political objective. Criminal activities, on the other hand, are illegal activities that are not primarily based on the use or threat of terror to achieve their objectives. A better representation of this distinction might be the use of indiscriminate use of explosives to highlight a cause, versus the use of explosives to open a safe as part of a burglary. While this distinction may be not be important to persons responding to these incidents (such as fire fighters at an explosion), it is important to consider when developing policies and programs dealing for with terrorist activities.

Given the City of Tallahassee's status as the state capital of Florida, the third largest state by population in the U.S., terrorism can occur in and around the urban area of the city.

There are three categories of terrorism that Leon County and the City of Tallahassee are concerned about: violent acts, biohazards, and cyberattacks.

Historical Occurrences

There has been only one instance of a domestic terrorist attack in Leon County. In 1999, an individual detonated two pipe bombs in restrooms of the Florida Agricultural and Mechanical University (FAMU) campus. No one was injured in this incident.

Since 9/11, however, there has been an increased emphasis on the potential for domestic terrorist incidents. For the same reasons that Tallahassee is a potential target for civil unrest, it is also a target

[133] Section 2 (15), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

for domestic terrorism. Due especially to the large state government influence (and to a much lesser extent, federal government influence), the possibility of a terrorist incident is a distinct possibility.

The FAMU incident aside, Leon County does not have a history of terrorist activities, and the broad, long-term terrorist threat is difficult to accurately assess. Instead, it is more likely that terrorist activities in Leon County and the City of Tallahassee will be in response to individual incidents. Examples of individual incidents might include a high interest or controversial court case being held at the Federal Courthouse, a copycat bomber at FAMU, or a response to state legislative actions.

There are no recorded incidents of deliberate biohazard attacks. There are recorded incidents of cyberattacks, although none of these can be classified as a terrorist attack per se.

Estimated Impacts, Probability, and Extent

There are several local high-capacity community centers and government buildings that could be potential targets for terrorist attacks. The two largest structures are Doak Campbell Stadium at Florida State University, which has a seating capacity of approximately 83,000 persons, and the Tallahassee-Leon County Civic Center, which has a seating capacity of approximately 13,000 persons.

In recognition of the potential threat posed by terrorist attacks, the Leon County Division of Emergency Management developed a Terrorism Response Plan which was integrated into the Leon County CEMP in 2007. The Terrorism Response Plan is a consequence management plan for preparing for, responding to, and recovering from a terrorist–initiated incident, particularly one involving weapons of mass destruction.

The probability based on the historical record of a terrorism event affecting Leon County and/or the City of Tallahassee is **occasional** as defined under Section 2.2.1 Risk.

Vulnerability Summary

Leon County and the City of Tallahassee are considered vulnerable to a terrorist attack. Terrorist attacks are most likely to occur in the City if Tallahassee as opposed to the unincorporated areas of Leon County. However, in the event of a biological or chemical attack on a target in the City of Tallahassee, residents in the unincorporated areas of Leon County have the potential to be affected.

Risk Assessment

Based on the historical data, residents of Leon County and the City of Tallahassee are considered to be at **low** risk for terrorist attacks.

2.22 Critical Facilities

Critical facilities are defined as providers of goods or services that are vital to local response functions in the event of a disaster. Critical facilities also play a vital recovery role during the aftermath of natural or manmade disasters. The following table summarizes the types and number of high priority critical facilities within Leon County. There is a total of 772 critical facilities identified within Leon County, 97 of which are hazardous material sites.

Table 49. Leon County Critical Facilities by Type and Jurisdiction, 2020.[134]

Critical Facility Type	Total Number of Sites	City of Tallahassee	Unincorporated Leon County
CHILD CARE FACILITY	167	135	32
COMMUNICATIONS TOWERS	163	93	70
CORRECTIONS	4	4	0
ELECTRIC GENERATION	41	22	19
EMERGENCY OPERATIONS CENTER	5	5	0
FIRE STATIONS	22	11	11
GOVERNMENT CENTER	3	3	0
HAZARDOUS MATERIALS SITES	276	186	90
HEALTHCARE FACILITY	74	63	11
HIGHER EDUCATION FACILITIES	5	5	0
HOSPITAL	7	7	0
HURRICANE SHELTER	14	9	5
HOMELESS SHELTERS AND OTHER RESIDENTIAL FACILITIES	7	6	1
LAW ENFORCEMENT	11	11	0
MILITARY	4	4	0
PUBLIC WATER SUPPLY (WELLS)	56	28	28
SCHOOLS (K-12)	59	47	12
SEWAGE TREATMENT FACILITY	5	1	4
SOLID WASTE FACILITY	6	0	6
Total Number of Critical Facilities	**929**	**640**	**289**

FEMA encourages but does not require the mapping of critical facilities. Given this guidance and the security implications of mapping existing and new critical facilities, the Tallahassee - Leon County LMS instead presents in tabular form only the types and numbers of existing high priority critical facilities located in Leon County. Specific locations and descriptions of critical facilities can be obtained from Tallahassee – Leon County Geographic Information Systems by qualified personnel.

Critical Facilities in Hazard Areas

In addition to an assessment of the numbers and types of high priority critical facilities located with the jurisdictions of Leon County, an analysis was conducted to determine the number of critical facilities located in identified flood and storm surge hazard areas. The following table lists the number of high

[134] Tallahassee – Leon County GIS.

priority critical facilities in Leon County located within hazard areas considered vulnerable to storm surge from hurricanes.

Table 50: Leon County Critical Facilities Located in Storm Surge Hazard Areas, 2019.[135]

	Storm Surge Zones		
Facility Type	**Category 3**	**Category 4**	**Category 5**
CHILD CARE FACILITY	1	3	6
COMMUNICATION TOWER	1	3	6
FIRE STATIONS	0	0	1
ELECTRIC GENERATION	0	0	2
HAZARDOUS MATERIALS SITE	0	1	5
PUBLIC WATER SUPPLY (WELL)	0	0	2
SOLID WASTE FACILITY	0	1	3
Total	2	8	24

The following table describes the type and number of Leon County Critical Facilities located within the FEMA 100-year flood zone.

Table 51: Leon County Critical Facilities Located within FEMA 100- and 500-year Flood Zones, 2019.[136]

Facility Type	**Number of Facilities**	**500-Yr Flood**	**Total Number of Facilities**
CHILD CARE FACILITY	1	0	1
COMMUNICATION TOWER	7	0	7
ELECTRIC GENERATION	2	0	2
HAZARDOUS MATERIALS SITE	12	5	17
HEALTHCARE FACILITY	0	1	1
PUBLIC WATER SUPPLY (WELL)	1	0	1
SCHOOL (K-12)	1	0	1
Total	24	6	30

[135] Ibid..
[136] Ibid.

The critical facilities that would stay open during a disaster would include the following:

- Emergency Operations Center
- City of Tallahassee Fire Stations
- City of Tallahassee Police Department
- Leon County Sheriff's Department
- Red Cross
- Talquin Electric Cooperation Emergency Management Operations Center
- All Designated Hurricane Shelters
- Tallahassee Memorial Hospital and Capital Regional Medical Center
- Thomas P. Smith Water Reclamation Facility
- City Utilities Department (facilities)
- Talquin Electric Cooperative (facilities)
- City of Tallahassee Fleet Division
- Cell and Microwave Transmission/Communication Towers
- City of Tallahassee Call Center

2.23 Risk Summary

Residents of Leon County are at varying levels of risk to a variety of natural and technological hazards. High-risk events involve hurricanes, tropical storms, and flooding. The county's inland location provides a buffer against the worst storm impacts, but it does not offer complete protection from potentially dangerous and damaging high winds and floods.

Hazus modeling indicates that Category 3, 4 or 5 storms can produce multi-billion-dollar damages from winds and flooding, particularly to residential structures. For more vulnerable structures, such as mobile homes, significant damages appear even under tropical storm conditions. In a tropical storm or hurricane, the higher elevated, northern portion of the county, including Tallahassee, will bear the brunt of the high winds. High winds not only affect structures, but also trees, which are abundant in the Tallahassee urban area. Trees can be hazardous to people, structures, vehicles, and other possessions and infrastructure, including electrical and telephone lines and internet and video cable.

Flooding is not limited to tropical storm or hurricanes. Flooding can occur from smaller weather events. Although these events tend to produce localized flooding, some areas are more vulnerable to others to this flooding due to historical, non-regulated development, or the steady increase of impervious surfaces in smaller watersheds that can "stage up" quickly. Various areas of the county are susceptible to flooding from the heavy rains that are typical during the summer, particularly the southeast areas of the county. Overall, flooding is the most common hazard facing Leon County and affects more residents on average than any other event. Hazards classified by risk level include:

- <u>High risk hazards:</u> hurricanes and tropical storms, and flooding.
- <u>Medium risk hazards:</u> severe storms (thunderstorms, tornados, lightning), drought, energy failures, and hazardous materials.
- <u>Low risk hazards:</u> storm surges, extreme temperatures, wildfires, sinkholes, invasive plants and animals, diseases, epidemics and pandemics, dam failure, transportation incidents, and terrorism.

Chapter 3 – Mitigation Strategy

This section discusses the overall mitigation strategy, including goals and objectives, existing policies, programs, and resources, and programs and initiatives intended to address the hazards previously described.

3.1 Hazard Mitigation Goals and Objectives

The LMS Steering Committee has developed six hazard mitigation goals with supporting objectives. The list was developed from a review of County and City comprehensive plans, land development regulations, and the CEMP to determine those elements of the plans and regulations with mitigation implications.

As part of the 2020 update of the LMS, the LMS Committee reviewed the adopted Hazard Mitigation Goals and Objectives to reflect the latest local government and other stakeholder priorities. Several changes were made to both enhance clarity and internal consistency, protect and mitigate critical facilities, strengthen the role of land acquisition, land use regulation, and building codes and inspections in development, and to increase intergovernmental coordination, among other changes. These revised goals and objectives include:

1. **Goal: Protect human health, safety and welfare.**

   Objectives:

   1.1 Identify and assess hazards that may affect the entire county and serve as the primary hazard analysis for other response, recovery, and resilience plans.
   1.2 Protect critical facilities through mitigation of existing facilities and minimize the construction of new critical facilities in hazardous or other high-risk areas.
   1.3 Support programs to address repetitively damaged and vulnerable residential structures in or near hazardous or other high-risk areas.
   1.3 Acquire properties subject to repetitive losses and restrict new development in hazardous or other high-risk areas.
   1.4 Regulate non-conforming land uses particularly in hazardous or other high-risk areas.
   1.6 Restrict and remove where feasible chemical storage facilities and other potentially hazardous land uses from hazardous or other high-risk areas.
   1.7 Incorporate hazard mitigation objectives and recommendations into the development review process where appropriate.
   1.8 Adopt land development building codes and inspection procedures that meet or exceed the hazard mitigation-related portions of the Florida Building Code

2. **Goal: Strengthen economic activities within the community.**

   Objectives:

   2.1 Diversify the local economy to protect the community from hazards that may affect a single economic resource.

2.2 Support the hardening of vulnerable commercial structures to hazards and the relocation of these structures from hazardous or other high-risk areas.
2.3 Coordinate economic development activities with existing and proposed mitigation initiatives.
2.4 Limit public expenditures in hazardous or other high-risk areas.

3. Goal: Enhance regional mitigation efforts.

Objectives:

3.1 Coordinate with and encourage the participation of other local stakeholders, including government agencies, in the local hazard mitigation process.
3.2 Coordinate with other government agencies to develop regional mitigation programs and plans.
3.3 Coordinate with other government agencies to develop regional hazard mapping procedures and processes.

4. Goal: Protect community, environmental, recreational, and historic resources.

Objectives:

4.1 Remove and/or relocate damaged and vulnerable infrastructure, particularly within hazardous or other high-risk areas.
4.2 Regulate land use, floodplains, non-point source stormwater run-off, and the design and location of sanitary sewer and septic tanks in hazardous or other high-risk areas.
4.3 Encourage the removal of septic tanks from hazardous or other high-risk areas.
4.4 Enhance the protective features of the natural ecosystem by preserving critical natural spaces and investing in green infrastructure wherever practical.
4.5 Incentivize development projects that exceed conservation and preservation requirements while providing connectivity to other natural areas.

5. Goal: Promote the community's ability to respond to a disaster in a timely manner.

Objectives:

5.1 Continue to participate in the National Flood Insurance Program (NFIP) and Community Rating System (CRS) and pursue additional initiatives whenever feasible.
5.2 Continue to coordinate with the NFIP to update and revise Flood Insurance Rate Maps where necessary.
5.3 Encourage public awareness of hazards and hazardous or other high-risk areas in the community.
5.4 Preserve the ability to safely shelter in place or evacuate hazardous or other high-risk areas.
5.5 Maintain plans, policies, and procedures for pre- and post-storm development.
5.6 Continue eligibility for federal mitigation grant funding, including both pre- and post-disaster grants, from the Federal Emergency Management Agency (FEMA)

5.7 Identify damaged structures in Special Flood Hazard Areas (SFHAs) and other hazardous or other high-risk areas for substantial damage determination.

5.8 Partner across agencies to provide disaster preparedness training, business continuity planning, and coordinated response activities.

3.2 Existing Policies, Programs, and Resources

This section is intended to summarize all existing authorities, policies, programs, and resources available to accomplish hazard mitigation within Leon County.

Authorities

The Leon County Department of Emergency Management and the Sheriff's Office are responsible for maintaining and updating plans and procedures necessary to be prepared for, respond to and recover from disaster situations. These plans include the Leon County Comprehensive Emergency Management Plan, the Leon County Local Mitigation Strategy and various county Continuity of Operations Plans. The Leon County Division of Emergency Management maintains an Emergency Operations Center and has a staff of seven to carry out its mission. The City of Tallahassee formed a Division of Emergency Management in 2008. The Division of Emergency Management has a full-time Emergency Coordinator who works with city agencies on emergency preparedness, response and recovery activities.

Existing Policies

Tallahassee – Leon County Comprehensive Plan

The Tallahassee – Leon County Comprehensive Plan is a joint policy plan that directs long range growth and development in both Tallahassee and Leon County. The Comprehensive Plan is comprised of multiple Elements, each addressing certain aspects of the community. Each Element is made up of aspirational goals, measurable objectives, and strategic policies. Goals are the long-term ends to which programs and activities are ultimately directed. Objectives are specific, measurable, intermediate ends that are achievable and mark progress towards goals. Policies are programs and activities conducted to achieve identified objectives and goals.

The Future Land Use Element and Map establish goals, objectives, and policies governing land use in the City of Tallahassee and Leon County. This element is based on the population projections of the community, as well as natural resource considerations and the distribution of infrastructure. Land uses are allocated on the Tallahassee-Leon County Future Land Use Map based on these assumptions and the community's commitment to concentrate urban development in a compact form within the Urban Service Area (USA). This pattern of development is intended to minimize urban sprawl and focus growth where infrastructure currently exists. In addition to emphasis within the USA, the element includes incentives to direct growth to underutilized areas such as the Southern Strategy and Central Core areas, which are delineated in figures of the element. These strategies are linked to how well the USA boundary is maintained. The city and the county have historically placed a high priority on limiting

expansions to the USA. By holding the line, developers are guided into focusing higher densities and intensities on lands within the USA.

There are several goals, objectives, and policies in the Comprehensive Plan that address hazard mitigation. These include the following:

Land Use Element

Policy 1.2.5: [L] (EFF. 4/10/09)

1. By 2014, local government shall develop and maintain as part of the local geographic information system database areas of known hazards.
2. By 2014, local government will include requirements in their land development regulations that mitigate and/or prevent future development in areas of known hazards. The land development regulations shall also contain provisions for the mitigation of existing development in areas of known hazards so as to prevent repetitive hazard losses.

Policy 1.4.6: [L] (EFF. 7/16/90; REV. EFF. 4/10/09)

By 2014, land development regulations will include standards for the regulation of future land use categories, subdivision, signage, and areas subject to seasonal or periodic flooding and areas of known hazards. Regulations concerning areas subject to seasonal or periodic flooding shall be consistent with all applicable state and federal regulations.

Policy 2.1.2: [L] (EFF. 7/16/90)

Prohibit residential development where physical constraints or hazards exist, or require the density and design to be adjusted accordingly. Such constraints or hazards include but are not limited to flood, storm or slope hazards and unstable soil or geologic conditions.

Policy 5.2.1: [L] (EFF. 7/16/90; REV. EFF. 4/10/09)

Develop regulations that will apply to the siting of public facilities and buildings. By 2014, local government shall also develop regulations that ensure the siting of critical facilities from within hazard areas and include provisions for the mitigation of existing critical facilities located in hazard areas.

Utilities Element

HAZARDOUS WASTE

Goal 2: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Properly manage waste materials that have hazardous characteristics to protect public health and the environment.

Objective 2.1: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Maintain and improve existing hazardous waste materials management programs.

Policy 2.1.1: [SW] (REV. EFF. 12/10/91)

The hazardous waste management program shall include:

a) Identify and require small quantity generators to annually report the amount of hazardous waste generated and its disposal method;
b) Establishment of a hazardous waste collection center;
c) Educational programs;
d) Technical assistance;
e) Working with the Regional Planning Council in coordinating information and activities related to hazardous waste disposal facilities, collection centers and incineration sites.

Policy 2.1.2: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Maintain and promote the use of the County's hazardous waste collection programs.

Policy 2.1.3: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Continue to comply with state laws and programs to annually notify small quantity generators of hazardous wastes of their legal responsibilities; penalties for non-compliance; recycling alternatives; and other waste reduction opportunities.

Policy 2.1.4: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Consider user fees to help support public education programs for residents and small businesses addressing proper hazardous materials management, recycling and disposal.

Policy 2.1.5: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Prohibit the burial of non-degradable and potentially hazardous household garbage such as plastics, paint, batteries and tires by individual landowners or businesses in unapproved sites.

Policy 2.1.6: [SW] (EFF. 12/24/10)

Provide proper reuse and recycling of used electronic devices. Ensure that final disposition of used electronics is environmentally sound.

Policy 2.1.7: [SW] (EFF. 7/16/90; REV. EFF. 12/24/10)

Local government shall continue to identify, assess, and mitigate all public abandoned and active dump sites, underground storage tanks, and publicly-owned brownfield sites where necessary and appropriate.

Intergovernmental Coordination Element

Policy 1.3.5: [I] (EFF. 4/10/09)

The Tallahassee-Leon County Local Hazard Mitigation Steering Committee shall review and update the adopted Leon County Local Mitigation Strategy as required by state law. The composition of the LMS Committee shall be comprised of a broad representation from governmental and private sector interests to ensure effective disaster mitigation coordination. The LMS Committee shall meet on a regular basis and provide an annual report to the City and County Commissions on the status of

disaster mitigation efforts and recommendations for prioritization of disaster mitigation programs in the annual schedule of Capital Improvements.

COORDINATION WITH COLLEGES AND UNIVERSITIES

Objective 1.6: [I] (REV. EFF. 6/26/98; REV. EFF. 4/10/09)

Florida State University, Florida A & M University, and Tallahassee Community College have all adopted master plans for their growth and development pursuant to applicable State statute and rules. The City of Tallahassee and Leon County will coordinate their land use, transportation, hazard mitigation, and utility planning with these institutions to assure that overall community needs are addressed and conflicts between the Plans are minimized.

Ordinances

The Comprehensive Plan in turn enables a set of ordinances and other regulations that govern land development, permitting, waste collection and disposal and other aspects of hazard mitigation. These regulations are not included in this document for brevity.

Other Programs and Plans

Local Mitigation Strategy

The Leon County Local Mitigation Strategy (LMS) is the accepted plan for how to reduce the risk natural, man-made and technological hazards pose to the community. The essential elements of the LMS include risk assessment, hazard identification and vulnerability analysis, vulnerable properties and estimated losses, hazard mitigation goals and objectives and potential funding sources. These elements of the LMS support the PDRP and the efforts of the community to redevelop after a disaster. As the governing mitigation plan for the City of Tallahassee and Leon County, it is essential that the PDRP and the LMS are consistent in their priorities, policies and procedures.

Comprehensive Emergency Management Plan

The Leon County Comprehensive Emergency Management Plan (CEMP) establishes uniform policies and procedures to effectively coordinate resources in response to natural, man-made and technological emergencies. It outlines direction and control of emergency situations from the Board of County Commissioners to the Division of Emergency Management. The Recovery Function of the CEMP outlines how the transition from response to recovery is managed and the activities conducted during the recovery phase. The Mitigation Function is a summation of the Leon County Local Mitigation Strategy and includes a brief discussion of concept of operations, pre-disaster mitigation planning and funding opportunities. The CEMP, which is updated on a regular basis in coordination with the LMS, is reviewed in more detail in the Plan Integration section of this plan.

Tallahassee – Leon County Post-Disaster Redevelopment Plan

The PDRP identifies policies, operational strategies and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of the community after a

disaster. The PDRP emphasizes seizing opportunities for hazard mitigation and community improvement consistent with the goals of the Comprehensive Plan and the initiatives of the LMS. THE PDRP is updated every five years, and includes information on hazards, vulnerability, and risk also found in the LMS.

City of Tallahassee Resiliency Plan

The Tallahassee Community Resilience Plan is a comprehensive assessment of threats to social, economic, and environmental features and characteristics which influence the community's ability to be resilient and recover from a range of acute shocks and chronic stresses. This document is intended to address underlying chronic stresses that affect our community, such as job, food, and housing insecurity, as well as acute shocks that include flooding, extreme temperatures, and significant storm events, especially as they intensify with our changing climate. This Plan was developed following Hurricane Hermine (2016) based on community input where residents expressed the need to better prepare for hurricanes and other hazards that present an increasing threat to life, property, and the environment.

The Tallahassee Community Resilience Plan includes a comprehensive set of recommendations that includes mitigation measures to address selected threats.

City of Tallahassee Urban Forest Management Plan

The City of Tallahassee, designated as a Tree City USA, is known for its abundance of trees and iconic canopy roads. At 55 percent, the City boasts one of the highest percentages of tree coverage in the nation. In September 2016, Hurricane Hermine highlighted some of the challenges the City faces related to its tree canopy – one of Tallahassee's most treasured assets. Subsequently, the City Commission voted in March 2017 to develop an Urban Forest Master Plan (UFMP) to help ensure the proper management of the urban tree canopy. Recent damage caused by Hurricane Michael further reinforced the importance of urban forest management as it relates to public safety and resilience.

A UFMP is a long- term plan of action that guides proactive and effective urban forest management that will support the City's efforts to balance the needs for storm hardening, infrastructure and growth, while ensuring that the City's trees contribute to key Commission priorities. Properly managed, the City's uniquely dense tree canopy drives economic development by contributing to a sense of place and making Tallahassee a unique place to live and visit. A healthy urban forest provides ecological and social value to the community, increasing an already high quality of life. Additionally, when properly managed, trees contribute to quality infrastructure and public safety rather than cause unnecessary expense. The latter includes managing the canopy to make the City's electric transmission and distribution system more resilient to the effects of hurricanes, tropical storms, and other severe storms.

Continuity of Operation Plans

A Continuity of Operation Plan (COOP) identifies essential functions and core responsibilities of the agency. It establishes backup plans and identifies alternate locations for agencies to function from if their facility is impacted during an emergency. If properly implemented, COOPs assure that the essential functions continue without interruption. This is essential in assisting a community to return to

normalcy after a catastrophic disaster. If government agencies are able to maintain a minimum level of service in an organized manner, a community can begin long-term recovery activities sooner. The City of Tallahassee maintains COOPs for the following agencies:

- Fire Rescue
- City Manager
- Police Department
- Planning/Growth Management
- Economic and Community Development
- Facilities Management
- Parks and Recreation
- City Commission

Leon County maintains COOPs for the following agencies:

- Emergency Management
- Sheriff's Office
- Emergency Medical Services
- County Administration
- County Attorney
- Facilities Management
- Growth and Environmental Management
- Health Department
- Management Information Services (IT)
- Property Appraiser
- Public Works
- Tax Collector
- Red Cross

Tallahassee Memorial Hospital, Capital Regional Medical Center, FSU, FAMU, and TCC have also created COOPs.

Supporting Hazard Mitigation Programs and Resources

1. The Tallahassee – Leon County Public Safety Complex is a multi-purpose facility developed in partnership with the City of Tallahassee and Leon County. This state-of-the-art facility is designed to withstand winds from a Category 3 hurricane or F4 tornado. This facility houses the City of Tallahassee Regional Transportation Management, the Leon County Emergency Operations Center, the Consolidated Dispatch Center, the Leon County Emergency Medical Services, and the Tallahassee Fire Department Administration. Most importantly, the public safety dispatchers for all services work together in the same facility. This ensures that when assistance is needed, the closest and most appropriate Fire, Police, Sheriff or EMS unit will be sent.
2. The Tallahassee Fire Department provides fire protection and Advanced life support first-response emergency medical services to the city of Tallahassee, Florida and Leon County. TFD presently has 16 Fire stations serving approximately 702 square miles (1,820 km2) incorporated and unincorporated land in Tallahassee as well as parts of Leon County with over 278,000 residents. As of 2015, the department is staffed by 267 certified firefighters and responds to over 22,000 incidents annually.[137]
3. Leon County Emergency Medical Services (LCEMS) provides emergency medical services all citizens and visitors of Leon County regardless of social economic status. Leon County EMS is part of a comprehensive system operating through a cooperative agreement between the City of Tallahassee and Leon County.[138]
4. The Leon County Department of Public Works maintains all County roads, stormwater facilities, mosquito control, conducts transportation and stormwater planning and permitting, and administers the permitting and inspection of water and sewer system construction and other related activities and programs.
5. The City of Tallahassee's Underground Utilities and Public Infrastructure department operates the City's water, wastewater, stormwater and gas utility systems, as well as public works and transportation infrastructure. Major infrastructure includes a 26 MGD wastewater treatment facility, 102 pump stations, 1,000 miles of sanitary sewers, 493 miles of storm drains, 110 miles of ditches and canals, 1,200 miles of water mains, 650 miles of streets, 8 water towers, and 27 water wells producing 10 billion gallons of finished water annually.
6. The City of Tallahassee's Utilities Department provides a range of utility services. The Company engages in the generation, transmission, and distribution of electric energy to commercial and residential sectors, as well as providing potable water, wastewater treatment (sewer), natural gas, and solid waste pickup services.
7. The Leon County Sheriff's Office provides police patrol, detective service, court protection, coroner service, and county prison operation for the unincorporated area of Leon County. The Tallahassee Police Department provides public safety services for the city of Tallahassee, Florida.
8. The Tallahassee-Leon County Planning Department's mission is to provide accurate information, creative and effective planning recommendations, and expertise in the areas of long-range land

137 https://en.wikipedia.org/wiki/Tallahassee_Fire_Department.

138 https://en.wikipedia.org/wiki/Leon_County_Emergency_Medical_Services.

use, environmental, and transportation planning for the orderly growth of the Tallahassee community. The Department coordinates the LMS, including its five-year updates and adoption by both the City and County commissions.

These comprehensive plans, policies, and programs are intended to help guide residential and non-residential development and redevelopment, provide urban services, protect the natural and built environment, provide security and emergency services, and help mitigate against natural and technological hazards.

At present, a great deal of formal and informal coordination occurs on a daily basis within Leon County, including the LMS committee member organizations, stakeholders, and other institutions and organizations that provide employment, education, transportation, utilities, and many other services. The various plans and programs previously described are constantly being evaluated and updated when necessary and required, including the Comprehensive Plan. This level of intergovernmental coordination is also driven by objectives and policies within the Intergovernmental Coordination Element of the Comprehensive Plan.

In addition to these actions, the Leon County Board of County Commissioners and the City of Tallahassee's City Commission have directed staff to review existing programs, plans, and other capabilities following the two most recent disasters: Hurricanes Hermine in 2016 and Hurricane Michael in 2018. These were comprehensive reviews of the impacts of these disasters upon citizens, infrastructure, and property formalized into "after action" reports that included recommendations and other direction incorporated where appropriate into these existing plans, policies, and programs.

The LMS Steering Committee is an integral part of this continued evaluation and review. As hazard mitigation funds have become available following Hermine and Michael, local government staff and other non-profit organizations have used the LMS process to refine existing hazard mitigation initiatives and develop new programs and projects to address various hazards identified in this plan.

Although these plans, policies, and programs will be continually refined and updated as necessary to accommodate the lessons learned from Hermine and Michael, at this time, there are no proposed changes to the Comprehensive Plan or the accompanying ordinances and regulations addressing hazard mitigation. Any proposed changes will be reviewed by the Planning Department and the two local government growth management departments for consistency with the Comprehensive Plan, reviewed by the Tallahassee – Leon County Planning Commission (which also serves as the Local Planning Agency under existing State statutes), and brought to the Leon County Board of County Commissioners and/or the City of Tallahassee's City Commission for consideration.

3.3 Hazard Mitigation Initiatives and Projects

History

As part of developing the original LMS, the LMS Steering Committee ranked and prioritized a set of mitigation initiatives. The purpose of this ranking was to indicate the overall importance of the project to local mitigation efforts by rank ordering those initiatives that support public health and safety, protect people, and protect real property in the most vulnerable areas. As part of this effort, the

Committee developed a list of criteria, performance measures, and number of points that could be assigned to weight these initiatives. Points were provided for initiatives that supported essential or critical public and private services, and previously identified mitigation goals. Bonus points were awarded to those initiatives that provide additional benefits. Based on the final scores, the Committee grouped the initiatives into high, medium or low categories.

For the 2017 update, the list of hazard mitigation initiatives was reviewed by the Steering Committee following Hurricane Hermine to reflect changes in priorities, accomplishments, and outdated initiatives. These changes were largely based on experiences and lessons learned after Hurricane Hermine, which made landfall just east of St. Marks, Florida on September 2, 2016. The Committee decided to keep the existing list of initiatives, but several initiatives were collapsed down into a single initiative to reduce redundancy, and several others were modified to accommodate specific projects proposed by Committee members for Hazard Mitigation Grant Program (HMGP) funding made available to Leon County following Hurricane Hermine. One new initiative was added to the bottom of the list and one completed initiative was removed. This completed initiative was the building of a single, community-wide emergency operations center.

Current Hazard Mitigation Initiatives

For the 2020 update to the LMS, the hazard mitigation initiatives and related projects and their relative ranking were re-evaluated by the LMS Committee. The status and priority of the existing mitigation initiatives were discussed in a meeting of the LMS Committee on December 3, 2020. LMS Committee staff presented a revised summary of mitigation initiatives. The revised summary, including project cost estimates, was derived from the annual progress report produced by the City of Tallahassee Stormwater Management Division each year and through discussions with LMS Committee members and other local officials. At this meeting, the Committee kept the priority list intact for the 2020 updated LMS but chose to add a list of projects intended for Hurricane Michael HMGP funding. This list is attached to this plan as Appendix H.

Other changes made to the existing list of mitigation initiatives include status updates and estimated costs (based on the annual progress report) and estimated timeframes; updating hazards addressed by the initiatives, responsible organizations, and potential funding sources.

Evaluation and Prioritization of Mitigation Initiatives and Projects

Existing Mitigation Initiatives

Many of the mitigation initiatives identified by the LMS Steering Committee are non-capital efforts such as policy changes and updates to existing codes and plans. Many of these efforts are ongoing, and there is no explicit starting or ending time or schedule in place. However, a general review of potential costs and benefits was conducted for the proposed mitigation initiatives to fulfill the requirements of Code of Federal Regulations (CFR) §201.6 (c)(3)(ii). The requirements of FEMA's HMGP to mitigate hazards also require a full cost/benefit analysis as part of the grant application.

The general economic evaluation of each mitigation initiative and their related projects was performed by determining the estimated costs, benefits, and available funding sources for each initiative. The estimated cost ranking system serves the purpose of assessing the potential cost of implementing each mitigation initiative. It also provides an indicator of the extent to which benefits may be maximized according to a cost-benefit review of the proposed projects and their associated costs. The categories of the estimated cost ranking system are depicted below:

Low Rank	$1 - $50,000
Medium Rank	$50,001 - $250,000
High Rank	$250,001 and up

Estimated costs were previously derived through consultation with LMS Committee staff and other local officials familiar with the initiatives and related programs. Estimated cost rankings for each mitigation initiative and the results of this prioritization procedure are included in Table 50.

The LMS Steering Committee has maintained this list of initiatives from the 2017 LMS, which was modified from the 2015 edition. The prioritization of these initiatives has also been maintained from the 2017 LMS. There are no changes in either the initiatives and/or their prioritization. The current Prioritized Mitigation Initiatives list currently includes 20 initiatives as described in Table 51 below.

Proposed Hurricane Michael Hazard Mitigation Grant Program Projects

On December 17, 2019, the LMS Committee voted to endorse and prioritize 37 proposed hazard mitigation projects. These projects are intended to compete for Hazard Mitigation Grant Program funding that FEMA has made available following Hurricane Michael. The ranking of these projects was conducted individually by the voting members of the Committee following a previous meeting on December 3, 2019 where the Committee and Working Group members heard presentation on each of the proposed projects. The ranking procedure was to simply rank-order each project by assigning a number from one to 36. This number represented the number of points assigned to each project, with 36 points assigned to the highest-ranking project and then down from there to one point for the lowest-ranking project. The LMS Coordinator then tallied the LMS Committee voting member responses and ranked the projects from highest to lowest. Several projects received identical scores, and these projects were reviewed and rank-ordered according to the Committee's wishes. This list of projects and their scoring and rank are included as Appendix I.

Priority	Initiative	Project Name	Estimated Cost & Timeframe	Responsible Organization	Hazard	Potential Funding Sources	Benefits/Costs Review	Background & Status
1	**Continue to identify needs for improving the disaster resistance of critical facilities**	Improving Disaster Resistance of Critical Facilities	Estimated costs are based on 722 critical sites across all jurisdictions within the County. To mitigate all 722 sites within the jurisdiction the County would require ≥$750 million which averages $1,038,781 per site. Not every site would require this amount, but other sites would require more. Estimated Timeframe: Five Years	• City of Tallahassee (COT) • Leon County Emergency Management	• Flooding, • Hurricanes & Tropical Storms • Storm Surge • Public Infrastructure Failure • Pandemic	• HMGP (Florida Division of Emergency Management (EM)) • Community Development Block Grant (Department of Economic Opportunity (DEO)) • Regional Domestic Security Task Force (RDSTF) (Department of Homeland Security (DHS))	High/High Discussion: Critical facilities include a mix of small and large installations. Larger facilities such as the EOC, fire stations, sewage treatment facilities, military facilities, the County jail, hospitals, and power generation stations benefit all citizens of Leon County.	Critical facilities provide essential services in the event of an emergency but may be housed in structures that require improvements to weather the impacts of a disaster. Improvements may include, but not be limited to, installing storm shutters, moving utilities underground, and acquiring or retrofitting generators, pumps, and associated appurtenances and/or connections for traffic signals, sewage pump stations, water well pump stations, and emergency shelters. Status: The Local Mitigation Strategy Steering Committee continues to work to identify additional security measures to protect critical facilities within the community. The City has installed extra security measures at certain critical facilities throughout the City. The North Florida Regional Domestic Security Task Force is provided funding to address K-12, Universities, Court houses and communications towers, funding is still needed to protect utilities. There is increased emphasis on identifying needs for improving critical facilities and monitoring since Hurricane Hermine on September 2, 2016 and Hurricane Michael October 10, 2018. Several sewage pump stations (#12, #74) have been replaced, some backup generators have been obtained, other electrical lines to critical facilities have been moved underground, a new water well is on line (#32), and redundant force mains have been installed. Additional funding needs have been identified for generators to operate, traffic signals, sewage pump stations, water well pump stations and emergency shelters such as schools, public community centers and libraries. There are approximately 150 key overhead main circuit lines, and these frequently serve medical, public safety and other critical facilities. A local committee outlines certain items to be purchased, and some funding is coordinated through the Regional Domestic Security Task Force (RDSTF). However, available funding for this initiative is decreasing.
2	**Increase intergovernmental coordination of stormwater management**	Create Project Manager Position	Administrative Services: Hire 1 Project Manager for Mitigation Services: $66,550 per year AND/OR Contract Services: 1 Mitigation Services Specialist $145 per hour: (160 hours: $23,200 per month, $69,600 per quarter or $278,400 per year). Estimated Timeframe: Five Years	• COT Underground Utilities & Public Infrastructure • Leon County Public Works • City and County Commissions	Flooding	Local	High/Medium Discussion: The design, construction, and operation of stormwater mitigation and other treatment facilities can be very expensive. The hiring of a project manager to increase intergovernmental coordination will generally benefit most residents and property owners within both Leon County and the City of Tallahassee by mitigating flooding and enhancing the environmental quality of existing surface and subsurface water resources.	Stormwater does not follow jurisdictional boundaries. Land use activities in the City can affect drainage characteristics outside municipal boundaries and, to a lesser extent, vice versa. In the past, stormwater management opportunities have been constrained by fiscal concerns and the impacts of significant amounts of pre-code development. These factors necessitate strong intergovernmental coordination for stormwater management efforts to be effective. Status: Intergovernmental Stormwater management coordination is currently accomplished through several initiatives including countywide land development ordinance, Blueprint 2000 intergovernmental agency Stormwater improvement projects and Local Mitigation Strategy Steering Committee meetings. In addition, the City and County are currently working with the Northwest Florida Water Management District to improve the accuracy of the Flood Insurance Rate Maps through the Risk Map program, which is funded by FEMA. The City has shared stormwater model data with the Northwest Florida Water Management District (NWFWMD) to assist in the county wide Special Flood Hazard Area remapping effort.
3	**Improve the disaster resistance of existing site-built housing stock**	Create Project Manager Position	Administrative Services: Hire 1 Project Manager for Housing Services: $66,550 per year AND/OR Contract Management: 1 Housing Services Specialist $145 per hour: (160 hours: $23,200 per month, $69,600 per quarter or $278,400 per year). Estimated Timeframe: 10 Years	• COT Economic & Community Development • Leon County Housing and Human Services • Capital Area Red Cross	All	• CDBG Program • SHIP • HOME • HMGP • FMAP • Repair and Restoration of Disaster Damaged Historic Properties (FEMA) • National Flood Mitigation Fund (FEMA) • Emergency Advance Measures for Flood Prevention (U.S. Army Corp of Engineers (COE)	Medium/Medium Discussion: Improving the disaster resistance of existing site-built housing stock varies from structure to structure, and the benefits depend on the number and type of improvements. The hiring of a project manager to increase intergovernmental coordination will benefit a limited number of residents and property owners within Leon County and the City of Tallahassee.	Build upon current CDBG, HOME and SHIP programs to improve the disaster resistance of existing site built housing stock, including elevating structures where feasible. Status: The Capital Area Chapter of the American Red Cross continues to provide educational programs to low income population on how they can be disaster resistant and be part of the Ready Rating Program. http://www.readyrating.org/
4	**Advocate that FEMA modify its policies to accommodate local floodplain management program requirements so as to avoid the frequent necessity for duplicate, and sometimes conflicting, modeling for NFIP purposes**	Create Project Manager Position	Administrative Services: Hire 1 Project Manager for Planning Manager: $66,550 per year (benefited) AND/OR Contract Management: 1 Housing Services Specialist $125 per hour: (160 hours: $20,000 per month, $60,000 per quarter or $240,00 per year). Estimated Timeframe: Two Years	• COT Underground Utilities & Public Infrastructure • Leon County Public Works • Leon County Development Support and Environmental Management (DSEM)	Flooding	Local	Medium/Medium Discussion: The hiring of a project manager to increase coordination between FEMA and local floodplain managers regarding modeling and maps will benefit a limited number of residents and property owners within Leon County and the City of Tallahassee.	Tallahassee and Leon County have advanced stormwater regulations and require sophisticated digital modeling. FEMA is slow to review/approve new modeling software or even more current versions of previously approved software. As a result, local communities frequently are faced with having to do advanced modeling for design and local permitting and then duplicate modeling with the FEMA-approved software list for NFIP purposes. Status: The City of Tallahassee and Leon County continue to cooperate with the Northwest Florida Water Management District through a Cooperating Technical Partnership with FEMA, which will be instrumental in accomplishing this goal. The City and County attended the Apalachee Bay Saint Mark River Watershed Discovery Meeting for updating the FEMA flood maps for the Saint Marks Basin. The City of Tallahassee has provided a map of areas to be reviewed to FEMA. The City of Tallahassee has worked with stormwater model

Priority	Initiative	Project Name	Estimated Cost & Timeframe	Responsible Organization	Hazard	Potential Funding Sources	Benefits/Costs Review	Background & Status
								providers to endorse modeling programs that have been added to the list of FEMA accepted stormwater models.
5	**Improve floodplain boundary identification and implementation of the FEMA map amendment process**	Create GIS Specialist Position	Administrative Services: Hire 1 GIS Specialist trained in LiDAR or Hi-Resolution mapping: $56,049 (benefited) AND/OR Contract Management: 1 GIS Specialist $110 per hour (160 hours: $17,600: $52,800 per quarter or $211,200 per year). Estimated Timeframe: Two Years	• COT Growth Management • COT Underground Utilities & Public Infrastructure • DSEM • Leon County Public Works; Tallahassee-Leon MIS/GIS	• Flooding • Storm Surge	• EMPA Trust Fund (DEM) • Small Watershed Program (USDA) • Emergency Advance Measures for Flood Prevention (COE) • Resource Conservation and Development Program (USDA) • Soil and Water Conservation Program (USDA) • National Flood Mitigation Fund (FEMA)	Medium/Medium Discussion: The hiring of a project manager to increase coordination between FEMA and local floodplain managers regarding floodplain boundary identification and implementation of the FEMA map amendment process will benefit selected residents and property owners within Leon County and the City of Tallahassee.	Efforts would focus on correcting inaccuracies in FEMA flood hazard boundaries. These boundaries are used for insurance purposes and frequently increase rates for residents that are clearly not in the floodplain. Other citizens use this information to guide property purchases and find out they are susceptible to flooding despite lying outside the hazard areas of a FIRM. This initiative would require the hiring of sufficient personnel to identify and prepare map amendments and expand the existing floodplain database to include best available information, such as permitting models, for incorporation into a GIS. Besides providing better data that could reduce insurance rates and improve decisions regarding property purchases, this information could guide acquisition efforts. Status: The City and County are currently working with the Northwest Florida Water Management District to improve the accuracy of the Flood Insurance Rate Maps through the Risk Map program funded by FEMA. Once complete, it is expected that FEMA will issue updates to the FIRM, which will improve the accuracy of the depiction of Special Flood Hazard Areas for the community. The City has provided several stormwater models and highwater elevations to NWFWMD.
6	**Explore methods to eliminate additional development in the 25-year floodplain**	Update Existing and/or Create New Ordinance(s)	Land Acquisition Costs: The average parcel in Leon County $187,400 (Median value of owner-occupied unit). Estimated Timeframe: Five Years	• COT Growth Management • DSEM • Tallahassee-Leon County Planning	Flooding	Local	Medium/Medium Discussion: This ongoing initiative utilizes existing staff and programs. This initiative will benefit a limited number of residents and property owners within Leon County and the City of Tallahassee.	This initiative aims at keeping new buildings from the highest risk area of the floodplain, and might include an acquisition effort targeting undeveloped lots. Status: The City of Tallahassee and Leon County growth management departments continue to consider new ordinance language to accomplish this goal.
7	**Create a public education campaign and community program that promotes awareness of vulnerability to hazards in our community and encourage disaster preparation**	Support and expansion of ongoing natural and manmade hazard awareness and mitigation public education programs for residents and property owners in Leon County and the City of Tallahassee	$125,000 for creating a primarily digitally driven campaign with some supplemental public relations to include distribution of material. Continue to utilize COT Utility billing educational inserts. Estimated Timeframe: Five Years	• COT • Leon County Emergency Management • Capital Area Red Cross	All Hazards	EMPA Trust Fund (DEM)	High/Medium Discussion: This initiative will utilize existing staff and programs with the possible addition of PR consultants as necessary. This initiative will benefit all residents and property owners within Leon County and the City of Tallahassee.	Status: Capital Area Chapter of the American Red Cross has developed the "Ready Rating Program." The program is designed to mitigate the impact of various disasters by educating residential and commercial property owners on personal actions they can take to reduce the effects of a disaster (such as removing dead limbs, putting up shutters / plywood, creating a safe room in your house/business, etc.). The City, Red Cross and County hosted an annual "Build a Bucket" disaster fair focusing on the community's vulnerability to various disasters and possible mitigation techniques, including wildfire mitigation actions developed by the Florida Forest Service. The fair could be hosted annually as a stand-alone event and integrated into other community events throughout the year. This strategy would address creating a safe room within the home, general home protection procedures, etc. Leon County Emergency Management also supports NOAA's Weather Ready Nation initiative. NOAA's Weather-Ready Nation initiative is first and foremost to save more lives and livelihoods. By increasing the nation's weather-readiness, the country will be prepared to protect, mitigate, respond to and recover from weather-related disasters. As part of the Weather-Ready Nation initiative, NOAA, along with partners, wants to motivate individuals and communities to take actions that will prepare them in the event of a weather disaster and to share their preparedness steps with others. These actions can save lives anywhere - at home, in schools, and in the workplace before tornados, hurricanes, and other extreme types of weather strike.
8	**Continue current efforts to remove dead, dying or diseased trees or branches next to roadways and power lines**	Tree Removal	Tree Removal Costs: Contract Labor: Leaners: $108.5 per tree Hangers: $80.17 per tree Estimated Timeframe: Ongoing	• COT Underground Utilities & Public Infrastructure • Leon County Public Works • COT Electric Utilities • Talquin Electric	• Hurricanes & Tropical Storms, Severe Storms • Invasive Plants & Animals • Drought	Local	High/High Discussion: This ongoing program utilizes existing staff and contractors. This program benefits all residents and property owners within Leon County and the City of Tallahassee by providing dependable electric service.	Debris from storm events poses a hazard to overhead power lines and roads. Status: Existing City Electric utility tree trimming policy is to trim all vegetation back to 6 feet from existing power lines. The entire system is trimmed on an 18-month cycle. Commission approved policy allows neighborhoods with high rates of outages due to vegetation to request additional clearance up to 10 feet from existing power lines. In 2017, the City started an enhanced tree trimming program cutting 12' above the electric lines. The City has been designated as a "Tree City" USA and "Tree City Growth" USA for 2018. Significant tree clearing has been done before, during and after Hurricane Michael on 10/10/18.
9	**City of Tallahassee and Leon County flood-related capital improvement projects**	Create Project Manager Position	Administrative Services: Hire 1 Project Manager for Mitigation Services: $66,550 per year AND/OR Contract Services: 1 Mitigation Services Specialist $145 per hour: (160 hours: $23,200 per month, $69,600 per quarter or $278,400 per year). Estimated Timeframe: Five Years	• COT Underground Utilities & Public Infrastructure • Leon County Public Works	• Hurricanes & Tropical Storms • Flooding • Storm Surge	• CDBG (DEO) • HMGP (DEM) • Emergency Bank Protection (COE) • STP (ISTEA) • Sustainable Development Challenge Grants (EPA) • National Flood Mitigation Fund (FEMA) • Soil and Water Conservation (USDA) • Resource Conservation and Development (USDA)	Medium/Medium Discussion: The hiring of a project manager to increase coordination between City of Tallahassee and Leon County flood-related capital improvement projects will benefit selected residents and property owners within Leon County and the City of Tallahassee.	Status: Numerous stormwater projects have been identified as necessary to provide relief to existing flood problems. A complete list of projects for the City of Tallahassee and Leon County are included in Appendix D.

Priority	Initiative	Project Name	Estimated Cost & Timeframe	Responsible Organization	Hazard	Potential Funding Sources	Benefits/Costs Review	Background & Status
						• Small Watershed Program (USDA)		
10	**Acquire parcels subject to flooding in the 100-year floodplain**	Land Acquisition of Parcels Vulnerable to Flooding in the 100-Year Floodplain	Land Acquisition Costs: The average parcel in Leon County $187,400 (Median value of owner-occupied unit). Estimated Timeframe: Ongoing	• City of Tallahassee Underground Utilities & Public Infrastructure • Leon County Public Works • Tallahassee - Leon County Planning	• Hurricanes & Tropical Storms • Flooding • Storm Surge	• Florida Communities Trust • HMGP	Medium/Medium Discussion: This ongoing program utilizes existing staff and contractors as necessary. This initiative benefits selected residents and property owners within Leon County and the City of Tallahassee.	This initiative builds on past City/County floodplain acquisition efforts and would be enhanced by improved information developed through Initiative #5. Acquisitions would target improved parcels with the most vulnerable structures. Status: The City and County continue to evaluate potential acquisition projects and possible funding sources for property acquisitions within the 100-year floodplain. Many parcels within the 100-year floodplain have been purchased by the City of Tallahassee and Leon County during previous years to provide flood relief to flood prone property owners. Some of these acquisition projects were entirely funded using local dollars. Others were funded through state and federal programs while also making use of local matching funds. Examples of these programs include the Flood Mitigation Assistance Program and the Hazard Mitigation Grant Program, both of which are FEMA programs administered by the Florida Division of Emergency Management. The City of Tallahassee has recently purchased and exchanged floodplain property near Texas Street.
11	**Develop and maintain emergency notification systems for all hazards and critical facilities**	Emergency Notification System	Per site costs can range from $25,000 to $150,000 per year depending on the size of the facility. Estimated Timeframe: Ongoing	• Leon County, City of Tallahassee, Emergency Management; Law Enforcement, Fire and Health; FSU; FAMU; TCC	All Hazards	• HMGP (DEM) • National Flood Mitigation Fund (FEMA) • U.S. Department of Homeland Security	High/Medium Discussion: Certain hazards affect all citizens of Leon County. Critical facilities include a mix of small and large installations. Larger facilities such as the EOC, fire stations, sewage treatment facilities, military facilities, the County jail, hospitals, and power generation stations benefit all citizens of Leon County.	Emergency notifications and warnings are essential to protecting lives and property. Immediate notification to a specific area is critical during rapidly developing situations such as tornados, hazardous material releases, pandemics, and flash and other flooding events. This system can also be used to inform residents, caregivers, and service providers of issues such as boil water notices, power outages, sewer issues, Amber Alerts and more. Status: Both the City of Tallahassee and Leon County have developed communications departments that also regularly send out public notifications via press releases, social media, and institutional websites. In addition to these capabilities, there are several warning systems already in place within Leon County and the City of Tallahassee. For instance, the Federal Emergency Management Agency, Federal Communications Commission, and the Wireless Communications Industry launched the Wireless Emergency Alert (WEA) system in 2013. This system sends concise, text-like messages to WEA capable mobile devices. Wireless providers, representing 97% of subscribers, are participating in distributing Wireless Emergency Alerts. Mobile users will not be charged for receiving these text-like alerts and are automatically enrolled to receive them. Wireless Emergency Alerts are a point-to-multipoint system, which means alert messages will be sent to those within a targeted warning area, unlike text messages which are not location aware. Wireless Emergency Alerts distributed by the National Weather Service include: Tornado warnings, Extreme Wind warnings, Flash Flood warnings, and Hurricane warnings. There are several flood-warning networks in place throughout the City and County, including a telephone-based warning system at the Lake Talquin Dam, and the Capital Area Flood Warning Network and the City of Tallahassee's Rainfall Data Telemetry System. The Capital Area Flood Warning Network and the City of Tallahassee Rainfall Data Telemetry System provide real-time rainfall totals and water levels at key points within the community. Emergency Management Officials can then use this information during major storm events to identify potential areas of flooding. Leon County Leon County utilizes the internet website http://cms.leoncountyfl.gov/ei/ to post all-hazards emergency public information for use by citizens and the media during emergency events. They also utilize a subscription service (powered by GovDelivery) available at the Leon County website for citizens to sign up for all-hazards emergency notifications, traffic notifications, as well as general Leon County government announcements. Notifications are available via email and SMS. During an emergency, Leon County Emergency Management staff can broadcast live through an electronic link on WFSU-88.9 FM. This provides full radio coverage throughout Leon County and the surrounding area as a primary resource for emergency and public safety information. From local government's experiences with Hurricane Hermine, County emergency management staff has recommended that WFSU be designated as a critical facility, that EOC personnel be tasked to report this information, and to review and upgrade if necessary, the existing telecommunications link with WFSU (88.9 FM) located in the Public Safety Complex. An additional recommendation includes considering providing WSFU's video production support to media partners in the Public Safety Complex in order to broadcast briefings and community updates. City of Tallahassee The City of Tallahassee's Water Quality Administration has initiated a remote detection system to determine the status and condition of the potable well facilities. This system achieves the goal of an audible alarm system for our potable water system. The Thomas P. Smith wastewater treatment plant on Springhill Road has a separate monitoring system with audible alarms for all equipment. The SCADA system monitors for potential chemical and gas leaks with audio and visual alarms. State of Florida/DEP/Florida Park Service staff maintains a list of email and phone numbers for residents downstream of the Corn Hydro Facility (i.e., Lake Talquin Dam). This list enables automatic email and phone distribution of either early warning of flooding due to know events upstream or emergency notification of rapidly developing events. Additionally, an emergency siren exists at the dam for boaters and residents in the

Priority	Initiative	Project Name	Estimated Cost & Timeframe	Responsible Organization	Hazard	Potential Funding Sources	Benefits/Costs Review	Background & Status
								immediate downstream area. These systems are tested on a quarterly basis and worked well during Hurricane Hermine and Hurricane Michael. The state point of contact for the Lake Talquin Dam is: Warren Poplin Florida Department of Environmental Protection Division Recreation & Parks/District 1 Bureau Chief Warren.Poplin@FloridaDEP.gov Office: 850-708-6080 Cell: 850-258-2013 <u>Tallahassee Community College</u> Tallahassee Community College (TCC) utilizes an Emergency Notification System called TCC Alert. System components include: • RAVE emergency reporting software sends messages to classroom phones, personal phones including text messages, E-mails and computer screen pop-ups for all campus computers. • Federal Signal Outdoor Siren System / Audible Messages • Captiveyes T.V. monitors screen pop-ups located throughout the campus <u>Florida State University</u> The Florida State University (FSU) Alert emergency notification and warning system (http://emergency.fsu.edu/services/FSUAlert) at provides 35+ methods of delivery, single-button activation, and end-user delivery in 5 minutes or less. The university continues to develop and improve the system with expanded coverage, new interoperable communications technologies, and redundancies to ensure operability always under all conditions. FSU recently added capabilities to issue emergency alerts and share response information through a new mobile app called SeminoleSAFE. The FSU ALERT EZ system allows for single-button activation and streamlines warning and notification to 3-5 minutes or less in the most extreme situations. FSU has identified locations on its campus prone to flooding with associated personal injury and property damage. University emergency management staff has proposed to install flood detection equipment in several key locations on its campus and integrate these stations into the FSU ALERT emergency notification and warning system. This Flood Detection and Warning system will require additional funding to implement. A local company, WeatherSTEM, has partnered with Florida State University, Tallahassee Community College, Florida A&M University, Leon County Schools and others to install forty-three weather stations throughout Tallahassee-Leon County. This regional weather MESONET of weather stations allows the public and others the opportunity to enroll in personal notifications of a variety of weather conditions, including lightning. The system provides a Professional Lightning Advisor (PLA) feature which allows people to monitor an ongoing lightning threat and determine when it is safe to resume normal activities. Additional stations and system features are in continual development. FSU previously proposed a regional lightning mapping array (LMA). This regional lightning detection and warning system would provide all public and non-profit entities in the region advanced warning of the potential of a lightning strike, followed by active monitoring capabilities once lightning is occurring. With advanced warning, detection and monitoring capabilities, the goal is to mitigate the risk to life and property from lightning strikes. FSU is exploring various possibilities for support. <u>Florida Agricultural and Mechanical University</u> The Florida Agricultural and Mechanical University (FAMU) emergency notification system issues warnings through Blackboard Connect, the University's emergency notification system. This web-based system sends instant alerts to all students, faculty and staff cell phones, e-mail, and/or pagers. On the main campus (Tallahassee), when notification is necessary due to an immediate and serious threat to public safety, the campus community will also be alerted through its Emergency Siren System, which delivers an audible tone followed by a voice message to the community notifying them of the immediate threat. Overall, monitoring and communications equipment, especially for state of the art digitally-based systems that protect critical facilities, can often require significant startup and/or maintenance funding commitments.
12	**Explore the feasibility of adding a full build-out component to the Leon County Master Stormwater Management Plan**	Create Project Manager Position	<u>Administrative Services</u>: Hire 1 Project Manager for Mitigation Services: $86,578 per year based on the average of 39,244 positions. AND/OR Contract Services: 1 Mitigation Services Specialist $145 per hour: (160 hours:	• DSEM • Tallahassee-Leon County Planning	• Flooding, • Hurricanes & Tropical Storms • Storm Surge	• EMPA Trust Fund (DCA) • Small Watershed Program (USDA) • Emergency Advance Measures for Flood Prevention (COE)	Medium/Medium <u>Discussion</u>: The hiring of a project manager to increase coordination between City of Tallahassee and Leon County stormwater management capital improvement	<u>Status</u>: The master Stormwater management plan does not address stormwater and flooding impacts given future build-out conditions for the entire County. This information could be used to revise existing floodplain regulations so that they reflect projected build-out conditions. Based on information from the Leon County Public Works Department, there are no plans to update the Master Plan at this time due to staffing limitations and current allocation of available resources.

Priority	Initiative	Project Name	Estimated Cost & Timeframe	Responsible Organization	Hazard	Potential Funding Sources	Benefits/Costs Review	Background & Status
			$23,200 per month, $69,600 per quarter or $278,400 per year). Estimated Timeframe: Five Years			• Resource Conservation and Development Program (USDA) • Soil and Water Conservation Program (USDA) • National Flood Mitigation Fund (FEMA)	projects and to recommend revisions to existing stormwater management regulations will benefit selected residents and property owners within Leon County and the City of Tallahassee.	
13	**City and County acquisition of easement or fee simple property to allow legal access for maintenance of major ditches and canals to reduce flooding**	Access Acquisition Program	Construction + Maintenance Costs: Curbs and Gutters: $29.65 linear foot Estimated Timeframe: Ongoing	• COT Underground Utilities & Public Infrastructure • Leon County Public Works	• Flooding	• HMGP (DEM); National Flood Mitigation Fund (FEMA)	Medium/Medium Discussion: This ongoing program utilizes existing staff and contractors as necessary. This initiative benefits selected residents and property owners within Leon County and the City of Tallahassee.	The program would consist of the acquisition of easements for ditches and the necessary land to access the ditches so normal maintenance can be performed. Currently the City of Tallahassee is responsible for the maintenance of over 23 miles of major ditches, and the County maintains over 28 miles of major ditches. About 15 miles have adequate access easements, are located within an easement or are located on public ROW. Approximately 30 acres are needed to have full public access to maintain the ditches. Status: The County has no plans to acquire any additional easements or fee simple properties for maintenance access. The City continues to acquire properties and/or easements as needed in conjunction with stormwater management capital improvement projects. The most recent easement was obtained near Golf Terrace Drive.
14	**Secure funding source for identified shuttering and hardening needs for windows at Tallahassee Memorial Hospital (TMH)**	Windows Replacement Project	Impact Resistant Windows average: $500 per window plus labor (conservatively: $80 per window). Estimated Timeframe: Two years	• COT • Leon County Emergency Management	• Flooding, • Hurricanes & Tropical Storms • Storm Surge	• EMPA Trust Fund (DEM) • HMGP (DEM) • CDBG (DEO)	High/Medium Discussion: TMH is a major regional hospital in Tallahassee. This project benefits all residents within Leon County and the City of Tallahassee.	Tallahassee Memorial Hospital is highly susceptible to wind damage from a tropical storm/hurricane. Currently neither hospital has storm shutters in place. As one of the primary hospitals serving the City of Tallahassee, Leon County and the region, local emergency management personnel should work with TMH to identify shutter options and hardening needs for windows, including costs. In addition, efforts should be undertaken to identify and harden essential support facilities (such as generators) at the hospital. Status: Once a possible funding source is identified, the committee has discussed applying for window protection at TMH. TMH has developed an application for hazard mitigation and is ready to proceed when funding becomes available. The other Tallahassee community hospital, Capital Regional Medical Center has installed hardened windows.
15	**Consider addressing the economic impact of different disaster scenarios, as information becomes available**	Economic Analysis of Disaster Scenarios	Administrative Services: Contract Services: Hire at least one 1 Human Services Specialist at $145 per hour: (160 hours: $23,200 per month, $69,600 per quarter or $278,400 per year). Additional contract support may be required at a lesser hourly rate. Estimated Timeframe: Five Years	• TLCGIS • City & County Offices of Management and Budget	All Hazards	Local	High/Medium Discussion: The hiring of a Human Services Specialist to analyze the economic impact of different disaster scenarios will benefit all residents and property owners within Leon County and the City of Tallahassee.	Status: The Florida Division of Emergency Management (DEM) has considered developing an economic impact model as part of their disaster modeling. Some data are already available through the TAOS and/or Hazus models. The City of Tallahassee, Leon County, and the Capital Area Chapter of the American Red Cross have programs in place to assess the impacts of disaster immediately following an event. Damage Assessment Teams are deployed following a disaster on a countywide basis to document disaster-related damages. These data are available to local, state, and federal governments, as well as local non-profits, universities, and other organizations. Tallahassee - Leon County GIS (TLCGIS) has developed Hazus capabilities and training. This software program has been used to estimate direct economic loss from building damage and indirect losses such as business interruption. These data and their model results are also used in the Tallahassee – Leon County Post-Disaster Redevelopment Plan (PDRP). Updated HAZUS models and data will be utilized for the 2019 update of the PDRP which is in progress now. Additionally, HAZUS can estimate shelter needs based on population and socioeconomic information, as well as other impacts and mitigation needs. The Apalachee Regional Planning Council and FDEM maintain and provide HAZUS information annually to the City and Leon County.
16	**Continue to improve and expand regional response capabilities for responding to biohazards, hazardous materials, and terrorism events**	Review of Regional Response Capabilities for Hazardous Materials and Terrorism Events	Resources: Hazmat PPE: $890 per Hazmat Suit Spill Kit: $2,018 per kit Oxygen tanks: $2,162 per rig (includes mask) Radiation Detector: $667 per unit Storage Cabinet: ≥$900 Drain Cleaning Machine: ≥$906 Water Jetter: ≥$3,999 Estimated Timeframe: Ongoing	• COT • Leon County Emergency Management	• Pandemics • Hazardous Materials • Transportation Incidents • Terrorism	• DEO/FEMA and other federal agency grants • Chemical Emergency Preparedness and Prevention Grants Program (EPA) • Disposal of Federal Surplus Property (GSA) • Hazardous Materials Training Program (FEMA)	High/Medium Discussion: The improvement and expansion of regional response capabilities benefits all residents and property owners within Leon County and the City of Tallahassee.	The possibility of an incident involving a weapon of mass destruction or a hazardous materials release exists within Leon County. County EM is preparing a response plan and now needs to identify the equipment needed to respond to effectively to an incident. In addition, the City and County need to identify potential funding sources to acquire the highly specialized, and often expensive, equipment. Status: Tallahassee Fire Department (TPD) has the only hazardous materials response unit in the region (between Alachua and Escambia Counties, and to a lesser extent, Bay County). Currently, TPD will respond to hazardous materials incidents outside of the County. TPD has also created a Regional Hazardous Materials Response Team. Our community emergency management officials have identified equipment needs and have purchased many of these items with funding from the federal Department of Homeland Security and the Federal Emergency Management Agency. A local committee outlines items to be purchased, and funding is coordinated through the Regional Domestic Security Task Force. However, available funding for this initiative is decreasing.
17	**Maintain training programs for emergency responders and continue to identify new training programs as needed.**	Development & Maintenance of Emergency Responders Training Programs	Administrative Services: Hire 1 Staff for training and exercising: Average of 1,517 salaries reported $60,600 per year (benefited) AND/OR Contract Services: Hire at least one 1 Human Services Specialist at $145 per hour: (160 hours: $23,200 per month,	• COT • Leon County Emergency Management	All	• Hazardous Materials Training Program (FEMA) • Chemical Emergency Preparedness and Prevention Grants Program (EPA)	High/Medium Discussion: The hiring of a Training Specialist to develop and maintain ER training programs will benefit all residents and property owners	In the event of a natural disaster, hazardous material release, or other catastrophic incident, numerous emergency responders, often with widely different roles, will be required to work as a single, integrated unit. Key to this effort is training. The City and County need to continually identify the different training needs for numerous responders, including, but not limited to dispatchers, initial responders, field responders, and incident commanders. Included as part of this is a continuous training program, involving classroom training, tabletop exercises and field exercises. The effort should also address the development and implement public awareness training programs.

Priority	Initiative	Project Name	Estimated Cost & Timeframe	Responsible Organization	Hazard	Potential Funding Sources	Benefits/Costs Review	Background & Status
			$69,600 per quarter or $278,400 per year). Additional contract support may be required at a lesser hourly rate. Estimated Timeframe: Five Years				within Leon County and the City of Tallahassee.	Status: The Apalachee Regional Planning Council, Tallahassee, Gainesville, Thomasville, Valdosta and other surrounding communities have worked together on regional responses. In Florida, surrounding communities have agreed to support each other through the Fire Chief's Association and the Regional Domestic Security Tasks Forces. There are seven of these in Florida, and they support each other as needed.
18	**Identify populations at risk under different scenarios**	Population Analysis of Disaster Scenarios	Administrative Services: Hire 1 Social Services Manager: Average of 9,505 salaries reported $57,443 per year (benefited). AND/OR Contract Services: Hire at least one 1 Human Services Specialist at $145 per hour: (160 hours: $23,200 per month, $69,600 per quarter or $278,400 per year). Additional contract support may be required at a lesser hourly rate.	• TLCGIS • COT • Leon County Emergency Management • Tallahassee - Leon County Planning	All	EMPA Trust Fund (DEM)	High/Medium Discussion: The hiring of a Social Services Manager to conduct a population analysis of disaster scenarios will benefit all residents and property owners within Leon County and the City of Tallahassee.	The intent of this initiative is to determine the impact on housing, medical, evacuation, shelters, etc., for different populations such as those attending special events, student populations, homeless populations, and the elderly. Status: The Tallahassee - Leon County Geographical Information System (TLCGIS) interlocal department has developed Hazus capabilities, including the acquisition of Hazus 4.2 software, data, and staff training. This software program has been used to estimate direct economic loss from building damage and indirect losses such as business interruption. Additionally, Hazus can estimate shelter needs based on population and socioeconomic information. TLCGIS has previously used it to compare known damages from Hurricane Hermine. In addition to the use of digital data and modeling, the Leon County and the City of Tallahassee in 2011-2012 collaboratively developed a Post-Disaster Redevelopment Plan (PDRP) to better prepare the community for long-term recovery and redevelopment after a disaster. This plan complements other planning efforts ongoing in the city and the county, including the Comprehensive Plan, Local Mitigation Strategy (LMS) and Comprehensive Emergency Management Plan (CEMP). The PDRP identifies policies, operational strategies and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of the community after a disaster. The PDRP is required to be updated every five years. Leon County now also requires a Temporary Uses, Construction Staging Areas, and Special Events Permit for events intended to accommodate an attendance of 250 or more persons. The County's Department of Development Support and Environmental Management processes this permit, which is reviewed by the County's Development Services Division, Fire Safety Office, Emergency Medical Services, Sheriff's Office and the Health Department.
19	**Encourage the establishment of community-based emergency shelters and increase the disaster resistance of existing community shelters and other non-profit service provider facilities.**	Establish Community-based Emergency Shelters	Resources: ≥$100,000 for a shelter to meet the needs of trailer park. Estimated Timeframe: Five Years	• COT • Leon County Emergency Management	All	Local	High/Medium Discussion: The establishment of and increasing the disaster resistance of community-based emergency shelters and other service provider facilities will benefit all residents and property owners within Leon County and the City of Tallahassee.	Subdivisions, mobile home parks, etc. that have storm shelters incorporated into their designs would provide additional sheltering capacity and eliminate the need to evacuate residents. These buildings could double as community centers. Status: The City of Tallahassee and Leon County have a total of 15 school campuses and 72 buildings, which meet the Red Cross standards and can be used as emergency shelters. In addition, the City of Tallahassee is now providing transportation to persons who regularly ride StarMetro seeking shelter. Six shelters were employed during Hurricane Michael on October 10, 2018 serving over 1,500 people. Through the successful completion of several structural hardening mitigation projects, Florida State University now maintains an inventory of four buildings with the capability to shelter 3,140 of its own students, faculty, staff and their immediate family members on campus.
20	**Identify major land-based transportation corridors and establish safe zones around those corridors based on the exposure pathway for different chemicals**	Transportation Corridor Safe Zone Mapping	Administrative Services: Contract Services: 1 Mitigation Services Specialist $145 per hour: (160 hours: $23,200 per month, $69,600 per quarter or $278,400 per year). Estimated Timeframe: Two Years	• COT • Leon County Emergency Management	• Hazardous Materials • Transportation Incidents	• Hazardous Materials training Program (FEMA) • Chemical Emergency Preparedness and Prevention Program (EPA)	High/Medium Discussion: The hiring of a Mitigation Services Specialist to identify and establish safe zones around major land-based transportation corridors will benefit all residents and property owners within Leon County and the City of Tallahassee.	This would also include identification of all structures, facilities and special need populations in the corridors. Provide ready access to this information to hazardous material response personnel, preferably from deployed resources (such as a GIS capability on the hazardous response vehicle). Status: The Apalachee Regional Planning Council has developed a commodity transportation study for hazardous materials. In addition, local Emergency Management officials have developed preliminary mapping of safe zones, 1-2 miles along the major routes through the community.

Changes in Initiatives since 2015

The list of initiatives and projects in the 2015 LMS was modified in 2017 following Hurricane Hermine. For the 2017 update, the LMS Committee changed the wording and order of this list to reflect changes in priorities, accomplishments, and outdated initiatives. These changes were largely based on experiences and lessons learned after Hurricane Hermine, which made landfall just east of St. Marks, Florida on September 2, 2016.

All of the initiatives and projects in the 2017 LMS have been brought into this updated edition of the LMS. They have been updated as to their estimated timeframes and costs, benefit/cost review, and status. The order of these initiatives has not changed, and none of them have been eliminated, deleted, or deferred.

Hurricane Hermine HMGP Projects

In April 2017, following the release of Hazard Mitigation Grant Program funds associated with Hurricane Hermine, the LMS Steering Committee endorsed seven proposed projects (see Attachment J) that were associated with several initiatives and projects in the 2017 list. These projects are associated with ongoing initiatives such as improving the disaster resistance of critical facilities. However, even with the completion of these particular projects, these initiatives will continue.

Hurricane Michael HMGP Projects

Attachments H and K indicate proposed hazard mitigation projects intended for Hurricane Michael HMGP funds. These discrete new projects have been determined by the LMS Steering Committee to be consistent with the initiatives in Table 52 and have been included here as a separate project list for clarity.

Chapter 4 – Plan Maintenance

4.1 Monitoring, Maintenance and Updating

The Steering Committee recognizes that to be effective, the *Tallahassee-Leon County Local Mitigation Strategy* must be reviewed and updated on a regular basis. To assist in this process, the LMS Committee has developed the following procedures:

1. The Steering Committee, with the assistance of the LMS Coordinator, will meet annually to review the local mitigation strategy, including evaluating the list of mitigation initiatives in Table 52, to ensure it is current, that the prioritization is still valid, and that it reflects changing conditions within the community. This will provide adequate time to incorporate any needed revisions prior to the next grant cycle. The Steering Committee will meet earlier or on a more frequent basis if needed, such as in a post-disaster environment.
2. The review of the local mitigation strategy will include:
    a. Deletion of completed projects and/or programs;
    b. Identification of new mitigation initiatives;
    c. Evaluation of the impact of recommended changes to city and/or county plans and ordinances identified during the local mitigation process; and
    d. Evaluation of any changes in the hazard identification and vulnerability assessment.
3. As needed, additional public and private sector interests will also be invited to participate in the review. Changes recommended by the Steering Committee will be forwarded to the Tallahassee-Leon County Planning Department and to Leon County Emergency Management for consideration. The Tallahassee-Leon County Planning Department, as coordinators for the LMS process, will forward recommended revisions to the City and County Commissions for final review and determination of action as directed by the Committee Chair.

Additionally, an annual Status Report will be prepared by the City of Tallahassee's Stormwater Management Division in coordination with Leon County. This report will contain a report on the status of each mitigation initiative, including progress towards the achievement of the initiatives purpose and new developments or programs impacting the implementation of the initiative. The Steering Committee will review these annual reports to monitor the progress in meeting the established goals and objectives, as well as monitoring the implementation of the mitigation initiatives.

The Planning Department will be the lead agency for the required five-year update of the LMS. The LMS Coordinator will start preparations for this update at least 18 months prior to the expiration of the LMS. This will include meeting with the LMS Committee to lay out the process, setting up a Planning Subcommittee composed of knowledgeable members of the Working Group to review the various parts of the plan, holding regular meetings as necessary with this subcommittee, and setting up public meetings for additional stakeholder input. The Coordinator will also put a draft copy of the updated LMS on the Planning Department's website along with a description of the process and write the agenda items for both the Leon County Board of County Commissioners and the Tallahassee City Commission to adopt the updated LMS by resolution at least one month prior to the expiration of the LMS.

4.2 Coordination with other Planning Documents and Activities

The following section details past and future efforts to coordinate the LMS with other local planning mechanisms.

Tallahassee-Leon County Comprehensive Plan

The Comprehensive Plan serves as the planning document that guides development in both the City of Tallahassee and Leon County. In 2007, amendments to the Comprehensive Plan resulted in the addition of new policies and objectives based on mitigation initiatives contained in the LMS and recommendations of the LMS Committee. The Intergovernmental Coordination Element was amended to incorporate policies describing the role and function of the LMS Committee. The Conservation Element was amended to incorporate policies to increase wildfire mitigation efforts, a promoted through the LMS. Policies and objectives in the Land Use Element were amended to incorporate goals and actions prescribed in the LMS Prioritized Mitigation Initiatives List. Lastly, the Glossary was amended to add the terms 'hazard' and 'hazard mitigation' to the language and terms within the Comprehensive Plan.

If any additional changes related to hazard identification and mitigation are identified by the LMS Committee, they will be transmitted to the Planning Department through the LMS coordinator for consideration. If specific text and/or map changes are recommended or directed by the elected officials of the City of Tallahassee and/or Leon County, the Planning Department will file a text and/or map amendment to the Comprehensive Plan as part of the regular Amendment Cycle (or Out of Cycle if necessary).

Leon County Comprehensive Emergency Management Plan

The LMS Committee and staff will continue to coordinate with the Leon County Sheriff's Office and the Leon County Emergency Manager to ensure policies, programs, mitigation plan and mitigation actions are consistent between the LMS and the Leon County Comprehensive Emergency Management Plan (CEMP). Any updates to the CEMP will consider and incorporate or reference relevant hazards, proposed mitigation alternatives, and other related information. Planning Department staff are provided FEMA training through the Emergency Manager and help staff the Emergency Operations Center during disaster and training events. This coordination extends to the LMS through the Steering Committee.

Tallahassee – Leon County Post-Disaster Redevelopment Plan

The 2012 Tallahassee - Leon County Post-Disaster Redevelopment Plan (PDRP) was developed as a tool to better prepare the community for long-term recovery and redevelopment after a disaster. The PDRP identifies policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of the community after a disaster. The PDRP emphasizes seizing opportunities for hazard mitigation and community improvement consistent with the goals of the Comprehensive Plan and the initiatives of the LMS. Hazus information developed for the PDRP was incorporated into this LMS update. The PDRP is currently being updated by the Apalachee Regional Planning Council (RPC). The creation and maintenance of the PDRP is a responsibility of the Planning Department. Staff regularly coordinates with the RPC on variety of issues, including the PDRP. This coordination is ongoing.

Community Rating System

The LMS will continue to contribute to the maintenance requirements for the Community Rating System (CRS) for both the City of Tallahassee and Leon County. The City's Water Resources Engineering Division will also continue to produce an annual report on the status of the LMS and the list of prioritized mitigation initiatives. Division staff regularly coordinate on an annual basis with Planning staff, who serve as the LMS Coordinator, on the production of the annual CRS report. They are also participants in the LMS Committee. The CRS annual report is also integrated into the LMS update. If projects are completed or deleted or if new projects are identified, the LMS is modified to reflect these changes.

Land Development Code

As discussed in Section 3.2, floodplain management regulations have long been incorporated into both the City of Tallahassee's and Leon County's land development regulations, based on policies in the Tallahassee – Leon County Comprehensive Plan, and flood mitigation initiatives in the LMS and the CRS. Mitigation initiatives included in the LMS will continue to be considered as part of amending existing ordinances and regulations and in the drafting of new ordinances and regulations for inclusion in the Code.

When necessary, the Planning Department can and does recommend changes to the land development code for both the City of Tallahassee and Leon County. Planning staff regularly meet with the City's Growth Management department and the County's Development Support and Environmental Management (DSEM) department on variety of issues, including hazard identification and mitigation. Planning Department staff also manage the Leon County Water Resources Committee, which is a citizen-appointed focus group that provides input on water resources issues to DSEM.

Tallahassee Resiliency Plan

The Tallahassee Community Resilience Plan is a document intended to address underlying chronic stresses that affect our community, such as job, food, and housing insecurity, as well as acute shocks that include flooding, extreme temperatures, and significant storm events, especially as they intensify with our changing climate. This Plan was developed following Hurricane Hermine (2016) based on community input where residents expressed the need to better prepare for hurricanes and other hazards that present an increasing threat to life, property, and the environment. This document outlines various strategies to develop resiliency which will be developed consistent with the LMS.

Staff from the City of Tallahassee Sustainability & Community Preservation Department serve on the LMS Steering Committee and Working Group. This is a new level of coordination that is ongoing. The creation of the Resiliency Plan was intended to be consistent with the LMS, and the LMS in turn recognizes the Resiliency Plan. The Resiliency Plan has a suite of recommendations that will be presented to various City departments for implementation, including the Comprehensive Plan and the LMS. Staff will be meeting over the next year to coordinate these recommendations at a policy level and will bring recommended changes as appropriate to the LMS Committee for consideration.

<u>Local Government Capital Improvement Projects</u>

Previously, mitigation initiative #11 included current flood-related capital improvement projects as an important mitigation action for addressing flood-related hazards in the City of Tallahassee. In the 2015 LMS update, prioritized mitigation initiative #9 includes continuing and newly identified flood-related

capital improvement projects as an important mitigation action for addressing flood-related hazards in the City of Tallahassee and Leon County. Capital improvement projects identified by the City of Tallahassee and Leon County will continue to be incorporated into future updates to the LMS.

4.3 Public Participation

The LMS Committee acknowledges that public participation is an important part of the plan maintenance and update processes for the local mitigation strategy. All LMS Committee meetings are publicly noticed by both the City of Tallahassee and Leon County Public Information offices. Implementation of the Strategy via capital projects or grant requests requires City or County commission approval (at minimum as part of the local government budgeting process, or more routinely as a separate action) and therefore is subject to public comment. Implementation of the Strategy via changes in public policy, such as through the local comprehensive plan or ordinance typically undergo several (noticed) public hearings before being considered for adoption. In sum, planning and implementation are subject to significant public review.

Separately from the publicly noticed annual meeting of the Steering Committee (which is required by the bylaws), at least one public meeting will be noticed and held annually to solicit further input on changes to the LMS or its planning procedures. This meeting may be held in conjunction with a commission workshop or with a scheduled agenda item regarding LMS activities before either the City or the County commission.

In addition to public notification for all LMS Committee meetings, making the 2020 LMS document available to the public online allows a broader proportion of the population the opportunity to participate in the LMS planning process. Citizens can contact TLCPD staff via an e-mail link on the webpage or by telephone through the number listed on the webpage with questions, concerns or comments.

To encourage public participation and increase community knowledge regarding the current LMS update and related planning processes, a copy of the 2020 LMS will also be maintained on the

Planning Department's website (https://www.talgov.com/place/pln-mitstrat).

Lastly, to keep the public updated on the status of mitigation initiatives promoted by the LMS, each year the annual Status Report compiled by the City of Tallahassee's Stormwater Management Division will be added to the Disaster Planning webpage. This report will contain a report on the status of each mitigation initiative, including progress towards the achievement of the initiatives purpose and new developments or programs impacting the implementation of the initiative.

A draft copy of the 2020 LMS update was added to the website prior to the public meeting on March 24, 2020 to give the community time to review the draft document and attend the meeting with questions and suggestions for revisions. The final draft was posted online for at least 30 days prior to the adoption of the LMS by the City and County commissions in April 2020. After the updated LMS was approved and adopted by both the City and County Commissions, the adopted version was added to the webpage.

APPENDIX A:

LMS Adoption Resolutions

RESOLUTION NO. 20-R-14

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF TALLAHASSEE, FLORIDA ADOPTING THE UPDATED 2020 TALLAHASSEE – LEON COUNTY LOCAL HAZARD MITIGATION STRATEGY

WHEREAS, the City of Tallahassee is subject to natural and man-made hazards, such as floods, hurricanes, sinkholes, wildfires, and release of hazardous materials and these hazards affect the health and property of the citizens of the City as well as its economic viability; and

WHEREAS, businesses lose revenue when damaged or isolated by storms and homeowners are subject to evacuation, lower home values, and higher insurance premiums; and

WHEREAS, disasters also impact local government when community infrastructure such as roads, water systems and wastewater treatment plants are subject to damage and costly repair; and

WHEREAS, hazard mitigation consists of actions, such as structural enhancements, planning, code enforcement, and responsible development, taken to permanently reduce or eliminate the long-term risks to people and property from the effects of hazards; and

WHEREAS, a "Local Mitigation Strategy" can minimize the effects of hazards by the following:

1. Identifying hazards to which the City is vulnerable;
2. Determining where the City is vulnerable to these hazards;
3. Assessing facilities and structures vulnerable to hazards;
4. Preparing a prioritized list of mitigation projects;
5. Identifying sources of funding, and
6. Making hazard awareness a community goal.

WHEREAS, the City and the County participate in the development and maintenance of the Local Mitigation Strategy under an interlocal agreement; and

WHEREAS, a Local Mitigation Strategy was originally adopted by the Board of County Commissioners in September 2000, and the last update approved in May 2017; and

WHEREAS, Federal and State rules require that each local government participating in a Local Mitigation Strategy must adopt and maintain the document individually; and

WHEREAS, a Local Mitigation Strategy has been prepared for the City and the County by the Tallahassee – Leon County Planning Department.

NOW, THEREFORE, BE IT RESOLVED by the City Commission of the City of Tallahassee, Florida that:

1. The City Commission of the City of Tallahassee adopts the 2020 update to the Local Mitigation Strategy, attached hereto and incorporated therein.

2. The City Commission supports the following local hazard mitigation goals of the strategy:

    1. Protect human health, safety and welfare,
    2. Protect economic activities within the community,
    3. Enhance regional mitigation efforts,
    4. Protect community, environmental, recreational, and historic resources, and
    5. Promote the community's ability to respond to a disaster in a timely manner.

3. The Local Mitigation Strategy represents a set of goals and does not require the City Commission to affirmatively act unless and until the Commission identifies and commits the resources necessary to act.

4. As resources permit, the City Commission will pursue federal, state, and other financial and technical resources and incentives with which to implement the Local Mitigation Strategy in a cost-effective manner.

5. This resolution shall become effective immediately upon its adoption.

ADOPTED by the City Commission of the City of Tallahassee this 22nd day of April, 2020.

CITY OF TALLAHASSEE

By: _____
John E. Dailey
Mayor

ATTEST:

By: _____
James O. Cooke, IV
City Treasurer-Clerk

APPROVED AS TO FORM:

By: _____
Cassandra K. Jackson
City Attorney

RESOLUTION NO. 2020-13

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF LEON COUNTY, FLORIDA ADOPTING THE UPDATED 2020 TALLAHASSEE – LEON COUNTY LOCAL HAZARD MITIGATION STRATEGY

WHEREAS, Leon County is subject to natural and man-made hazards, such as floods, hurricanes, sinkholes, wildfires, and release of hazardous materials and these hazards affect the health and property of the citizens of the County as well as its economic viability; and

WHEREAS, businesses lose revenue when damaged or isolated by storms and homeowners are subject to evacuation, lower home values, and higher insurance premiums; and

WHEREAS, disasters also impact local government when community infrastructure such as roads, water systems and wastewater treatment plants are subject to damage and costly repair; and

WHEREAS, hazard mitigation consists of actions, such as structural enhancements, planning, code enforcement, and responsible development, taken to permanently reduce or eliminate the long-term risks to people and property from the effects of hazards; and

WHEREAS, a "Local Mitigation Strategy" can minimize the effects of hazards by the following:

1. Identifying hazards to which the County is vulnerable;
2. Determining where the county is vulnerable to these hazards;
3. Assessing facilities and structures vulnerable to hazards;
4. Preparing a prioritized list of mitigation projects;
5. Identifying sources of funding, and
6. Making hazard awareness a community goal.

WHEREAS, the City and the County participate in the development and maintenance of the Local Mitigation Strategy under an interlocal agreement; and

WHEREAS, a Local Mitigation Strategy was originally adopted by the Board of County Commissioners in September 2000, and the last update approved in May 2017,

WHEREAS, Federal and State rules require that each local government participating in a Local Mitigation Strategy must adopt and maintain the document individually.

WHEREAS, a Local Mitigation Strategy has been prepared for the County by the Tallahassee – Leon County Planning Department;

NOW, THEREFORE, BE IT RESOLVED by the Board of County Commissioners of Leon County, Florida, assembled in regular session this 28th day of April 2020, that:

1. The Leon County Board of County Commissioners adopts the 2020 update to the Local Mitigation Strategy, attached hereto and incorporated therein.

2. The Board supports the following local hazard mitigation goals of the strategy:

    1. Protect human health, safety and welfare,
    2. Protect economic activities within the community,
    3. Enhance regional mitigation efforts,
    4. Protect community, environmental, recreational, and historic resources, and
    5. Promote the community's ability to respond to a disaster in a timely manner.

3. The Local Mitigation Strategy represents a set of goals and does not require the Board to affirmatively act unless and until the Board identifies and commits the resources necessary to act.

4. As resources permit, the Board of County Commissioners will pursue federal, state, and other financial and technical resources and incentives with which to implement the Local Mitigation Strategy in a cost-effective manner.

5. This resolution shall become effective immediately upon its adoption.

DONE AND ADOPTED by the Board of County Commissioners of Leon County, Florida, on this 28th day of April 2020.

LEON COUNTY, FLORIDA

By: _____
Bryan Desloge, Chairman
Board of County Commissioners

ATTESTED BY:
Gwendolyn Marshall, Clerk of the Court & Comptroller
Leon County, Florida

By: _____

APPROVED AS TO FORM:
Chasity H. O'Steen, County Attorney
Leon County Attorney's Office

By: Chasity H. O'Steen Digitally signed by Chasity H. O'Steen
DN: cn=Chasity H. O'Steen, o=Leon County Board of County Commissioners, ou=County Attorney's Office, email=osteenc@leoncountyfl.gov, c=US
Date: 2020.05.06 14:43:30 -04'00'

APPENDIX B:

BYLAWS OF THE
TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY
STEERING COMMITTEE

BYLAWS OF THE
TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY
STEERING COMMITTEE

1.1 LMS COMMITTEE PREAMBLE

The Tallahassee-Leon County Local Mitigation Strategy Steering Committee (LMS Committee) has been created in accordance with the Code of Federal Regulations, Title 44 CFR Part 201 and Section 252.46 Florida Statutes. In compliance with these regulations, the following sets forth the Bylaws, Policies and Procedures that shall serve to guide the proper functioning of the LMS Committee. The intent is to provide guidance for the operation of the LMS Committee to ensure the accomplishment of hazard mitigation planning tasks within a cooperative framework among key institutions on a continuing basis.

1.2 LMS COMMITTEE PURPOSE AND FUNCTION

(1) Persons representing the various governmental entities, agencies, and public, private, and non-profit organizations noted herein shall be involved in the hazard mitigation planning process via the establishment of a LMS Committee.

(2) The purpose of the LMS Committee shall be to ensure the technical sufficiency and completeness of the Local Mitigation Strategy (LMS plan), associated studies, applications for disaster assistance and related funding, and to ensure coordination and consistency with applicable state, local and regional hazard mitigation plans and programs.

(3) The LMS Committee shall assist Leon County (County) and the City of Tallahassee (City) in carrying out local governments' hazard planning functions through recommendations on various issues.

(4) To carry out its function as an advisory committee to the County and the City, the LMS Committee shall:

(a) Provide review of the Local Mitigation Strategy and its updates and to make recommendations as to its need, feasibility, technical accuracy and consistency with local, state and regional plans, programs, projects and comprehensive plans;

(b) Report to the County and City regarding current and future hazard mitigation needs, applicable funding sources, and other planning issues to assist local government with achieving coordination and consistency among local Comprehensive Plan, the Comprehensive Emergency Management Plan, and regional, state, and federal hazard mitigation initiatives;

(c) Review information that is input to or produced by the LMS Planning process;

(d) Recommend policies, projects, and studies (to be undertaken by applicable staff, departments or organizations) that further the intent or directly implement federal, state or local hazard mitigation goals or objectives;

(e) Transmit to the County and City and share with other agencies or entities all significant findings and comments on hazard mitigation matters;

(f) Conduct any other functions assigned to the LMS Committee by the County or the City Commissions.

1.3 COMMITTEE MEMBERSHIP

(1) The Tallahassee-Leon County LMS Committee shall include representatives from the organizations named below concerned with the impacts of natural and man-made hazards on the health, safety and welfare of the community.

(2) There is no limit on the number of members who may serve on the LMS Committee. The addition of any new voting organizations to the LMS Committee other than those specified in these bylaws must be approved by the County and the City Commissions.

(3) The LMS Committee shall include the following voting organizations:

a. Leon County Department of Development Support and Environmental Management
b. Leon County Department of Public Works
c. Leon County Emergency Management
d. City of Tallahassee Department of Underground Utilities and Public Infrastructure
e. City of Tallahassee Fire Department
f. City of Tallahassee Police Department
g. Leon County Sheriff's Office
h. Tallahassee-Leon County Planning Department
i. Tallahassee-Leon County GIS
j. Capital Area Chapter, American Red Cross
k. Leon County Emergency Medical Services, and
l. Blueprint Intergovernmental Agency.

The following organizations shall be represented as ex-officio (non-voting) members on the LMS Committee:

a. Florida Division of Emergency Management
b. Tallahassee Memorial Hospital
c. Capital Regional Medical Center
d. Florida State University
e. Florida Agricultural and Mechanical University
f. Tallahassee Community College
g. Council of Neighborhood Associations
h. Tallahassee Area Chamber of Commerce
i. Apalachee Regional Planning Council
j. City of Tallahassee Utilities, and
k. Florida Department of Health in Leon County.

Other non-voting staff may be added pursuant to Section 1.3(2) of these bylaws.

(4) In the event that the appointed member is unable to attend a LMS Committee meeting, an alternate from that department or agency may serve as their representative at the meeting.

(5) If a member no longer wishes to serve on the LMS Committee, they shall notify the chairperson and designate a replacement who holds a position within that department or organization that either is professionally more responsible for LMS-related activities or can fairly represent the organization's stakeholder concerns in the LMS process.

(6) A person cannot be an alternate for more than one LMS Committee member.

1.4 VOTING

(1) Each Voting member of the LMS Committee may name via written notice to the chairman one (1) alternate who may vote only in the absence of that member on a one vote per member basis.

(2) Non-voting members shall sit with the same rights and privileges as other members, except that non-voting members shall not have the right to present motions or second same, or to vote upon any motions of the LMS Committee.

1.5 OFFICERS AND ELECTIONS

(1) The officers of the LMS Committee will be the Chairperson and Vice Chairperson. The officers shall be voting members elected by the LMS Committee membership.

(2) The LMS Committee Chairperson shall preside at all meetings. In the event of the Chairperson's absence or at his/her direction, the Vice Chairperson shall assume the powers of the Chairperson. In the event that neither the Chairperson nor Vice Chairperson can preside at the meeting, the committee members present shall elect one of its members to serve as acting Chairperson for the meeting.

(3) Officers shall be elected in November of each year, or in the event there is not a meeting in November, the next scheduled meeting. Nominations for officers shall be made at the meeting. Election shall be a majority vote of the LMS Committee voting members present.

(4) Newly elected officers shall assume their duties at the first meeting of the next calendar year. They shall hold office for one year, or until their successors are elected, and they shall be eligible for re-election.

(5) In the event that either the Chairperson or Vice Chairperson office becomes vacant, a replacement shall be elected by the committee at the next scheduled LMS Committee meeting and assume duties immediately and hold the position for the remainder of the calendar year.

1.6 MEETINGS AND AGENDAS

(1) The LMS Committee shall meet not less than annually. Regular LMS Committee meetings shall be held at dates, times, and places as approved by the LMS Committee. Regular meeting dates and times may be changed to accommodate holidays or for other valid reasons.

(2) There shall be an official agenda for every LMS Committee meeting. The agenda shall be prepared by the designated LMS Coordinator.

(3) Every attempt shall be made to send agenda packages to LMS Committee members seven (7) days prior to a regular LMS Committee meeting.

(4) Any LMS Committee member or alternate who is eligible to vote at the LMS Committee meeting may place additional items on the LMS Committee agenda, with the approval of the majority of the voting members or alternates present.

1.7 OFFICIAL ACTIONS

(1) All official actions of the LMS Committee shall be by motion and open vote.

(2) All official and formal positions of the LMS Committee, regardless of whether adopted or rejected, shall be recorded in the minutes. Verbatim minutes are not required but minutes shall include an accurate summary of discussions and actions taken.

1.8 CONDUCT OF MEETING

(1) All LMS Committee meetings shall be conducted under the requirements of the Florida "Government in the Sunshine" law (Chapter 286, F.S.), including applicable notice requirements, and be open to the public and press.

(2) The public will have the right to speak, enter into discussion or actively participate in any way only with the permission of the chairperson.

(3) In the absence of rules covered in this document, Roberts Rules of Order shall be followed at all LMS Committee meetings.

(4) A quorum for LMS Committee meetings shall consist of a minimum of five voting members or alternates including at least one member representing a City-only department and one member representing a County-only department.

(5) The LMS Committee must comply with Section 122.3143, F.S., "Voting Conflicts," which requires that a member who has a conflict of interest on any particular matter to declare the conflict of interest before discussion and a vote is taken and shall be excused from voting on that issue.

(6) The LMS Committee shall operate in compliance with the Standards of Conduct set forth in Section 112.313, F.S.

1.9 ADMINISTRATION

(1) The Chairperson may call an emergency (non-regular) meeting of the LMS Committee when a circumstance exists which requires immediate action by the LMS Committee. When such a meeting is called, each LMS Committee member shall be notified, stating the date, hour and place of the meeting and the purpose for which it is called, and no other business shall be transacted at that meeting. At least a twenty-four (24) hour advance notice of such emergency meeting shall be given to the public before the time the meeting is held.

(2) If after reasonable diligence it becomes impossible to give notice of an emergency meeting to each LMS Committee member, the business of the meeting may be carried out if a quorum is present and appropriate public notice has been provided.

(3) The LMS Coordinator shall be designated by the LMS Committee and shall serve as primary staff of the LMS Committee.

(4) The LMS Coordinator is responsible for the minutes of all LMS Committee meetings and all notices and agendas for the LMS Committee meetings.

(5) The LMS Committee shall operate in compliance with Florida's Public Records Law, Chapter 119, F.S.

(6) The LMS Coordinator shall transmit LMS Committee recommendations to the County, City, or other entity as applicable.

1.10 CONDUCT OF MEETING

(1) These bylaws may be amended by a two-thirds vote of those voting members or alternates present at a regularly scheduled LMS Committee meeting.

(2) Amendments to the bylaws shall become effective immediately after the approval by both the County and the City.

1.11 EFFECTIVE DATE

(1) These bylaws shall become effective immediately upon the approval by both the County and the City.

APPENDIX C:

LMS Steering Committee
Agendas & Meeting Minutes
2015-2020

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

ANNUAL MEETING

Tuesday, December 16, 2015
11:00 p.m. – 12:30 p.m.

Planning Department Conference Room
3rd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

AGENDA

1. Introductions
2. New Business
   (a) Review of December 11, 2014 minutes
   (b) Election of Committee Officers
   (c) Update on 2015 State Hazard Mitigation Plan Advisory Team (SHMPAT) meeting (DEM and Planning Staff)
   (d) Update on Tallahassee – Leon County Local Mitigation Strategy (Planning Staff)
   (e) Annual LMS Update (DEM and Planning Staff)
   (f) Open Discussion
3. Adjourn

Committee Coordinator: Steve Hodges, Senior Planner, TLCPD

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 16, 2015

Planning Department Conference Room
3rd Floor Renaissance Center

Attendees

Dave Bujak (FSU EM)
Patrick Dooley (COT EU)
Alexander Falcone (FDEM)
Ryan Guffey (DSEM)
Steve Hodges (TLCPD)
David Henry (COT UU)
Denise Imbler (ARPC)
John Kraynak (LC DSEM)
Jack Kostrzewa (CRTPA)
GW Lupton (TCC)
Gabriel Menendez (COT PW)
Kevin Peters (LCSO)
Angela Sutton (FAMU)
Scott Weisman (TLCGIS)

The meeting began at 11:00 a.m. with a quorum and introductions.

The December 11, 2014 minutes were moved by Ryan Guffey, seconded by Kevin Peters, and approved unanimously.

Kevin nominated the current chairman Gabe Menendez and vice-chairman Scott Weisman as Chair for 2016. Ryan seconded the motion, and it was approved unanimously.

Alexander Falcone from the Florida Division of Emergency Management presented an update on the annual 2015 State Hazard Mitigation Plan Advisory Team (SHMPAT) meeting. Topics covered at this meeting included an ongoing Florida Geological Survey study of sinkhole susceptibility and risk assessment; the status of the Florida Flood Risk Information System program; and ongoing mitigation grant opportunities through FDEM. No actions were taken by the Committee.

Planning staff presented an update on the Tallahassee – Leon County Local Mitigation Strategy, including that it was successfully updated as per federal requirements and was adopted in May 2015 by the Tallahassee City Commission and the Leon County Board of County Commissioners.

As part of the annual LMS update, several additional updates to the LMS were discussed and recommended by the Steering Committee. These included (1) updating Initiative #11 (Evaluate requirements and feasibility for the County's participation in the NFIP Community Rating System) since Leon County now participates in the National Flood Insurance Program; (2) adding of the Apalachee Regional Planning Council, the Leon County Department of Environmental Health, and the City of Tallahassee's Utilities department to the Steering Committee as ex officio (non-voting) members. Staff was directed to bring a set of revised bylaws back to the Steering Committee for consideration at their next meeting.

Dave Bujak of Florida State University (FSU) gave an update to the Committee on several FSU proposed emergency management projects. One of these projects was a hazardous weather

detection and monitoring system that was proposed to be added as an initiative to the list of adopted initiatives in the LMS. The Committee agreed to add it to the list of initiatives in the LMS.

The Committee adjourned at approximately 12:20 p.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on: _____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

ANNUAL MEETING

Tuesday, December 6, 2016
2:00 p.m. – 4:00 p.m.

Planning Department Conference Room
3rd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

FINAL AGENDA

1. Introductions
2. Agenda Modifications
2. New Business
   (a) Election of New Officers
   (b) Review of December 16, 2015 minutes
   (c) Proposed Addition of Leon County Department of Environmental Health, Apalachee Regional Planning Council, and City of Tallahassee Utilities to Steering Committee
   (d) Hurricane Hermine Disaster Declaration and HGMP Grant Process
      1. Review 2016 LMS Annual Report
      2. Addition or Deletion of LMS Initiatives
      3. Prioritization of LMS Initiatives and Proposed HGMP Grant Applications
3. Open Discussion
4. Adjourn

Committee Coordinator: Steve Hodges, Senior Planner, TLCPD

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 6, 2016

Planning Department Conference Room
3rd Floor Renaissance Center

Attendees
Buck Dickinson (WheelerEMC)
Patrick Dooley (COT EU)
Eric Ettens (COT)
Ned Fernandez (WheelerEMC)
Mary Fricke (Arcadis)
Mark Fuller (COTSW)
Ryan Guffey (DSEM)
Steve Hodges (TLCPD)
Jarod Jarworski (FDEM)
Kristen Kerr (COT)
Roger Lamarque (FDEM)
GW Lupton (TCC)
Robert Mills (LCPW)
Anna Padilla (LCDESM)
Kevin Peters (LCSO)
Robby Powers (COTEM)
Scott Ross (LCOFS)
Melissa Schloss (FDEM)
Todd Schroeder (FFS)
Sara Thomas (ARPC)
Scott Weisman (TLCGIS)
Jason Wheeler (WheelerEMC)
Robert Wigen (COT)
Charles Wu (LCPW)

The meeting began at 2:00 p.m. with a quorum and introductions.

Robby Powers nominated the current chair Scott Weisman as Chair, and Cherie Bryant for vice-chair, for 2017. Ryan Guffey moved the slate; Kevin Peters seconded this motion, and it was approved unanimously.

The December 15, 2015 minutes were moved by Ryan Guffey, seconded by GW Lupton, and approved unanimously.

Planning staff led a discussion of draft changes to the Committee bylaws in order to update them for the Local Mitigation Strategy (LMS). This include a motion by Robby to add the Blueprint Intergovernmental Agency to the Steering Committee as a voting member, and add the City of Tallahassee's Utility Department to the Committee as a non-voting member. Charles Wu seconded this motion, and it was approved unanimously. Following this discussion, Robby offered a motion to approve all other changes offered by staff. Charles seconded the motion, and it was approved unanimously.

Planning staff led a discussion of proposed changes to Table 3.3 in the LMS to reflect updated initiatives and their priorities. A number of motions were approved in this order:

1. Mark Fuller motioned moving Initiative #19 to #1 in priority. Robby seconded the motion, and it was approved unanimously.
2. Robby motioned eliminating Initiative #11 and joining Initiatives #24 and #25 to Initiative #10. Mark seconded the motion, and it was approved unanimously.
3. Keven Peters motioned updating Initiative #16 [now #18] to include updating the Tallahassee – Leon County Post-Disaster Redevelopment Plan. Robby seconded the motion, and it was approved unanimously.
4. Ryan motion

The Committee agreed to meet in early 2017 to review all the proposed changes to the LMS, and to consider any proposed Hazard Mitigation Grant Program projects for Hurricane Hermine disaster declaration funding as it becomes available to the community.

The Committee adjourned at approximately 3:51 p.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on:_____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING NOTICE

Wednesday, February 8, 2017
9:00 a.m. – 11:00 a.m.

Leon County Development Support
and Environmental Management
Conference Room
2nd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

FINAL AGENDA

1. Introductions
2. Agenda Modifications
3. Old Business
   (a) Review of December 6, 2016 minutes
   (b) Review and Adoption of LMS Changes (Bylaws, Initiatives, Other) Discussed at December 6, 2016 LMS Meeting
   (c) Hurricane Hermine Disaster Declaration and Hazard Mitigation Grant Program (HMGP) Grant Process
      1. Notice Of Funding
      2. Prioritization, Ranking, and Endorsement of Proposed HMGP Grant Applications
4. New Business
5. Open Discussion
6. Adjourn

Committee Coordinator: Steve Hodges, Senior Planner, TLCPD

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Wednesday, February 8, 2017

Leon County Development Support and Environmental Management
Conference Room
2rd Floor Renaissance Center

Attendees
Cherie Bryant (TLCPD)
Mathieu Cavell (LC PIO)
Jim Christie (211 Big Bend)
Patrick Dooley (COT EU)
Philip Doyle (TMH)
Eric Etters (COT)
Ned Fernandez (WheelerEMC)
Elise Fisher (FDEM)
Macy Fricke (Arcadis)
Mark Fuller (COTSW)
Theresa Heiker (LCPW)
David Henry (COT UU)
Steve Hodges (TLCPD)
Andy Johnson (LC Admin)
Kristen Kerr (COT)
GW Lupton (TCC)
Randy Nicklaus (211 Big Bend)
Nicki Paden (LC Admin)
Anna Padilla (LCDESM)
Tony Park (LCPW)
Kevin Peters (LCSO)
Robby Powers (COTEM)
Melissa Schloss (FDEM)
Todd Schroeder (FFS)
Scott Weisman (TLCGIS)
Jason Wheeler (WheelerEMC)
Robert Wigen (COT)
Charles Wu (LCPW)

The meeting began at 9:00 a.m. with a quorum and introductions.

The December 6, 2016 minutes were moved by Kevin Peters, seconded by Robbie Powers, and approved unanimously.

Following a short presentation by Planning staff on changes to the Committee's bylaws (Appendix B) and Table 3.3 (Local Mitigation Strategy Initiatives), Tony Park moved the bylaws, with the addition of the Leon County Sheriff's Office as a voting member of the LMS Steering Committee. This motion was seconded by Robert Wigen, and it was approved unanimously. Robby Powers moved the revised Table 3.3, seconded by Tony, and it was approved unanimously.

Planning staff and Ned Fernandez of Arcadis Design and Consultancy led a discussion of the various federal hazard mitigation grant programs that will be active in 2017, as well as their applicability to the local proposed hazard mitigation projects. They include the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) Program, the Community Development Block Grant – Disaster Resistance (CDBG-DR) program, and the federal Flood Acquisition Assistance (FAA) program. Given the abundance and complexity of the various grant programs and the amount of effort required to prepare hazard mitigation grant applications for the local proposed hazard mitigation projects, Tony motioned that the Committee delay the ranking of these proposed HMGP

projects. This motion was seconded by David Henry, and it was approved unanimously. Following additional discussion of the project endorsement process, Tony motioned that the Committee endorse all of the local proposed hazard mitigation projects. This motion was seconded by Robby, and it was approved unanimously.

The Committee agreed to a meeting in late March or early to mid-April to rank the proposed local proposed hazard mitigation projects. Staff committed to bring to the Committee one or more ranking methods for the Committee to consider at that meeting.

The Committee adjourned at approximately 10:45 a.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on: _____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING NOTICE

Tuesday, April 18, 2017
2:00 p.m. – 4:00 p.m.

Leon County Development Support
and Environmental Management
Conference Room
2nd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

FINAL AGENDA

1. Introductions
2. Agenda Modifications
3. Old Business
   (a) Review of February 8, 2017 minutes
   (b) Hurricane Hermine Disaster Declaration and Hazard Mitigation Grant Program (HMGP) Opportunities
      1. Notice Of Funding
      2. Ranking and Prioritization of Proposed HMGP Grant Applications
4. New Business
5. Open Discussion
6. Adjourn

Committee Coordinator: Steve Hodges, Senior Planner, TLCPD

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, April 18, 2017

Leon County Development Support
and Environmental Management
Conference Room
2rd Floor Renaissance Center

Attendees

Chad Abrams (LCEMS)
Tim Barden (LCOMB)
Jeremy Branch (WheelerEMC)
Cherie Bryant (TLCPD)
Eryn Calabro (LCOMB)
Jim Christie (211 Big Bend)
Patrick Dooley (COTEU)
Ned Fernandez (Arcadis)
Mark Fuller (COTSW)
Chief Jerome Gaines (TFD)
Blas Gomez (COTUUPI)
Charles Hargraves (Blueprint IA)
David Henry (COTUU)
Steve Hodges (TLCPD)
Denise Imbler (ARPC)
Andy Johnson (LCAdmin)
Kristen Kerr (COT)
Brian Moody (COTUUPI)
Dana Morgan (COT)
Randy Nicklaus (211 Big Bend)
Anna Padilla (LCDESM)
Tony Park (LCPW)
Kevin Peters (LCSO)
Major Lawrence Revell (TPD)
Todd Schroeder (FFS)
Sara Thomas (ARPC)
Scott Weisman (TLCGIS)

The meeting began at 9:00 a.m. with a quorum and introductions. There were no agenda modifications.

The February 8, 2017 minutes were moved by Cherie Bryant, seconded by Tony Park, and approved unanimously.

Following the endorsement by the Committee on February 8, 2017 of all of the local proposed hazard mitigation projects for Hurricane Hermine Hazard Mitigation Grant Program (HMGP) funding, Planning staff recommended that the HMGP project applications be ranked based on an ordinal ranking system developed by City of Tallahassee staff. Following discussion of this method, the Committee agreed to utilize this method and to first hear a brief summary of each HMGP project application given by the applicant. Following these summaries, the Steering Committee voting members provided their vote on each project as outline in the ranking system. The final results were as follows:

Funding Priority	Project Name or Description	Applicant
1	Improving Operational Reliability of Water Supply Well #18	City of Tallahassee
2	Providing Redundant Electrical Circuits to the Main Pump Station #PS 149	City of Tallahassee
3	Permanent Generators at Branch Libraries and Community Centers	Leon County
4	Emergency Back-up Power Generator	2-1-1 Big Bend, Inc.
5	4908 Crooked Road Property Acquisition	Leon County Development Support and Environmental Management
6	12386 Waterfront Drive Structure Elevation	Leon County Development Support and Environmental Management
7	Tallahassee Memorial Hospital Generators	Tallahassee Memorial Hospital

Chief Jerome Gaines motioned that the Committee adopt the ranking of these proposed HMGP projects. This motion was seconded by Major Lawrence Revell, and it was approved unanimously. Staff was directed to include this ranking process within the next update of the Local Mitigation Strategy.

The Committee adjourned at approximately 3:45 a.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on: _____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING NOTICE

Thursday, December 7, 2017
10:00 a.m. – 11:00 a.m.

Leon County Development Support
and Environmental Management
Conference Room
2nd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

FINAL AGENDA

1. Introductions
2. Agenda Modifications
3. Review of April 18, 2017 minutes
4. Election of Officers for 2018
3. Old Business
   (a) Status of Hurricane Hermine Disaster Hazard Mitigation Grant Program (HMGP) Grant Applications
4. Introduction and Presentation by Abena Ojetayo, City of Tallahassee Chief Resilience Officer
5. New Business
6. Open Discussion
7. Adjourn

Committee Coordinator: Steve Hodges, Senior Planner, TLCPD

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 7, 2017

Leon County Development Support
and Environmental Management
Conference Room
2rd Floor Renaissance Center

Attendees

Chad Abrams (LCEMS)
Tim Barden (LCOMB)
Cherie Bryant (TLCPD)
Buck Dickinson (Wheeler EMC)
Mark Fuller (COTSW)
Stephen Hodges (TLCPD)
Nicole King (Red Cross)
G.W. Lupton (TCC)
Abena Ojetayo (COTEM)
Anna Padilla (LCDESM)
Tony Park (LCPW)
Kevin Peters (LCSO)
Scott Ross (LC OFS)
Sara Thomas (ARPC)
Scott Weisman (TLCGIS)

The meeting began at 10:00 a.m. with a quorum and introductions. There were no agenda modifications.

The Tuesday, April 18, 2017 minutes were moved by Tony Park, seconded by Kevin Peters, and approved unanimously.

The Committee selected its officers for 2018, following its bylaw requirements. Tony motioned a slate including Chad Abrams for Chair and Cherie Bryant for Vice-Chair. Kevin seconded this motion, and it was approved unanimously.

Planning staff updated the Committee on the status of the local proposed hazard mitigation projects for Hurricane Hermine Hazard Mitigation Grant Program (HMGP) funding. There were no actions taken by the Committee on this item.

Abena Ojetayo, the City of Tallahassee's Chief Resiliency Officer, was introduced by Planning staff. Abena then made a presentation on the City's Resiliency planning process and deliverables. There were no actions taken by the Committee on this item.

The Committee adjourned at approximately 12 p.m.

Approved: _____
Chairman

Attest: _____
Stephen M. Hodges, Committee Staff

Minutes approved on: _____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Thursday, October 18, 2018
10:00 a.m. – 12:00 a.m.

Planning Department Conference Room
3rd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

1. Introductions
2. Agenda Modifications
3. Review of December 7, 2018 minutes
4. Election of Officers for 2019
3. Old Business:
   (a) Status of Hurricane Hermine Disaster Hazard Mitigation Grant Program (HMGP) Grant Applications
   (b) Update on the City of Tallahassee's Resilience Planning Project (Abena Ojetayo, City of Tallahassee Chief Resilience Officer)
4. New Business:
   (a) 2018 Flood Mitigation Assistance Grant Program Notice of Funding Opportunity
   (b) Required Five-Year Update of LMS
   (c) Hurricane Michael (https://www.fema.gov/disaster/4399)
5. Open Discussion
6. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, TLCPD

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, October 18, 2018

Planning Department Conference Room
3rd Floor, Renaissance Center
435 Macomb Street
Tallahassee, Florida

Attendees

Chad Abrams (LC EMS)
Tim Barden (LC OMB)
Eryn Calabro (LC OMB)
Patrick Dooley (COT Electric)
Mark Fuller (COTSW)
Ryan Guffey (LC DSEM)
David Henry (COT UUPI)
Stephen Hodges (TLCPD)
Andy Johnson (LC)
Dana Morgan (COT EM)
Abena Ojetayo (COT CRO)
Nicki Paden (LC)
Anna Padilla (LC DESM)
Kevin Peters (LCSO)
Lawrence Rubin (FSU Facilities)
Todd Schroeder (FFS)
Curtis Summerhoff (FSU EM)
Sara Thomas (COT EM)
Scott Weisman (TLCGIS)
Robert Wigen (COT RM)
Charles Wu (LC PW)

The meeting began at 10:00 a.m. with a quorum and introductions. There were no agenda modifications.

The December 7, 2017 minutes were moved with correction by Kevin Peters, seconded by Scott Weisman, and approved unanimously.

The Committee selected officers for 2019, following its bylaw requirements. Kevin Peters nominated Charles Wu for Chair, and Stephen Hodges nominated Abena Ojetayo for Vice-Chair. Kevin Peters motioned this slate, Stephen seconded it, and the motion was unanimously carried.

Planning staff updated the Committee on the status of the previously submitted Hazard Mitigation Grant Program (HMGP) applications submitted by the City of Tallahassee, Leon County, and 2-1-1 Big Bend, Inc. There were no actions taken by the Committee on this item.

Planning staff made a quick presentation of the status of the No actions were taken by the Committee.

Abena Ojetayo made a presentation of the City's resiliency planning project. This included a discussion of the integration of this resiliency plan into the Local Mitigation Strategy, and letting the committee know about an upcoming City of Tallahassee Resiliency Summit on October 29, 2018.

Planning staff discussed the upcoming 2018 Flood Mitigation Assistance Grant Program Notice of Funding Opportunity and encouraged Committee members to consider submitting a grant proposal for this funding. No actions were taken by the Committee.

Planning staff briefly discussed the upcoming five-year update of the Local Mitigation Strategy. No actions were taken by the Committee.

Kevin Peters discussed at length the ongoing local government activities related to Hurricane Michael and its effects on Leon County and the City of Tallahassee. The Federal Emergency Management Administration (FEMA) made a Major Disaster Declaration (DR-4399) for Hurricane Hermine on October 11, 2018. Designated Counties (Individual Assistance) include Bay, Calhoun, Franklin, Gadsden, Gulf, Holmes, Jackson, Leon, Liberty, Taylor, Wakulla, and Washington. No actions were taken by the Committee.

The Committee adjourned at approximately 11:25 p.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on: _____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Thursday, January 10, 2019
8:00 a.m. – 9:00 a.m.

Conference Room 4F 4th
Floor, City Hall
300 S. Adams Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of October 18, 2018 minutes
3. Old Business:
   (a) Status of Hurricane Hermine Disaster Hazard Mitigation Grant Program (HMGP) Grant Applications (Planning)
   (b) Status of Required Five-Year Update of LMS (Planning)
4. New Business:
   (a) Status of Hurricane Michael HMGP Program (Jason Pettus)
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Thursday, January 10, 2019

Conference Room 4F
4th Floor, City Hall
300 S. Adams St.
Tallahassee, Florida

Attendees

Chad Abrams (LC EMS)
Zach Annett (ARPC)
Tim Barden (LC OMB)
Cherie Bryant (TLCPD)
Elise Fisher (ARPC)
Jeanie Green (COT Code Enforc.)
Theresa Heiker (LC PW)
SirTeria Henderson (COT Code Enforc.)
David Henry (COT UUPI)
Stephen Hodges (TLCPD)
Helen Ash Ible (COT Grants Mgmt)
Andy Johnson (LC Admin.)
Alex Mackin (LC EM)
James Maduro, Jr. (COT GMO)
Abena Ojetayo (COT Resilience)
Anna Padilla (LC DESM)
James Payne (COT Code Enforc.)
Jason Pettus (Wheeler EMC)
Todd Schroeder (FFS)
Max Stout (COT Resource Mgmt.)
Curtis Summerhoff (FSU EM)
Scott Weisman (TLCGIS)

The meeting began at 8:00 a.m. with a quorum and introductions. There were no agenda modifications.

The October 18, 2018 minutes were moved with corrections by Abena Ojetayo, seconded by Cherie Bryant, and approved unanimously.

Jason Pettus gave a status update for the anticipated Hurricane Michael Hazard Mitigation Grant Program (HMGP) funding for Leon County and the State of Florida. The Federal Emergency Management Administration (FEMA) made a Major Disaster Declaration (DR-4399) for Hurricane Hermine on October 11, 2018. Designated Counties (Individual Assistance) include Bay, Calhoun, Franklin, Gadsden, Gulf, Holmes, Jackson, Leon, Liberty, Taylor, Wakulla, and Washington. Public Assistance reimbursements are still being calculated (which will affect the HMGP funding available to each affected county). Jason also described his work to estimate costs for the current initiatives in the Local Mitigation Strategy. There were no actions taken by the Committee on this item.

Planning staff updated the Committee on the status of the previously submitted Hazard Mitigation Grant Program (HMGP) applications submitted by the City of Tallahassee, Leon County, and 2-1-1 Big Bend, Inc. There were no actions taken by the Committee on this item.

Helen Ash Ible of the City's Grants Management office described a new software application that tracks grant opportunities and the materials necessary to submit grant applications. There were no actions taken by the Committee on this item.

Planning staff discussed the status of the upcoming five-year update of the Local Mitigation Strategy. There were no actions taken by the Committee on this item.

The Committee adjourned at approximately 10:00 a.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on:_____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Monday, August 12, 2019
9:30 a.m. – 11:00 a.m.

DSEM Conference Room
2nd Floor, Renaissance Center
435 N Macomb Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of January 10, 2019 minutes
3. Old Business:
   (a) Status of Required Five-Year LMS Update (Planning)
4. New Business:
   (a) Hurricane Michael Notice of Funding Availability (TBD)
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Monday, August 12, 2019

DSEM Conference Room
2nd Floor, Renaissance Center
435 N. Macomb St.
Tallahassee, Florida

Attendees
Chad Abrams (LC EMS)
Tim Barden (LC OMB)
Cherie Bryant (TLCPD)
Jim Christie (Big Bend 211)
Mark Fuller COT UUPI)
David Henry (COT UUPI)
Stephen Hodges (TLCPD)
Adan Jacobs (COT Resilience)
Andy Johnson (LC Admin.)
RaSarah Johnson (Talquin EC)
Alex Mackin (LC EM)
James Maduro, Jr. (COT GMO)
Abena Ojetayo (COT Resilience)
Anna Padilla (LC DESM)
Kevin Peters (LC EM)
Ben Pingree (PLACE)
Max Stout (COT Res. Mgmt.)
Curtis Summerhoff (FSU EM)
Sara Thomas (COT EM & Fire)
Scott Weisman (TLCGIS)
James Wenyon (LC EM)
Robert Wigen (COT Res. Mgmt.)
Katelyn White (FSU EM)
Wanda Whitehead (COT OGM)
Charles Wu (LC PW)

The meeting began at 9:30 a.m. with a quorum and introductions. There were no agenda modifications.

The January 10, 2019 minutes were moved with edits by Charles Wu, seconded by Abena Ojetayo, and approved unanimously.

Planning staff gave a status update for the anticipated Hurricane Michael Hazard Mitigation Grant Program (HMGP) funding for Leon County and the other affected counties in Florida. The Federal Emergency Management Administration (FEMA) made a Major Disaster Declaration (DR-4399) for Hurricane Hermine on October 11, 2018. Designated Counties (Individual Assistance) include Bay, Calhoun, Franklin, Gadsden, Gulf, Holmes, Jackson, Leon, Liberty, Taylor, Wakulla, and Washington. Public Assistance reimbursements are still being calculated (which will affect the HMGP funding available to each affected county). Staff stated that the Notice of Funding Availability for DR-4399 would be available soon according to state Division of Emergency Management staff. There were no actions taken by the Committee on this item.

Planning staff discussed the status of the upcoming five-year update of the Local Mitigation Strategy, as well as steps taken to date and the efforts to coordinate the DR-4399 projects with the update. There were no actions taken by the Committee on this item.

The Committee adjourned at approximately 11:00 a.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on:_____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Tuesday, December 3, 2019
2:00 p.m. – 4:30 p.m.

DSEM Conference Room
2nd Floor, Renaissance Center
435 N Macomb Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of August 12, 2019 minutes
3. Old Business:
   (a) Hurricane Michael Notice of Funding Availability (Planning) – Project Review & Ranking
   (b) Status of Required Five-Year LMS Update (Planning)
4. New Business:
   (a) Election of Officers for 2020
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 3, 2019

DSEM Conference Room
2nd Floor, Renaissance Center
435 N. Macomb St.
Tallahassee, Florida

Attendees

Chad Abrams (LCEMS)
Mike Alfano (TLCPD)
Tim Barden (LCOMB)
Benjamin Benedict (LCSO)
Cherie Bryant (TLCPD)
Travis Carden (COT Fleet)
Ken Cureton (LCPW)
Tatiana Daguillard (Blueprint)
Aran Dhanarajan (BBHC)
Patrick Dooley (COT Electric & Gas)
Mark Fuller (COTUUPI)
Blas Gomez (COTUUPI)
Theresa Heiker (LCPW)
David Henry (COTUUPI)
Stephen Hodges (TLCPD)
Adam Jacobs (COT Resilience)
Andy Johnson (LC Admin.)
RaSarah Johnson (Talquin EC)
Richard Jones (TFD)
Justin Kinsley (LCPW)
Shington Lamy (LC Admin)
Chris Muehlemann (LCPW)
Danielle Nesbeth (COT Electric & Gas)
Todd Notley (TFD)
Abena Ojetayo (COT Resilience)
Anna Padilla (LC DESM)
Brent Pell (LCPW)
Kevin Peters (LCEM)
Jason Pettus (Wheeler EMC)
Ben Pingree (PLACE)
Lawrence Revell (TPD)
Scott Ross (LCOMB)
Annya Shalun (Blueprint)
Jeff Shepard (COT Fleet)
Eugene Sherman (TFD)
Stacy Slavichak (FSU Facilities)
Max Stout (COT Res. Mgmt.)
Elizabeth Swiman (FSU Facilities)
Sara Thomas (COTEM & Fire)
Marie Vandenberg (BBHC)
Scott Weisman (TLCGIS)
Carol Weber (BBHC)
Robert Wigen (COT Res. Mgmt.)
Katelyn White (FSUEM)
Gary Williams (TPD)
Charles Wu (LC PW)

The meeting began at 2:00 p.m. with a quorum and introductions. There were no agenda modifications.

The August 12, 2019 minutes were moved by Anna Padilla, seconded by Chad Abrams, and approved unanimously.

Planning staff presented information regarding Hurricane Michael Hazard Mitigation Grant Program (HMGP) funding for Leon County and the other affected counties in Florida. The Federal Emergency Management Administration (FEMA) made a Major Disaster Declaration (DR-4399) for

Hurricane Hermine on October 11, 2018. Designated Counties include Bay, Calhoun, Franklin, Gadsden, Gulf, Holmes, Jackson, Leon, Liberty, Taylor, Wakulla, and Washington. At this time, the Notice of Funding Availability has been released, which includes available HMGP grant funds by county.

Based on previous direction from the Committee, Planning staff asked all applicants to prepare a short presentation, including estimated costs, for each project the Committee would be asked to consider. The Committee heard the presentations and asked questions of the applicants following their individual presentations. After the presentations were heard, the Committee discussed several methods to rank 36 potentially eligible projects. The methods discussed included the ranking method previously used for Hurricane Hermine HMGP funds, and a method proposed by staff. Following this discuss, Ben Pingree motioned that the voting members of the Committee individually score each project on their own with a unique number of points from 1-36 (36 being the highest ranked project) and return their scores to Planning staff by the close of business on Friday, December 6, 2019 for tabulation and ranking. As part of the discussion prompted by the motion, Ben suggested that the criteria for ranking these projects include the anticipated impact of the project, potential reduction of risk to life and property, the estimated cost, the proposed ranking of multiple projects submitted by a single applicant (as proposed by the applicant), and other information presented by the applicants. Chad Abrams seconded the motion, and it passed unanimously. Staff was then directed to schedule another meeting of the LMS Committee on December 17, 2019 so that they can review and ratify this preliminary ranking of the proposed projects, and then endorse all or some of these projects.

Planning staff discussed the status of the ongoing five-year update of the Local Mitigation Strategy, as well as steps taken to date and the efforts to coordinate the DR-4399 projects with the update. Staff asked the Committee for direction to submit a draft copy of the LMS to the state Division of Emergency Management.

The Committee was asked by staff to nominate a new LMS Committee Chair and Vice -Chair for 2020 as required by the LMS bylaws. Ben motioned that Brett Pell and Abena Ojetayo be nominated as Chair and Vice-Chair respectively. David Henry seconded the motion. Following discussion, the motion was passed by the Committee with Brett Pell voting against it.

RaSarah Johnson asked the Committee to consider adding Talquin Electric Cooperative to the Committee. The Committee discussed this proposal, and then asked staff to put this on the agenda for December 17th. The Committee adjourned at approximately 4:30 p.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on: _____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Tuesday, December 17, 2019
1:00 p.m. – 3:00 p.m.

DSEM Conference Room 2nd
Floor, Renaissance Center 435
N Macomb Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of December 3, 2019 minutes
3. Old Business:
   (a) Hurricane Michael Notice of Funding Availability (TBD)
4. New Business:
   (a) Consideration of New Committee Members
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 17, 2019

DSEM Conference Room
2nd Floor, Renaissance Center
435 N. Macomb St.
Tallahassee, Florida

Attendees

Chad Abrams (LCEMS)
Mike Alfano (TLCPD)
Beg Baldwin (Refuge House)
Tim Barden (LCOMB)
Benjamin Benedict (LCSO)
Holly Bernardo (CESC)
Brian Bradshaw (FDEM)
Cherie Bryant (TLCPD)
Tatiana Daguillard (Blueprint)
Gena Dozier (CCYS)
Mark Fuller (COTUUPI)
Blas Gomez (COTUUPI)
David Henry (COTUUPI)
Stephen Hodges (TLCPD)
Spencer Ingram (Miracle Hill)
Andy Johnson (LC Admin.)
RaSarah Johnson (Talquin EC)
Danielle Nesbeth (COT Electric & Gas)
Abena Ojetayo (COT Resilience)
Anna Padilla (LC DESM)
Brent Pell (LCPW)
Kevin Peters (LCEM)
Jason Pettus (Wheeler EMC)
Ben Pingree (PLACE)
Lawrence Revell (TPD)
Eugene Sherman (TFD)
Sylvia Smith (BBHC)
Max Stout (COT Res. Mgmt.)
Sara Thomas (COTEM & Fire)
Sharon Tyler (Red Cross)
Robert Wigen (COT Res. Mgmt.)
Charles Wu (LC PW)

The meeting began at 1:00 p.m. with a quorum and introductions. There were no agenda modifications.

The December 3, 2019 minutes were moved by Chad Abrams, seconded by Abena Ojetayo, and approved unanimously.

Planning staff summarized information regarding Hurricane Michael Hazard Mitigation Grant Program (HMGP) funding for Leon County and the other affected counties in Florida. The Federal Emergency Management Administration (FEMA) made a Major Disaster Declaration (DR-4399) for Hurricane Hermine on October 11, 2018. Designated Counties include Bay, Calhoun, Franklin, Gadsden, Gulf, Holmes, Jackson, Leon, Liberty, Taylor, Wakulla, and Washington. At this time, the Notice of Funding Availability has been released, which includes available HMGP grant funds listed by the designated counties.

Spencer Ingram, representing the Miracle Hill Nursing and Rehabilitation Center in Tallahassee, asked the Committee to consider adding a request for HMGP grant funds to acquire a permanent

power generator to the list of projects the Committee is considering for endorsement and prioritization. The Committee asked questions of Mr. Ingram and discussed this proposed project.

The Committee then discussed the proposed list of projects and their proposed prioritization. The voting Steering Committee members, based on direction given to Planning staff from the December 3, 2019 meeting, had been previously requested to prioritize the list of proposed projects using criteria including the anticipated impact of the project, potential reduction of risk to life and property, the estimated cost, the proposed ranking of multiple projects submitted by a single applicant (as proposed by the applicant), and other information presented by the applicants. Staff then compiled these individual scores into a master spreadsheet which was distributed to the Committee at this meeting. These included estimated costs that were described by staff as "not to exceed" cost figures.

The Committee members then discussed this list of projects at length. Following this discussion, Ben Pingree motioned that the Committee endorse the proposed Miracle Hill project and add it to the bottom of the existing list of proposed HMGP projects and endorse and accept the ranked projects as presented by staff. Andy Johnson seconded the motion, and it passed unanimously.

Following this motion, it was noted by the Committee that six projects were noted to have similar scores. (There were three pairs that had similar scores.) The Committee agreed to rank order these similarly-scored projects. This modified rank ordering was motioned by Andy Johnson, seconded by Benjamin Benedict, and it passed unanimously. Staff then committed to provide an endorsement letter for all HMGP applicants based on the endorsement and ranking of all the projects presented.

Planning staff then discussed the status of the ongoing five-year update of the Local Mitigation Strategy, as well as steps taken to date and the efforts to coordinate the DR-4399 projects with the update. As part of this discussion, staff proposed the addition of several local organizations to the Steering Committee, including Talquin Electric Cooperative to the Committee. Ben Pingree asked staff to research similar communities in Florida to analyze the composition of these other steering committees and to provide that information to the Committee and Ben for consideration.

The Committee adjourned at approximately 2:45 p.m.

Approved: Attest:

_____ _____

Chairman Stephen M. Hodges, Committee Staff

Minutes approved on:_____

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Thursday, February 20, 2020
10:00 p.m. – 12:00 p.m.

Gathering Room
Leon County Division of Facilities Management
1907 South Monroe Street
Tallahassee, Fl 32301

1. Introductions
2. Agenda Modifications
3. Review of December 17, 2019 minutes
3. Old Business:
   (a) Priority List of Proposed Hurricane Michael HMGP Projects
   (b) Status of Five-Year LMS Update (Planning)
4. New Business:
   (a) TBA
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

APPENDIX D:

Local Government Stormwater Management
Capital Improvement Projects

Leon County Stormwater Management Capital Improvement Projects, FY2015-2019.[1]

FY 2015 - 2019 Capital Projects	Cost ($)	Current Status
Autumn Woods Drainage Improvements	1,030,000	Design/Permitting
Baum Road Drainage Improvements	230,000	Planning
Gum Road Target Planning Area	5,348,474	Planning
Killearn Acres Flood Mitigation	752,361	Planning
Killearn Lakes Plantation Stormwater	2,194,408	Planning and construction
Lake Henrietta Renovation	390,000	Planning
Lake Heritage Outfall	900,000	Construction
Langley Circle	300,000	Planning
Lexington Pond/Fords Arm South	4,822,953	Planning
Longwood Outfall Retrofit	223,578	Planning
Maylor & Taylor Roads	320,000	Planning
Raymond Tucker Road/Golden Pheasant	1,910,000	Permitting
Robinson Road Flood Improvements	350,000	Design
Southbrook/Otter Creek/Chadwick Way	125,000	Construction
Stormwater Structure Inventory & Mapping	757,514	Survey
Total	**$19,654,288**	
1991 Stormwater Master Plan		
Fred George - North Creek Wetland Restoration	303,000	Planning
1994 Stormwater Master Plan		
Baum Road at Capitola Road	640,000	Planning
Benjamin Chaires Road	245,000	Planning
Buck Lake Road (east of Baum Road)	160,000	Planning
Buck Lake Road (Baum to Benjamin Chaires)	500,000	Planning
Chaires Crossroad	7,900,000	Planning
Crump Road Drainage Improvements	975,000	Planning
Jefferson Road	1,300,000	Planning
Moccasin Gap Road	115,000	Planning
N. Miccosukee Road	723,000	Planning
Veterans Memorial @ US 90	1,300,000	Planning
Wadesboro Road	180,000	Planning
Total	**$14,038,000**	
2009 Stormwater Master Plan		
Alford Arm @ CSX Railroad	2,820,000	Planning
Clydesdale	800,000	Planning
Earls Slough	260,000	Planning
Franklin Oaks/Moore Woods/etc. (west of Wakulla Springs)	7,800,000	Planning
Imaginary Road	130,000	Planning
Liberty Ridge Wild Cherry/etc. (east of Wakulla Springs)	12,690,000	Planning
Louvenia Court	1,000,000	Planning

[1] Leon County Public Works, 2019.

FY 2015 - 2019 Capital Projects	Cost ($)	Current Status
Sir Richard Road	200,000	Planning
Surrey Farms subdivision	180,000	Planning
Tung Grove Road	1,500,000	Planning
Total	**$27,380,000**	
Other		
2012 Killearn Lakes Plantation Stormwater Plan	9,000,000	Planning

City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2018 Progress Report - Attachment

Table 1: City of Tallahassee Drainage Improvement Projects

The City has identified the following 16 drainage improvement projects in its current Capital Improvement Program (FY2018-2022). The estimated cost of these projects totals $94,739,630.

Project	Cost ($)	Prior Year	Current Status
Downtown Stormwater Master Plan	850,000	Analysis	Analysis
Frenchtown Stormwater Master Plan (1)	12,145,400	(see note 1 below)	(see note 1 below)
Inglewood Stormwater Improvements	1,485,300	Construction	Construction
Lower Central Drainage Ditch (2)	12,450,050	Design/ Construction	Design/ Construction
Madison-Gaines St. Stormwater Outfall	7,250,000	Construction	Complete
Maclay Boulevard Stormwater Facility (2)	13,800,000	Design/ Construction	Design/ Construction
McCord Pond Drainage Ditch Improvements Project	5,500,000	n/a	Preliminary Engineering
Medium Stormwater System Imprv. (3)	12,000,000	New	(see note 3 below)
Meginnis Arm LOMR	225,000	FEMA Review	Complete
Northeast Ditch Tributary 2 Flood Study	120,000	FEMA Review	FEMA Review
Pensacola Street Stormwater Outfall (2)	1,200,000	n/a	Design
Rainfall and Stream Gauging	2,251,861	Data gathering	Data gathering
Royal Oaks Creek	5,650,000	Design	Design/ Construction
Small Projects Initiative (see below)	750,000	See Table 2 below	See Table 2 below
Stormwater Infrastructure Inventory and Mapping	3,360,000	Data gathering	Data gathering
South City – Country Club Creek & East Ditch LOMR	3,300,000	Preliminary Design	Final Design
Total	**82,337,611**		

Notes:
1. The Frenchtown Stormwater Project has been segmented into multiple phases. Nine phases have been constructed while other phases are in various stages of implementation.
2. These projects have been segmented into multiple Phases in various stages of implementation.
3. The Medium Stormwater System Improvement Project funds the construction of multiple small to medium sized projects, some of which are listed under the Small Projects Initiative (SPI) project list (Table 2).

Table 2: City of Tallahassee Drainage Improvement Projects - Small Projects Initiative – Current & Planned Projects

Project	Prior Year Activity	Status
3244 Shannon Lakes	Completed	N/A
903 Beard Street	Completed	N/A
Limerick Drive Outfall	Shelved	N/A
1423 Devils Dip	Under Construction	Completed
1829 Ivan drive	Completed	N/A
3033 Shamrock South	Design	Under Construction
Gwen Street	Study	Study
Limerick Drive (near 2220 Limerick Drive)	Construction	Completed
Tory Sound	Construction	Completed
Arkansas Street	Design	Design
Lee Avenue	Shelved	N/A
Short Street	Design	Construction
Sauls Street	Completed	N/A
Glendale Drainage Improvements	Design	Design
1125 Seminole Drive	Shelved	N/A
Longstreet/Pickett Court	Shelved	N/A
Breckenridge on Park	Study	Design
Atchena Nene Drainage Improvements	Study	Design
Adams Street and College Avenue Drainage Improvements	Completed	N/A
2494 Elfinwing Lane & 3753 Swallowtail Trace	Study	Design
Brandon Hill Drive Drainage Improvements	Study	Study
University Park Drainage Improvements	Completed	N/A
Rosemary Terrace Flood Relief	Study	Study
Olson Road Stormwater Outfall Improvements	Design	Design
806 Ridge Road	Design	Completed
1121 and 1123 Clay Street	Design	Design

City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2018 Progress Report - Attachment

Project	Prior Year Activity	Status
Fermanagh Drive Curb Inlet Modifications	Study	Study
Chestwood Avenue	Study	Study
Pinewood Drive – Delta Office Park Stormwater Outfall	Study	Design
1528 and 1526 Blountstown Street	Future	Complete
Pine View / Pine Forest Drainage Improvements	Future	Study
227 Palmer Avenue East	Future	Future
2216 Tallahassee Drive	Future	Study
2280 & 2328 Sandpiper St	Future	Future
1930 E Indian Head Drive	Future	Future
1514 Chowkeebin Nene	Future	Future
3713 Sulton Court, 548 Maclay Road	Future	Future
2027 Holmes St, 2016 Warwick St	Future	Future
1312 Pepper Drive Land Acquisition		Complete
1327 Linda Ann Drive		Design
3701 Aksarben Street		Study

Note: All "Small Projects Initiative" projects that are listed as "On Hold" have been recommended for construction and are awaiting implementation. SPI projects listed as "Future" are planned in the SPI program and are planned to be implemented in the order listed.
SPI projects listed as "Integrated" are included as a component or part of a major capital improvement project.

APPENDIX E:

2019 Annual CRS Report

City of Tallahassee
Your Own Utilities℠

Water Resources Engineering | 300 S. Adams St., Box-35 | Tallahassee | Florida | 32301 | 850.891.6155

MEMORANDUM

TO: Reese Goad, City Manager
City of Tallahassee

THROUGH: Wayne Tedder, AICP Assistant City Manager
City of Tallahassee

THROUGH: Jennifer E.C. Porter P.E. CPM, Interim General Manager
Underground Utilities & Public Infrastructure

FROM: John Buss, Assistant General Manager
Underground Utilities & Public Infrastructure

DATE: April 25, 2019

SUBJECT: FEMA COMMUNITY RATING SYSTEM
Local Mitigation Strategy Progress Report

Attached is a progress report on the City of Tallahassee/Leon County Local Mitigation Strategy Initiative. This report was prepared by the Water Resources Engineering Division to meet requirements of the Community Rating System (CRS) annual recertification. Because of the City participation in the CRS program, Tallahassee floodplain property owners receive up to 20% discount on their flood insurance premiums.

The report contains a review of each item in the Local Mitigation Strategy Initiatives including statements discussing how much has been accomplished to date as well as discussion of why any objectives have not been reached. To meet the annual recertification requirements, please forward this memorandum with the report to the City Commission. The attached report will be released to the media and made available to the public. No action is required by the Commission. This is for informational purposes only.

JMB/mf
Attachments

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(1) Continue to identify needs for improving the disaster resistance of critical facilities.	Critical facilities provide essential services in the event of an emergency but may be housed in structures that require improvements to weather the impacts of a disaster. Improvements may include, but not be limited to, installing storm shutters, moving utilities underground, and acquiring or retrofitting generators, pumps, and associated appurtenances and/or connections for traffic signals, sewage pump stations, water well pump stations, and emergency shelters. Status: The Local Mitigation Strategy Steering Committee continues to work to identify additional security measures to protect critical facilities within the community. The City has installed extra security measures at certain critical facilities throughout the City. The North Florida Regional Domestic Security Task Force is provided funding to address K-12, Universities, Court houses and communications towers, funding is still needed to protect utilities. There is increased emphasis on identifying needs for improving critical facilities and monitoring since Hurricane Hermine on September 2, 2016 and Hurricane Michael October 10, 2018. Several sewage pump stations (#12, #74) have been replaced, some backup generators have been obtained, other electrical lines to critical facilities have been moved underground, a new water well is on line (#32), and redundant force mains have been installed. Additional funding needs have been identified for generators to operate, traffic signals, sewage pump stations, water well pump stations and emergency shelters such as schools, public community centers and libraries. There are approximately 150 key overhead main circuit lines, and these frequently serve medical, public safety and other critical facilities. A local committee outlines certain items to be purchased, and some funding is coordinated through the Regional Domestic Security Task Force (RDSTF). However, available funding for this initiative is decreasing.	Flooding, Hurricanes & Tropical Storms, Storm Surge/ Tsunami, Energy Failures/ Disruptions	High/Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee & Leon County	HMGP (Florida Division of Emergency Management (EM)); Community Development Block Grant (Department of Economic Opportunity (DEO)); Regional Domestic Security Task Force (RDSTF) (Department of Homeland Security (DHS))

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(2) Increase intergovernmental coordination in the area of stormwater management.	Stormwater does not follow jurisdictional boundaries. Land use activities in the City can affect drainage characteristics outside municipal boundaries and, to a lesser extent, vice versa. In the past, stormwater management opportunities have been constrained by fiscal concerns and the impacts of significant amounts of pre-code development. These factors necessitate strong intergovernmental coordination for stormwater management efforts to be effective. Status: Intergovernmental Stormwater management coordination is currently accomplished through several initiatives including countywide land development ordinance, Blueprint 2000 intergovernmental agency Stormwater improvement projects and Local Mitigation Strategy Steering Committee meetings. In addition, the City and County are currently working with the Northwest Florida Water Management District to improve the accuracy of the Flood Insurance Rate Maps through the Risk Map program, which is funded by FEMA. The City has shared stormwater model data with the North West Florida Water Management District (NWFWMD) to assist in the county wide Special Flood Hazard Area remapping effort.	Flooding	Low/ Continuing	City Underground Utilities & Public Infrastructure and County Public Works; City and County Commissions	City of Tallahassee& Leon County	Local
(3) Improve the disaster resistance of existing site built housing stock.	Build upon current CDBG, HOME and SHIP programs to improve the disaster resistance of existing site built housing stock, including elevating structures where feasible. Status: The Capital Area Chapter of the American Red Cross continues to provide educational programs to low income population on how they can be disaster resistant and be part of the Ready Rating Program. http://www.readyrating.org/	All	High/ Continuing	Tallahassee Economic & Community Development, Leon County Housing and Human Services; Capital Area Red Cross	City of Tallahassee& Leon County	CDBG Program, SHIP, HOME, HMGP, and FMAP; Repair and Restoration of Disaster Damaged Historic Properties (FEMA); National Flood Mitigation Fund (FEMA); Emergency Advance Measures for Flood Prevention (U.S. COE)

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(4) Advocate that FEMA modify its policies to accommodate local floodplain management program requirements to avoid the frequent necessity for duplicate, and sometimes conflicting, modeling for NFIP purposes.	Tallahassee and Leon County have advanced stormwater regulations and require sophisticated digital modeling. FEMA is slow to review/approve new modeling software or even more current versions of previously approved software. As a result, local communities frequently are faced with having to do advanced modeling for design and local permitting and then duplicate modeling with the FEMA-approved software list for NFIP purposes. Status: The City of Tallahassee and Leon County continue to cooperate with the Northwest Florida Water Management District through a Cooperating Technical Partnership with FEMA, which will be instrumental in accomplishing this goal. The City and County attended the Apalachee Bay Saint Mark River Watershed Discovery Meeting for updating the FEMA flood maps for the Saint Marks Basin. The City of Tallahassee has provided a map of areas to be reviewed to FEMA. The City of Tallahassee has worked with stormwater model providers to endorse modeling programs that have been added to the list of FEMA accepted stormwater models.	Flooding	Low/ Continuing	City of Tallahassee Underground Utilities & Public Infrastructure and Leon County Public Works; Leon County Development Support and Environmental Management (DSEM)	City of Tallahassee& Leon County	Local

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(5) Improve floodplain boundary identification and implementation of the FEMA map amendment process.	Efforts would focus on correcting inaccuracies in FEMA flood hazard boundaries. These boundaries are used for insurance purposes and frequently increase rates for residents that are clearly not in the floodplain. Other citizens use this information to guide property purchases and find out they are susceptible to flooding despite lying outside the hazard areas of a FIRM. This initiative would require the hiring of sufficient personnel to identify and prepare map amendments and expand the existing floodplain database to include best available information, such as permitting models, for incorporation into a GIS. Besides providing better data that could reduce insurance rates and improve decisions regarding property purchases, this information could guide acquisition efforts. Status: The City and County are currently working with the Northwest Florida Water Management District (NWFWMD) to improve the accuracy of the Flood Insurance Rate Maps through the Risk Map program, which is funded by FEMA. Once complete, it is expected that FEMA will issue updates to the FIRM, which will improve the accuracy of the depiction of Special Flood Hazard Areas for the community. The City has provided several stormwater models and high-water elevations to NWFWMD.	Flooding, Storm Surge/ Tsunami	Medium/ Continuing	City of Tallahassee Growth Management and Underground Utilities & Public Infrastructure, DSEM, Leon County Public Works; Tallahassee-Leon MIS/GIS	City of Tallahassee& Leon County	EMPA Trust Fund (DEM); Small Watershed Program (USDA); Emergency Advance Measures for Flood Prevention (Army Corps); Resource Conservation and Development Program (USDA); Soil and Water Conservation Program (USDA); National Flood Mitigation Fund (FEMA)
(6) Explore methods to eliminate additional development in the 25-year floodplain.	This initiative aims at keeping new buildings from the highest risk area of the floodplain, and might include an acquisition effort targeting undeveloped lots. Status: The City of Tallahassee, Growth Management Department continues to consider new ordinance language to accomplish this goal.	Flooding	High/ Continuing	City of Tallahassee Growth Management and DSEM, Tallahassee-Leon County Planning	City of Tallahassee& Leon County	Local

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(7) Create a public education campaign and community program that promotes awareness of vulnerability to hazards in our community and encourage disaster preparation.	Status: : Capital Area Chapter of the American Red Cross has developed the "Ready Rating Program." The program is designed to mitigate the impact of various disasters by educating residential and commercial property owners on personal actions they can take to reduce the effects of a disaster (such as removing dead limbs, putting up shutters / plywood, creating a safe room in your house/business, etc.). The City, Red Cross and County hosted an annual "Build a Bucket" disaster fair focusing on the community's vulnerability to various disasters and possible mitigation techniques, including wildfire mitigation actions developed by the Florida Forest Service. The fair could be hosted annually as a stand-alone event and integrated into other community events throughout the year. This strategy would address creating a safe room within the home, general home protection procedures, etc. Leon County Emergency Management also supports NOAA's Weather Ready Nation initiative. NOAA's Weather-Ready Nation initiative is first and foremost to save more lives and livelihoods. By increasing the nation's weather-readiness, the country will be prepared to protect, mitigate, respond to and recover from weather-related disasters. As part of the Weather-Ready Nation initiative, NOAA, along with partners, wants to motivate individuals and communities to take actions that will prepare them in the event of a weather disaster and to share their preparedness steps with others. These actions can save lives anywhere - at home, in schools, and in the workplace before tornados, hurricanes, and other extreme types of weather strike.	All Hazards	Low/ Continuing (for Repetitive Flood Loss Property Owners, Owners of Property in Floodplain, and Utility billing educational inserts)	City of Tallahassee and Leon County Emergency Management; Capital Area Red Cross	City of Tallahassee& Leon County	EMPA Trust Fund (DEM)
(8) Continue current efforts to remove dead, dying or diseased trees or branches next to roadways and power lines.	Debris from storm events poses a hazard to overhead power lines and roads. Status: Existing City Electric utility tree trimming policy is to trim all vegetation back to 6 feet from existing power lines an 18-month cycle. Commission approved policy allows neighborhoods with high rates of outages due to vegetation to request additional clearance up to 10 feet from existing power lines. In 2017, the City started an enhanced tree trimming program cutting 12' above the electric lines. The City has been designated as a "Tree City"	Hurricanes & Tropical Storms, Tornados, Thunderstorms, Exotic Pest Infestations, Drought	High/Continuing	City of Tallahassee Underground Utilities & Public Infrastructure and Leon County Public Works, City Electric Utilities and Talquin Electric	City of Tallahassee& Leon County	Local

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	USA and "Tree City Growth" USA for 2018. Significant tree clearing has been done before, during and after Hurricane Michael 10/10/18.					
(9) City of Tallahassee and Leon County flood-related capital improvement projects.	Status: Numerous stormwater projects have been identified as necessary to provide relief to existing flood problems. A complete list of projects for the City of Tallahassee are included in Table-1 &Table-2 attached.	Flooding/ Tsunami	High/Continuing	City of Tallahassee Underground Utilities & Public Infrastructure and Leon County Public Works	City of Tallahassee& Leon County	CDBG (DEO); HMGP (DEM); Emergency Bank Protection (Army Corps); STP (ISTEA); Sustainable Development Challenge Grants (EPA); National Flood Mitigation Fund (FEMA); Soil and Water Conservation (USDA); Resource Conservation and Development (USDA); Small Watershed Program (USDA)
(10) Acquire parcels subject to flooding in the 100-year floodplain.	This initiative builds on past City/County floodplain acquisition efforts and would be enhanced by improved information developed through Initiative #5. Acquisitions would target improved parcels with the most vulnerable structures. Status: The City and County continue to evaluate potential acquisition projects and possible funding sources for property acquisitions within the 100-year floodplain. Many parcels within the 100-year floodplain have been purchased by the City of Tallahassee and Leon County during previous years to provide flood relief to flood prone property owners. Some of these acquisition projects were entirely funded using local dollars. Others were funded through state and federal programs while also making use of local matching funds. Examples of these programs include the Flood Mitigation Assistance Program and the Hazard Mitigation Grant Program, both of which are FEMA programs administered by the Florida Division of Emergency Management. The City of Tallahassee has	Flooding, Hurricanes & Tropical Storms, Storm Surge/ Tsunami	High/Continuing	City of Tallahassee Underground Utilities & Public Infrastructure; Leon County Public Works; Tallahassee - Leon County Planning	City of Tallahassee& Leon County	Florida Communities Trust; HMGP

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	recently purchased and exchanged floodplain property near Texas Street.					
(11) Develop and maintain emergency notification systems for all hazards and critical facilities.	Emergency notifications and warnings are essential to protecting lives and property. Immediate notification to a specific area is critical during rapidly developing situations such as tornados, hazardous material releases, and flash and other flooding events. This system can also be used to inform residents of utilities issues such as boil water notices, power outages, sewer issues, Amber Alerts and more. Status: Both the City of Tallahassee and Leon County have developed communications departments that also regularly send out public notifications via press releases, social media, and institutional websites. In addition to these capabilities, there are several warning systems already in place within Leon County and the City of Tallahassee. For instance, the Federal Emergency Management Agency, Federal Communications Commission, and the Wireless Communications Industry launched the Wireless Emergency Alert (WEA) system in 2013. This system sends concise, text-like messages to WEA capable mobile devices. Wireless providers, representing 97% of subscribers, are participating in distributing Wireless Emergency Alerts. Mobile users will not be charged for receiving these text-like alerts and are automatically enrolled to receive them. Wireless Emergency Alerts are a point-to-multipoint system, which means alert messages will be sent to those within a targeted warning area, unlike text messages which are not location aware. Wireless Emergency Alerts distributed by the National Weather Service include: Tornado Warning, Extreme Wind Warning, Flash Flood Warning, and Hurricane Warning. There are several flood-warning networks in place throughout the City and County, including a telephone-based warning system at the Lake Talquin Dam, and the Capital Area Flood Warning Network and the City of Tallahassee's Rainfall Data Telemetry System. The Capital Area Flood Warning Network and the City of Tallahassee Rainfall Data Telemetry System provide	All Hazards	Medium/Continuing	Leon County, City of Tallahassee, Emergency Management; Law Enforcement, Fire and Health; FSU; FAMU; TCC	City of Tallahassee& Leon County	HMGP (DEM); National Flood Mitigation Fund (FEMA)l U.S. Department of Homeland Security

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	real-time rainfall totals and water levels at key points within the community. Emergency Management Officials can then use this information during major storm events to identify potential areas of flooding. *Leon County* Leon County utilizes the internet website to post all-hazards emergency public information for use by citizens and the media during emergency events. They also utilize a subscription service (powered by GovDelivery) available at the Leon County website for citizens to sign up for all-hazards emergency notifications, traffic notifications, as well as general Leon County government announcements. Notifications are available via email and SMS. During an emergency, Leon County Emergency Management staff can broadcast live through an electronic link on WFSU-88.9 FM. This provides full radio coverage throughout Leon County and the surrounding area as a primary resource for emergency and public safety information. From local government's experiences with Hurricane Hermine, County emergency management staff has recommended that WFSU be designated as a critical facility, that EOC personnel be tasked to report this information, and to review and upgrade if necessary the existing telecommunications link with WFSU (88.9 FM) located in the Public Safety Complex. An additional recommendation includes considering providing WSFU's video production support (satellite uplink, etc .) to media partners in the Public Safety Complex in order to broadcast briefings and community updates. *City of Tallahassee* The City of Tallahassee's Water Quality Administration has initiated a remote detection system to determine the status and condition of the potable well facilities. This system achieves the goal of an audible alarm system for our potable water system. The Thomas P. Smith wastewater treatment plant on Springhill Road has a separate monitoring system with audible alarms for all equipment. The SCADA system monitors for potential chemical and gas leaks with audio and visual alarms.					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	COT Electric Utility staff maintains a list of email and phone numbers for residents downstream of the Corn Hydro Facility (i.e., Lake Talquin Dam). This list enables automatic email and phone distribution of either early warning of flooding due to know events upstream or emergency notification of rapidly developing events. Additionally, an emergency siren exists at the dam for boaters and residents in the immediate downstream area. These systems are tested on a quarterly basis and worked well during Hurricane Hermine and Hurricane Michael. *Tallahassee Community College* Tallahassee Community College (TCC) utilizes an Emergency Notification System called TCC Alert. System components include: • RAVE emergency reporting software sends messages to classroom phones, personal phones including text messages, E-mails and computer screen pop-ups for all campus computers. • Federal Signal Outdoor Siren System / Audible Messages • Captiveyes T.V. monitors screen pop-ups located throughout the campus *Florida State University* The Florida State University (FSU) Alert emergency notification and warning system (http://emergency.fsu.edu/services/FSUAlert) at provides 35+ methods of delivery, single-button activation, and end-user delivery in 5 minutes or less. The university continues to develop and improve the system with expanded coverage, new interoperable communications technologies, and redundancies to ensure operability at all times under all conditions. FSU recently added capabilities to issue emergency alerts and share response information through a new mobile app called SeminoleSAFE. The FSU ALERT EZ system allows for single-button activation and streamlines warning and notification to 3-5 minutes or less in the most extreme situations. FSU has identified locations on its campus prone to flooding with associated personal injury and property					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	damage. University emergency management staff has proposed to install flood detection equipment in several key locations on its campus and integrate these stations into the FSU ALERT emergency notification and warning system. This Flood Detection and Warning system will require additional funding to implement. FSU has proposed a regional lightning mapping array (LMA). This regional lightning detection and warning system would provide all public and non-profit entities in the region advanced warning of the potential of a lightning strike, followed by active monitoring capabilities once lightning is occurring. With advanced warning, detection and monitoring capabilities, the goal is to mitigate the risk to life and property from lightning strikes. FSU is exploring various possibilities for support. A local company, WeatherSTEM, has partnered with Florida State University, Tallahassee Community College, Florida A&M University, Leon County Schools and others to install forty-three weather stations throughout Tallahassee-Leon County. This regional weather MESONET of weather stations allows the general public and others the opportunity to enroll in personal notifications of a variety of weather conditions, including lightning. The system provides a Professional Lightning Advisor (PLA) feature which allows people to monitor an ongoing lightning threat and determine when it is safe to resume normal activities. Additional stations and system features are in continual development. *Florida Agricultural and Mechanical University* The Florida Agricultural and Mechanical University (FAMU) emergency notification system issues warnings through Blackboard Connect, the University's emergency notification system. This web-based system sends instant alerts to all students, faculty and staff cell phones, e-mail, and/or pagers. On the main campus (Tallahassee), when notification is necessary due to an immediate and serious threat to public safety, the campus community will also be alerted through its Emergency Siren System, which delivers an audible tone followed by a voice message to the community notifying them of the immediate threat. Overall, monitoring and communications equipment, especially for state of the art digitally-based systems that					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	protect critical facilities, can often require significant startup and/or maintenance funding commitments.					
(12) Explore the feasibility of adding a full build-out component to the Leon County Master Stormwater Management Plan	Status: The master Stormwater management plan does not take into account Stormwater and flooding impacts given future build-out conditions for the entire County. This information could be used to revise existing floodplain regulations so that they reflect projected build-out conditions. Based on information from the Leon County Public Works Department, there are no plans to update the Master Plan at this time due to staffing limitations and current allocation of available resources.	Flooding, Hurricanes & Tropical Storms, Storm Surge/ Tsunami	Medium/Continuing	DSEM, Tallahassee-Leon County Planning	Leon County	EMPA Trust Fund (DCA); Small Watershed Program (USDA); Emergency Advance Measures for Flood Prevention (Army Corps); Resource Conservation and Development Program (USDA); Soil and Water Conservation Program (USDA); National Flood Mitigation Fund (FEMA)
(13) City and County are to implement a program to acquire easement or fee simple land allowing access to maintain the major ditches/canals to reduce flooding.	The program would consist of the acquisition of easements for ditches and the necessary land to access the ditches so normal maintenance can be performed. Currently the City of Tallahassee is responsible for the maintenance of over 23 miles of major ditches, and the County maintains over 28 miles of major ditches. About 15 miles have adequate access easements, are located within an easement or are located on public ROW. Approximately 30 acres are needed to have full public access to maintain the ditches. Status: The County has no plans to acquire any additional easements or fee simple properties for maintenance access. The City continues to acquire properties and/or easements as needed in conjunction with stormwater management capital improvement projects. The most recent easement was obtained near Golf Terrace Drive.	Flooding	High/Continuing	City of Tallahassee Underground Utilities & Public Infrastructure; Leon County Public Works	City of Tallahassee& Leon County	HMGP (DEM); National Flood Mitigation Fund (FEMA)

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(14) Secure funding source for identified shuttering and hardening needs for windows at Tallahassee Memorial Hospital (TMH).	Tallahassee Memorial Hospital is highly susceptible to wind damage from a tropical storm/hurricane. Currently neither hospital has storm shutters in place. As one of the primary hospitals serving the City of Tallahassee, Leon County and the region, local emergency management personnel should work with TMH to identify shutter options and hardening needs for windows, including costs. In addition, efforts should be undertaken to identify and harden essential support facilities (such as generators) at the hospital. Status: Once a possible funding source is identified, the committee has discussed applying for window protection at TMH. TMH has developed an application for hazard mitigation and is ready to proceed when funding becomes available. The other Tallahassee community hospital, Capital Regional Medical Center has installed hardened windows.	Flooding, Hurricanes & Tropical Storms, Storm Surge/ Tsunami	High/Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee& Leon County	EMPA Trust Fund (DEM); HMGP (DEM); CDBG (DEO)
(15) Consider addressing the economic impact of different disaster scenarios, as information becomes available.	Status: The Florida Division of Emergency Management (FDEM) has considered developing an economic impact model as part of their disaster modeling. Some data are already available through the TAOS and/or Hazus models. The City of Tallahassee, Leon County, and the Capital Area Chapter of the American Red Cross have programs in place to assess the impacts of disaster immediately following an event. Damage Assessment Teams are deployed following a disaster on a countywide basis to document disaster-related damages. This data is available to local, state, and federal governments, as well as local non-profits, universities, and other organizations. Tallahassee - Leon County GIS (TLCGIS) has developed HAZUS capabilities and training. This software program has been used to estimate direct economic loss from building damage and indirect losses such as business interruption. These data and their model result are also used in the previous Tallahassee – Leon County Post-Disaster Redevelopment Plan (PDRP). Updated HAZUS model and data will be utilized for the 2019 update of the PDRP which is in progress now. Additionally, HAZUS can estimate shelter needs based on population and socioeconomic information, as well as other impacts and mitigation needs. The Apalachee Regional Planning Council and	All Hazards	Low/Continuing	TLCGIS, City & County Offices of Management and Budget	City of Tallahassee& Leon County	Local

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	FDEM maintain and provide HAZUS information annually to the City and Leon County.					
(16) Continue to improve and expand regional response capabilities for responding to hazardous materials and terrorism events.	The possibility of an incident involving a weapon of mass destruction or a hazardous materials release exists within Leon County. County EM is preparing a response plan and now needs to identify the equipment needed to respond to effectively to an incident. In addition, the City and County need to identify potential funding sources to acquire the highly specialized, and often expensive, equipment. Status: Tallahassee Fire Department (TFD) has the only hazardous materials response unit in the region (between Alachua and Escambia Counties, and to a lesser extent, Bay County). Currently, TFD will respond to hazardous materials incidents outside of the County. TFD has also created a Regional Hazardous Materials Response Team. Our community emergency management officials have identified equipment needs and have purchased many of these items with funding from the federal Department of Homeland Security and the Federal Emergency Management Agency. A local committee outlines items to be purchased, and funding is coordinated through the Regional Domestic Security Task Force. However, available funding for this initiative is decreasing.	Hazardous Materials Storage and Transportation, Terrorism, Aviation Incidents	Medium/Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee& Leon County	DEO/FEMA and other federal agency grants Chemical Emergency Preparedness and Prevention Grants Program (EPA); Disposal of Federal Surplus Property (GSA); Hazardous Materials Training Program (FEMA)
(17) Maintain training programs for emergency responders, and continue to identify new training programs as needed.	In the event of a natural disaster, hazardous material release, or other catastrophic incident, numerous emergency responders, often with widely different roles, will be required to work as a single, integrated unit. Key to this effort is training. The City and County need to continually identify the different training needs for numerous responders, including, but not limited to dispatchers, initial responders, field responders, and incident commanders. Included as part of this is a continuous training program, involving classroom training, tabletop exercises and field exercises. The effort should also address the development and implement public awareness training programs. Status: The Apalachee Regional Planning Council, Tallahassee, Gainesville, Thomasville, Valdosta and other surrounding communities have worked together on regional responses. In Florida, surrounding communities	All	Low/Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee& Leon County	Hazardous Materials Training Program (FEMA); Chemical Emergency Preparedness and Prevention Grants Program (EPA)

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	have agreed to support each other through the Fire Chief's Association and the Regional Domestic Security Tasks Forces. There are seven of these in Florida, and they support each other as needed.					

(18) Identify populations at risk under different scenarios.	Determine the impact on housing, medical, evacuation, shelters, etc., for different populations such as those attending special events, student populations, and the elderly. Status: Leon County has developed HAZUS capabilities and training. This software program has been used to estimate direct economic loss from building damage and indirect losses such as business interruption. Additionally, HAZUS can estimate shelter needs based on population and socioeconomic information. Leon County Geographical Information system (GIS) department has received HAZUS 4.2 and will use it to compare known damages from Hurricane Hermine. It will also be integrated into the 2020 LMS update. The Local Mitigation Strategy Steering Committee regularly meets to discuss these issues. Additional coordination has also taken place using the digital information available through the community's Geographic Information System. In addition, the Florida Department of Health and the Florida Division of Emergency Management also considers this topic for hazardous materials. In addition, the Leon County and the City of Tallahassee in 2011-2012 collaboratively developed a Post-Disaster Redevelopment Plan (PDRP) to better prepare the community for long-term recovery and redevelopment after a disaster. This plan complements other planning efforts ongoing in the city and the county, including the Comprehensive Plan, Local Mitigation Strategy (LMS) and Comprehensive Emergency Management Plan (CEMP). The PDRP identifies policies, operational strategies and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of the community after a disaster. The PDRP is required to be updated every five years. It is being updated at this time. Leon County now also requires a Temporary Uses, Construction Staging Areas and Special Events Permit for events intended to accommodate an attendance of 250 or more persons. The County's Department of Development Support and Environmental Management processes this permit, which is reviewed by the County's Development Services Division, Fire Safety Office, Emergency Medical Services, Sheriff's Office and the Health Department.	All	Low/Continuing	TLCGIS, City of Tallahassee and Leon County Emergency Management, and City of Tallahassee - Leon County Planning	City of Tallahassee& Leon County	EMPA Trust Fund (DEM)
(19) Encourage the establishment of community-based emergency shelters.	Subdivisions, mobile home parks, etc. that have storm shelters incorporated into their designs would provide additional sheltering capacity and eliminate the need to evacuate residents. These buildings could double as community centers.	All	Low/ Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee& Leon County	Local

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2019

Initiative	Summary/Status as of April 2019	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	Status: The City of Tallahassee and Leon County have a total of 15 school campuses and 72 buildings, which meet the Red Cross standards and can be used as emergency shelters. In addition, the City of Tallahassee is now providing transportation to persons who regularly ride StarMetro seeking shelter. Six shelters were employed during Hurricane Michael on October 10, 2018 serving over 1,500 people. Through the successful completion of several structural hardening mitigation projects, Florida State University now maintains an inventory of four buildings with the capability to shelter 3,140 of its own students, faculty, staff and their immediate family members on campus, without burdening the community shelter system.					
(20) Identify major land-based transportation corridors and establish safe zones around those corridors based on the exposure pathway for different chemicals.	This would also include identification of all structures, facilities and special need populations in the corridors. Provide ready access to this information to hazardous material response personnel, preferably from deployed resources (such as a GIS capability on the hazardous response vehicle). Status: The Apalachee Regional Planning Council has developed a commodity transportation study for hazardous materials. In addition, local Emergency Management officials have developed preliminary mapping of safe zones, 1-2 miles along the major routes through the community.	Hazardous Materials Storage and Transportation	Low/Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee& Leon County	Hazardous Materials training Program (FEMA); Chemical Emergency Preparedness and Prevention Program (EPA)

City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2018 Progress Report - Attachment

Table 1: City of Tallahassee Drainage Improvement Projects

The City has identified the following 16 drainage improvement projects in its current Capital Improvement Program (FY2018-2022). The estimated cost of these projects totals $94,739,630.

Project	Cost ($)	Prior Year	Current Status
Downtown Stormwater Master Plan	850,000	Analysis	Analysis
Frenchtown Stormwater Master Plan (1)	12,145,400	(see note 1 below)	(see note 1 below)
Inglewood Stormwater Improvements	1,485,300	Construction	Construction
Lower Central Drainage Ditch (2)	12,450,050	Design/ Construction	Design/ Construction
Madison-Gaines St. Stormwater Outfall	7,250,000	Construction	Complete
Maclay Boulevard Stormwater Facility (2)	13,800,000	Design/ Construction	Design/ Construction
McCord Pond Drainage Ditch Improvements Project	5,500,000	n/a	Preliminary Engineering
Medium Stormwater System Imprv. (3)	12,000,000	New	(see note 3 below)
Meginnis Arm LOMR	225,000	FEMA Review	Complete
Northeast Ditch Tributary 2 Flood Study	120,000	FEMA Review	FEMA Review
Pensacola Street Stormwater Outfall (2)	1,200,000	n/a	Design
Rainfall and Stream Gauging	2,251,861	Data gathering	Data gathering
Royal Oaks Creek	5,650,000	Design	Design/ Construction
Small Projects Initiative (see below)	750,000	See Table 2 below	See Table 2 below
Stormwater Infrastructure Inventory and Mapping	3,360,000	Data gathering	Data gathering
South City – Country Club Creek & East Ditch LOMR	3,300,000	Preliminary Design	Final Design
Total	**82,337,611**		

Notes:
1. The Frenchtown Stormwater Project has been segmented into multiple phases. Nine phases have been constructed while other phases are in various stages of implementation.
2. These projects have been segmented into multiple Phases in various stages of implementation.
3. The Medium Stormwater System Improvement Project funds the construction of multiple small to medium sized projects, some of which are listed under the Small Projects Initiative (SPI) project list (Table 2).

Table 2: City of Tallahassee Drainage Improvement Projects - Small Projects Initiative – Current & Planned Projects

Project	Prior Year Activity	Status
3244 Shannon Lakes	Completed	N/A
903 Beard Street	Completed	N/A
Limerick Drive Outfall	Shelved	N/A
1423 Devils Dip	Under Construction	Completed
1829 Ivan drive	Completed	N/A
3033 Shamrock South	Design	Under Construction
Gwen Street	Study	Study
Limerick Drive (near 2220 Limerick Drive)	Construction	Completed
Tory Sound	Construction	Completed
Arkansas Street	Design	Design
Lee Avenue	Shelved	N/A
Short Street	Design	Construction
Sauls Street	Completed	N/A
Glendale Drainage Improvements	Design	Design
1125 Seminole Drive	Shelved	N/A
Longstreet/Pickett Court	Shelved	N/A
Breckenridge on Park	Study	Design
Atchena Nene Drainage Improvements	Study	Design
Adams Street and College Avenue Drainage Improvements	Completed	N/A
2494 Elfinwing Lane & 3753 Swallowtail Trace	Study	Design
Brandon Hill Drive Drainage Improvements	Study	Study
University Park Drainage Improvements	Completed	N/A
Rosemary Terrace Flood Relief	Study	Study
Olson Road Stormwater Outfall Improvements	Design	Design
806 Ridge Road	Design	Completed
1121 and 1123 Clay Street	Design	Design

City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2018 Progress Report - Attachment

Project	Prior Year Activity	Status
Fermanagh Drive Curb Inlet Modifications	Study	Study
Chestwood Avenue	Study	Study
Pinewood Drive – Delta Office Park Stormwater Outfall	Study	Design
1528 and 1526 Blountstown Street	Future	Complete
Pine View / Pine Forest Drainage Improvements	Future	Study
227 Palmer Avenue East	Future	Future
2216 Tallahassee Drive	Future	Study
2280 & 2328 Sandpiper St	Future	Future
1930 E Indian Head Drive	Future	Future
1514 Chowkeebin Nene	Future	Future
3713 Sulton Court, 548 Maclay Road	Future	Future
2027 Holmes St, 2016 Warwick St	Future	Future
1312 Pepper Drive Land Acquisition		Complete
1327 Linda Ann Drive		Design
3701 Aksarben Street		Study

Note: All "Small Projects Initiative" projects that are listed as "On Hold" have been recommended for construction and are awaiting implementation. SPI projects listed as "Future" are planned in the SPI program and are planned to be implemented in the order listed.
SPI projects listed as "Integrated" are included as a component or part of a major capital improvement project.

APPENDIX F:

Southern Wildfire Risk Assessment Summary Report
for Leon County (2020)

Southern Wildfire Risk Assessment Summary Report

leon

Report was generated using
www.southernwildfirerisk.com

Report version: 4.0

Report generated: 1/28/2020

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Users should also note that property boundaries included in any product do not represent an on-the-ground survey suitable for legal, engineering, or surveying purposes. They represent only the approximate relative locations.

Introduction

Welcome to the Southern Wildfire Risk Assessment Summary Report.

This tool allows users of the Professional Viewer application of the Southern Wildfire Risk Assessment (SWRA) web Portal (SouthWRAP) to define a specific project area and summarize wildfire related information for this area. A detailed risk summary report is generated using a set of predefined map products developed by the Southern Wildfire Risk Assessment project which have been summarized explicitly for the user defined project area. The report is generated in MS WORD format.

The report has been designed so that information from the report can easily be copied and pasted into other specific plans, reports, or documents depending on user needs. Examples include, but are not limited to, Community Wildfire Protection Plans, Local Fire Plans, Fuels Mitigation Plans, Hazard Mitigation Plans, Homeowner Association Risk Assessments, and Forest Management or Stewardship Plans. Formats and standards for these types of reports vary from state to state across the South, and accordingly SouthWRAP provides the SWRA information in a generic risk report format to facilitate use in any type of external document. The SouthWRAP Risk Summary Report also stands alone as a viable depiction of current wildfire risk conditions for the user defined project area.

SouthWRAP provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in the South.

Results of the assessment can be used to help prioritize areas in the state where mitigation treatments, community interaction and education, or tactical analyses might be necessary to reduce risk from wildfires.

The SouthWRAP products included in this report are designed to provide the information needed to support the following key priorities:

- Identify areas that are most prone to wildfire
- Identify areas that may require additional tactical planning, specifically related to mitigation projects and Community Wildfire Protection Planning
- Provide the information necessary to justify resource, budget and funding requests
- Allow agencies to work together to better define priorities and improve emergency response, particularly across jurisdictional boundaries
- Define wildland communities and identify the risk to those communities
- Increase communication and outreach with local residents and the public to create awareness and address community priorities and needs
- Plan for response and suppression resource needs
- Plan and prioritize hazardous fuel treatment programs

To learn more about the SWRA project or to create a custom summary report, go to www.southernwildfirerisk.com.

Products

Each product in this report is accompanied by a general description, table, chart and/or map. A list of available SouthWRAP products in this report is provided in the following table.

SouthWRAP Product	Description
Wildland Urban Interface (WUI)	Depicts where humans and their structures meet or intermix with wildland fuel
WUI Risk Index	Represents a rating of the potential impact of a wildfire on people and their homes
Community Protection Zones	Represents those areas designated as primary and secondary priorities for community protection planning
Burn Probability	Probability of an area burning given current landscape conditions, percentile weather, historical ignition patterns and historical fire prevention and suppression efforts
Characteristic Rate of Spread	Represents the speed with which a fire moves in a horizontal direction across the landscape
Characteristic Flame Length	Represents the distance between the tip and base of the flame
Characteristic Fire Intensity Scale	Quantifies the potential fire intensity for an area by orders of magnitude
Fire Type - Extreme	Represents the potential fire type (surface or canopy) under extreme percentile weather conditions
Surface Fuels	Contains the parameters needed to compute surface fire behavior characteristics
Dozer Operability Rating	Level of difficulty to operate a dozer in an area based on limitations associated with slope and vegetation type

Wildland Urban Interface

Description

The South is one of the fastest growing regions in the nation, with an estimated population growth of 1.5 million people per year. The South also consistently has the highest number of wildfires per year. Population growth is pushing housing developments further into natural and forested areas where most of these wildfires occur. This situation puts many lives and communities at risk each year.

In particular, the expansion of residential development from urban centers out into rural landscapes, increases the potential for wildland fire threat to public safety and the potential for damage to forest resources and dependent industries. This increase in population across the region will impact counties and communities that are located within the Wildland Urban Interface (WUI).

The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire.

For the **leon** project area, it is estimated that **272,877** people or **94.1 % percent** of the total project area population (**289,861)** live within the WUI.

The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels.

WUI housing density is categorized based on the standard Federal Register and U.S. Forest Service SILVIS data set categories, long considered a de facto standard for depicting WUI. However, in the SWRA WUI data the number of housing density categories is extended to provide a better gradation of housing distribution to meet specific requirements for fire protection planning activities. While units of the actual data set are in *houses per sq. km*., the data is presented as the *number of houses per acre* to aid with interpretation and use by fire planners in the South.

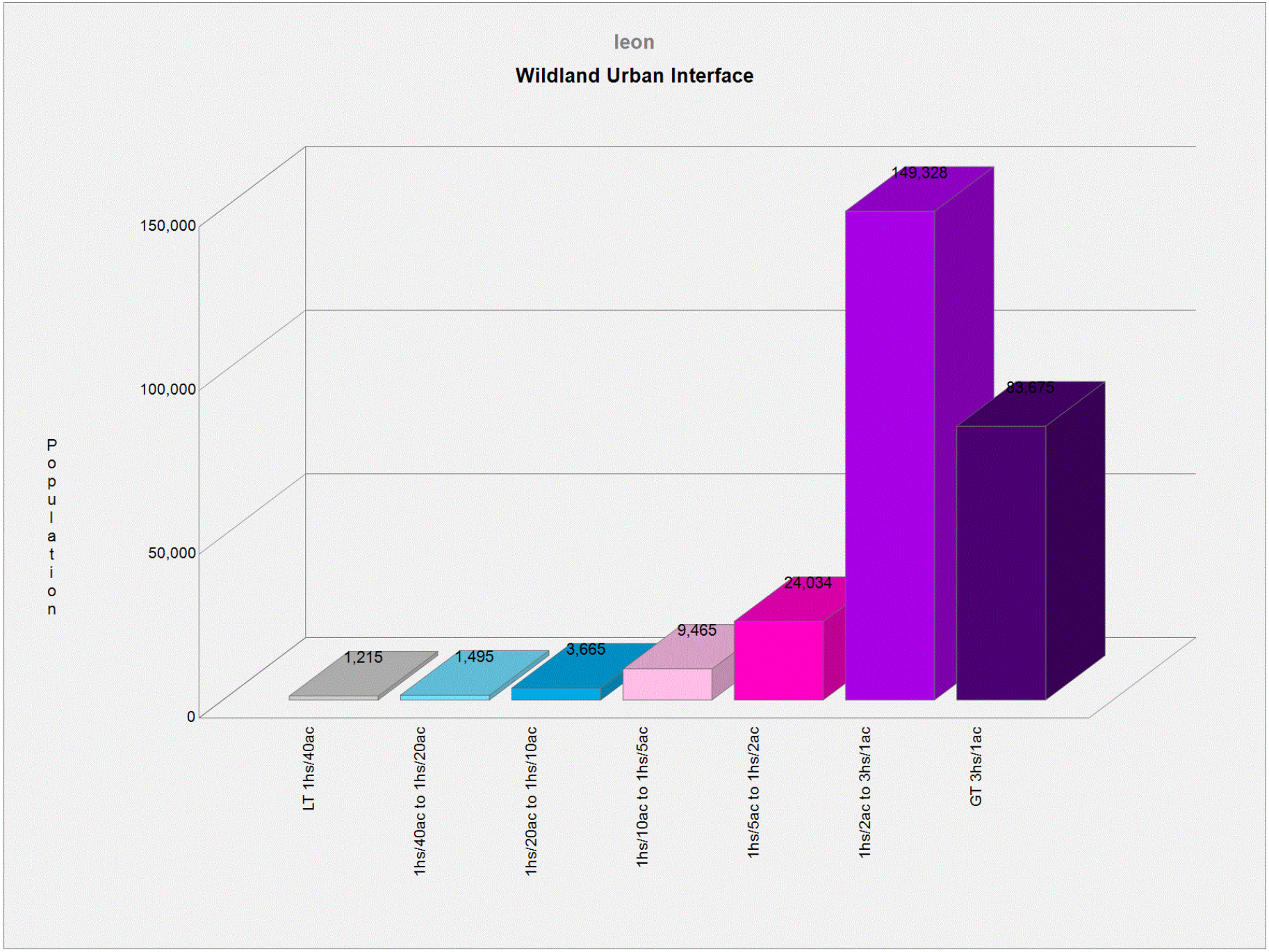
In the past, conventional wildland urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources do not provide the level of detail for defining population living in the wildland as needed by Southern state WUI specialists and local fire protection agencies.

The new SWRA WUI 2012 dataset is derived using advanced modeling techniques based on the SWRA Where People Live (housing density) dataset and 2012 LandScan population count data available from the Department of Homeland Security, HSIP Freedom Data Set. WUI is simply a subset of the Where People Live dataset. The primary difference between the WPL and WUI is that populated areas surrounded by sufficient non-burnable areas (i.e. interior urban areas) are removed from the Where People Live data set, as these areas are not expected to be directly impacted by a wildfire. Simply put, the SWRA WUI is the SWRA WPL data with the urban core areas removed.

Data is modeled at a 30-meter cell resolution, which is consistent with other SWRA layers. The following table shows the total population for each WUI area within the project area.

WUI – Population and Acres

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
LT 1hs/40ac	1,215	0.4 %	62,647	25.4 %
1hs/40ac to 1hs/20ac	1,495	0.5 %	25,228	10.2 %
1hs/20ac to 1hs/10ac	3,665	1.3 %	29,206	11.8 %
1hs/10ac to 1hs/5ac	9,465	3.5 %	33,054	13.4 %
1hs/5ac to 1hs/2ac	24,034	8.8 %	38,035	15.4 %
1hs/2ac to 3hs/1ac	149,328	54.7 %	51,741	21.0 %
GT 3hs/1ac	83,675	30.7 %	6,963	2.8 %
Total	**272,877**	**100.0 %**	246,874	100.0 %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Wildland Urban Interface
Population
150,000
100,000
50,000
0
1,215
1,495
3,665
9,465
24,034
149,328
83,675
LT 1hs/40ac
1hs/40ac to 1hs/20ac
1hs/20ac to 1hs/10ac
1hs/10ac to 1hs/5ac
1hs/5ac to 1hs/2ac
1hs/2ac to 3hs/1ac
GT 3hs/1ac

WUI Risk Index

Description

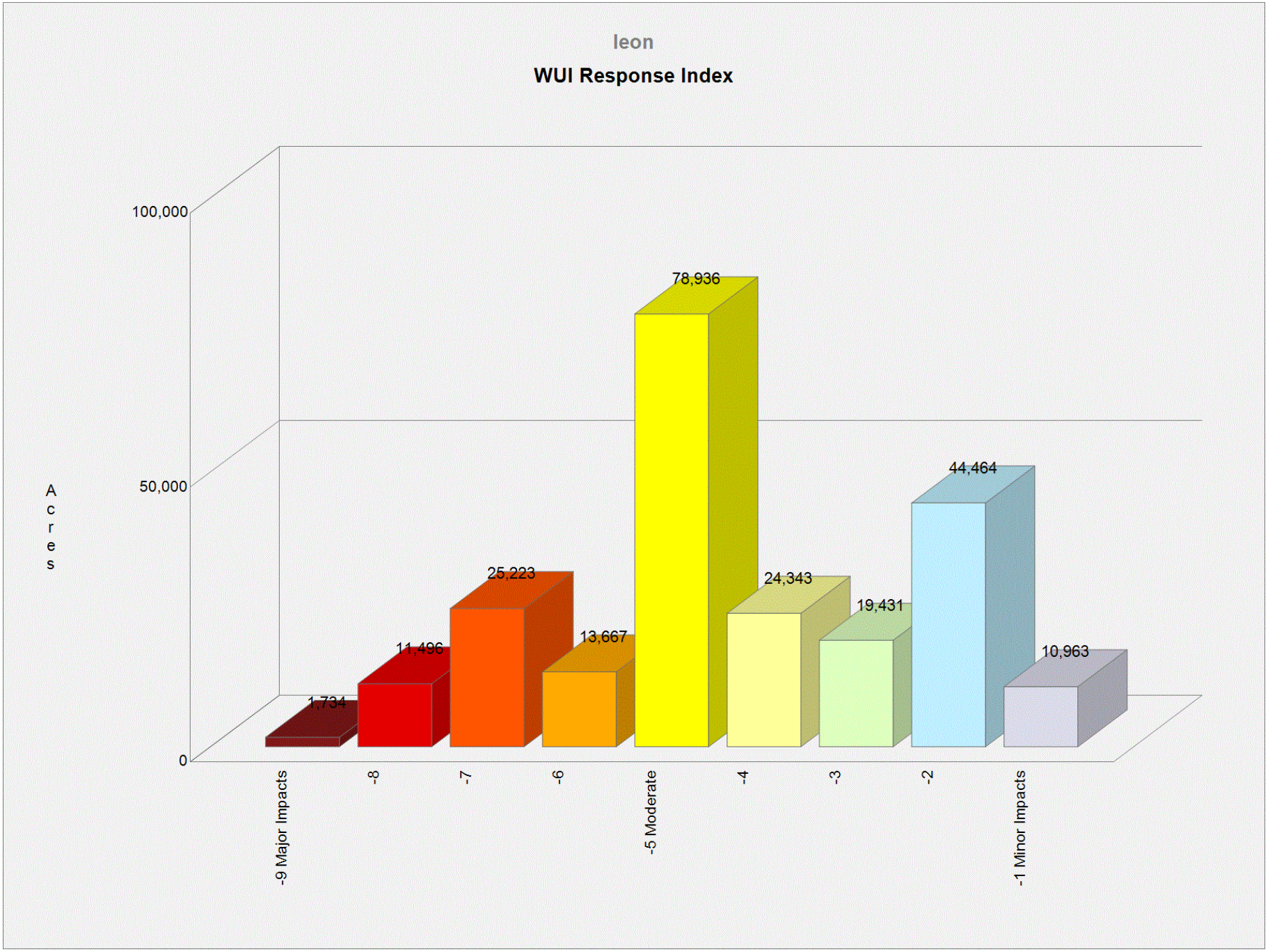
The Wildland Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes.

The WUI Risk Rating is derived using a Response Function modeling approach. Response functions are a method of assigning a net change in the value to a *resource* or *asset* based on susceptibility to fire at different intensity levels, such as flame length. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9 while areas with low housing density and low flame lengths are rated -1.

To calculate the WUI Risk Rating, the WUI housing density data was combined with Flame Length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts based on values defined by the SWRA Update Project technical team. By combining flame length with the WUI housing density data, you can determine where the greatest potential impact to homes and people is likely to occur.

Fire intensity data is modeled to incorporate penetration into urban fringe areas so that outputs better reflect real world conditions for fire spread and impact in fringe urban interface areas. With this enhancement, houses in urban areas adjacent to wildland fuels are incorporated into the WUI risk modeling. All areas in the South have the WUI Risk Index calculated consistently, which allows for comparison and ordination of areas across the entire region. Data is modeled at a 30-meter cell resolution, which is consistent with other SWRA layers.

Class	Acres	Percent
-9 Major Impacts	1,734	0.8 %
-8	11,496	5.0 %
-7	25,223	11.0 %
-6	13,667	5.9 %
-5 Moderate	78,936	34.3 %
-4	24,343	10.6 %
-3	19,431	8.4 %
-2	44,464	19.3 %
-1 Minor Impacts	10,963	4.8 %
Total	**230,257**	**100.0 %**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WUI Response Index
Acres
100,000
50,000
0
1,734
11,496
25,223
13,667
78,936
24,343
19,431
44,464
10,963
-9 Major Impacts
-8
-7
-6
-5 Moderate
-4
-3
-2
-1 Minor Impacts

Community Protection Zones

Description

Community Protection Zones (CPZ) represent those areas considered highest priority for mitigation planning activities. CPZs are based on an analysis of the Where People Live housing density data and surrounding fire behavior potential. Rate of Spread data is used to determine the areas of concern around populated areas that are within a 2-hour fire spread distance. This is referred to as the Secondary CPZ.

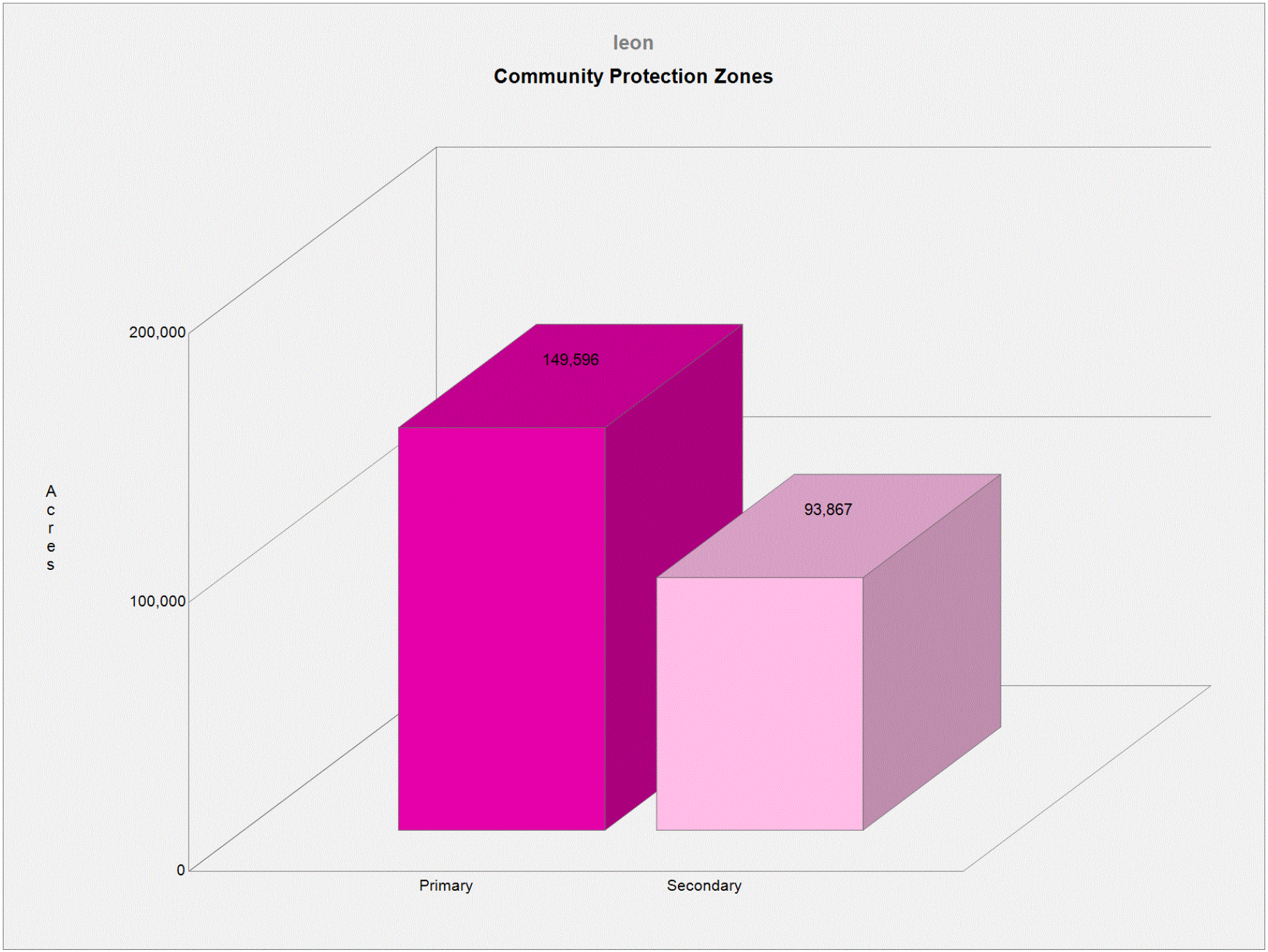
General consensus among fire planners is that for fuel mitigation treatments to be effective in reducing wildfire hazard, they must be conducted within a close distance of a community. In the South, the WUI housing density has been used to reflect populated areas in place of community boundaries (Primary CPZ). This ensures that CPZs reflect where people are living in the wildland, not jurisdictional boundaries.

Secondary CPZs represent a variable width buffer around populated areas that are within a 2-hour fire spread distance. Accordingly, CPZs will extend farther in areas where rates of spread are greater and less in areas where minimal rate of spread potential exists. Secondary CPZ boundaries inherently incorporate fire behavior conditions.

Primary CPZs reflect areas with a predefined housing density, such as greater than 1 house per 20 acres. Secondary CPZs are the areas around Primary CPZs within a 2 hour fire spread distance.

All areas in the South have the CPZs calculated consistently, which allows for comparison and ordination of areas across the entire region. Data is modeled at a 30-meter cell resolution, which is consistent with other SWRA layers.

Class	Acres	Percent
Primary	149,596	61.4 %
Secondary	93,867	38.6 %
Total	**243,463**	**100.0 %**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Community Protection Zones
200,000
100,000
0
Acres
149,596
93,867
Primary
Secondary

Burn Probability

Description

The Burn Probability (BP) layer depicts the probability of an area burning given current landscape conditions, percentile weather, historical ignition patterns and historical fire prevention and suppression efforts.

Describe in more detail, it is the tendency of any given pixel to burn, given the static landscape conditions depicted by the LANDFIRE Refresh 2008 dataset (as resampled by FPA), contemporary weather and ignition patterns, as well as contemporary fire management policies (entailing considerable fire prevention and suppression efforts).

The BP data does not, and is not intended to, depict fire-return intervals of any vintage, nor do they indicate likely fire footprints or routes of travel. Nothing about the expected shape or size of any actual fire incident can be interpreted from the burn probabilities. Instead, the BP data, in conjunction with the Fire Program Analysts FIL layers, are intended to support an actuarial approach to quantitative wildfire risk analysis (e.g., see Thompson et al. 2011).

Values in the Burn Probability (BP) data layer indicate, for each pixel, the number of times that cell was burned by an FSim-modeled fire, divided by the total number of annual weather scenarios simulated. Burn probability raster data was generated using the large fire simulator - FSim - developed for use in the Fire Program Analysis (FPA) project. FSim uses historical weather data and current landcover data for discrete geographical areas (Fire Planning Units - FPUs) and simulates fires in these FPUs. Using these simulated fires, an overall burn probability and marginal burn probabilities at four fire intensities (flame lengths) are returned by FSim for each 270m pixel in the FPU.

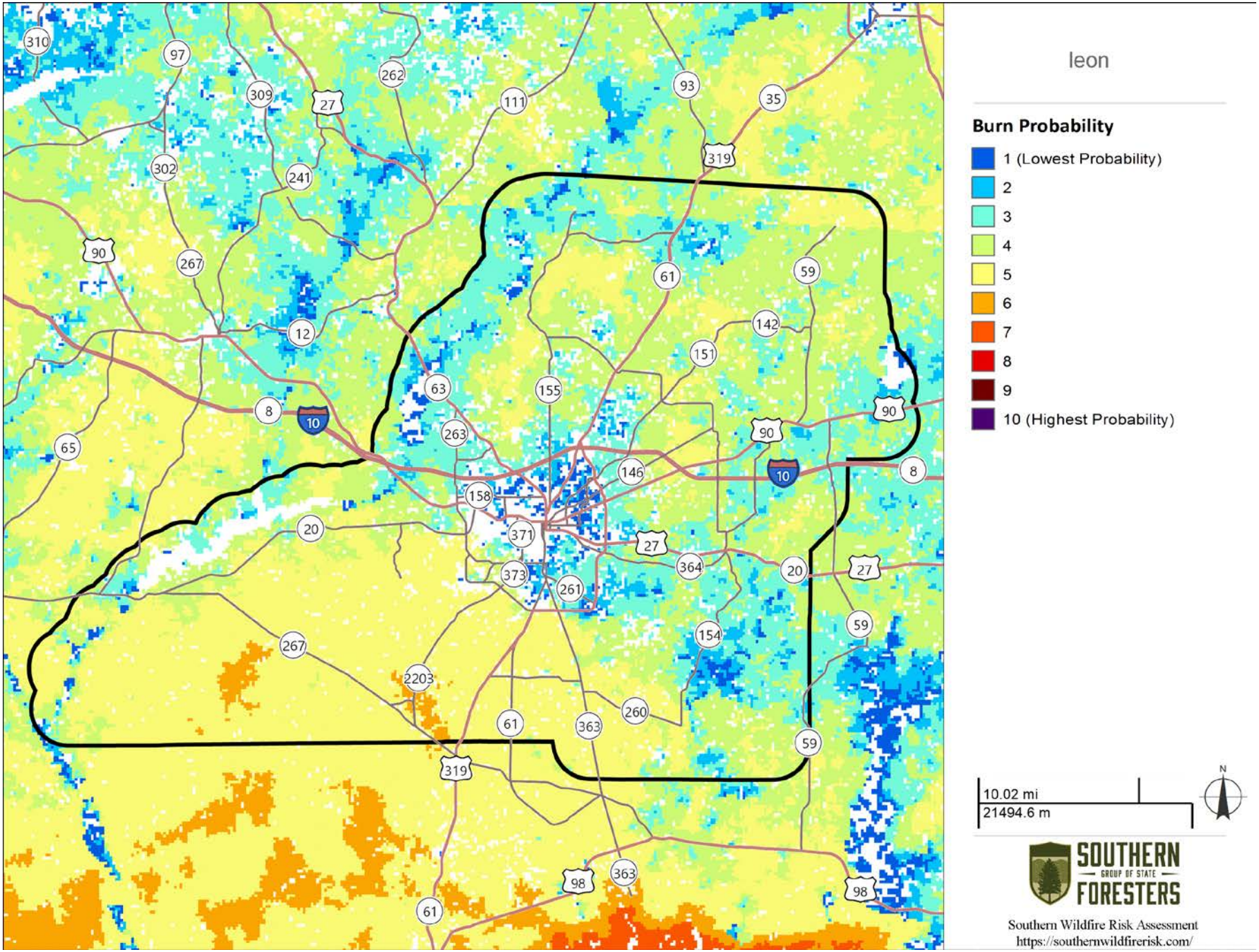
The fire growth simulations, when run repeatedly with different ignition locations and weather streams, generate burn probabilities and fire behavior distributions at each landscape location (i.e., cell or pixel). Results are objectively evaluated through comparison with historical fire patterns and statistics, including the mean annual burn probability and fire size distribution, for each FPU. This evaluation is part of the FSim calibration process for each FPU, whereby simulation inputs are adjusted until the slopes of the historical and modeled fire size distributions are similar and the modeled average burn probability falls within an acceptable range of the historical reference value (i.e., the 95% confidence interval for the mean).

Please refer to the metadata available for this dataset for a detailed description of the data processing methods, assumptions and references that pertain to the development of this data. This information is available from the USFS Missoula Fire Sciences Laboratory.

Please refer to the web site link in the report References to obtain more detailed descriptions of FPA and the related data products such as Burn Probability.

Burn Probability replaces the Wildland Fire Susceptibility Index (WFSI) layer developed in the original SWRA project completed in 2005.

Class	Acres	Percent
1	12,502	2.3 %
2	24,463	4.4 %
3	118,892	21.5 %
4	189,777	34.3 %
5	202,279	36.5 %
6	5,764	1.0 %
7	0	0.0 %
8	0	0.0 %
9	0	0.0 %
10	0	0.0 %
Total	**553,677**	**100.0 %**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Burn Probability
1 (Lowest Probability)
2
3
4
5
6
7
8
9
10 (Highest Probability)
10.02 mi
21494.6 m
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Southern Wildfire Risk Assessment
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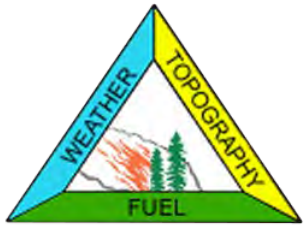
Fire Behavior

Description

Fire behavior is the manner in which a fire reacts to the following environmental influences:

1. **Fuels**
2. **Weather**
3. **Topography**



Fire behavior characteristics are attributes of wildland fire that pertain to its spread, intensity, and growth. Fire behavior characteristics utilized in the Southern Wildfire Risk Assessment (SWRA) include fire type, rate of spread, flame length and fire intensity scale. These metrics are used to determine the potential fire behavior under different weather scenarios. Areas that exhibit moderate to high fire behavior potential can be identified for mitigation treatments, especially if these areas are in close proximity to homes, business, or other assets.

Fuels

The SWRA includes composition and characteristics for both surface fuels and canopy fuels. Significant increases in fire behavior will be captured if the fire has the potential to transition from a surface fire to a canopy fire.

Fuel datasets required to compute both surface and canopy fire potential include:

- **Surface Fuels**, generally referred to as fire behavior fuel models, provide the input parameters needed to compute surface fire behavior.
- **Canopy Cover** is the horizontal percentage of the ground surface that is covered by tree crowns. It is used to compute wind reduction factors and shading.
- **Canopy Ceiling Height/Stand Height** is the height above the ground of the highest canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire. A good estimate of canopy ceiling height would be the average height of the dominant and co-dominant trees in a stand. It is used for computing wind reduction to midflame height and spotting distances from torching trees (Fire Program Solutions, L.L.C, 2005).
- **Canopy Base Height** is the lowest height above the ground above which here is sufficient canopy fuel to propagate fire vertically (Scott & Reinhardt, 2001). Canopy base height is a property of a plot, stand, or group of trees, not of an individual tree. For fire modeling, canopy base height is an effective value that incorporates ladder fuel, such as tall shrubs and small trees. Canopy base height is used to determine if a surface fire will transition to a canopy fire.
- **Canopy Bulk Density** is the mass of available canopy fuel per unit canopy volume (Scott & Reinhardt, 2001). Canopy bulk density is a bulk property of a stand, plot, or group of trees, not of an individual tree. Canopy bulk density is used to predict whether an active crown fire is possible.

Weather

Environmental weather parameters needed to compute fire behavior characteristics include 1-hour, 10-hour, and 100-hour timelag fuel moistures, herbaceous fuel moisture, woody fuel moisture, and the 20-foot 10 minute average wind speed. To collect this information, weather influence zones were established across the region. A weather influence zone is an area where for analysis purposes the weather on any given day is considered uniform. Within each weather influence zone, historical daily weather is gathered to compile a weather dataset from which four percentile weather categories are created. The percentile weather categories are intended to represent low, moderate, high, and extreme fire weather days. Fire behavior outputs are computed for each percentile weather category to determine fire potential under different weather scenarios.

The four percentile weather categories include:

- Low Weather Percentile (0 – 15%)
- Moderate Weather Percentile (16 – 90%)
- High Weather Percentile (91 – 97%)
- Extreme Weather Percentile (98 – 100%)

Topography

Topography datasets required to compute fire behavior characteristics are elevation, slope and aspect.

FIRE BEHAVIOR CHARACTERISTICS

Fire behavior characteristics provided in this report include:

- **Characteristic Rate of Spread**
- **Characteristic Flame Length**
- **Characteristic Fire Intensity Scale**
- **Fire Type - Extreme**

Characteristic Rate of Spread

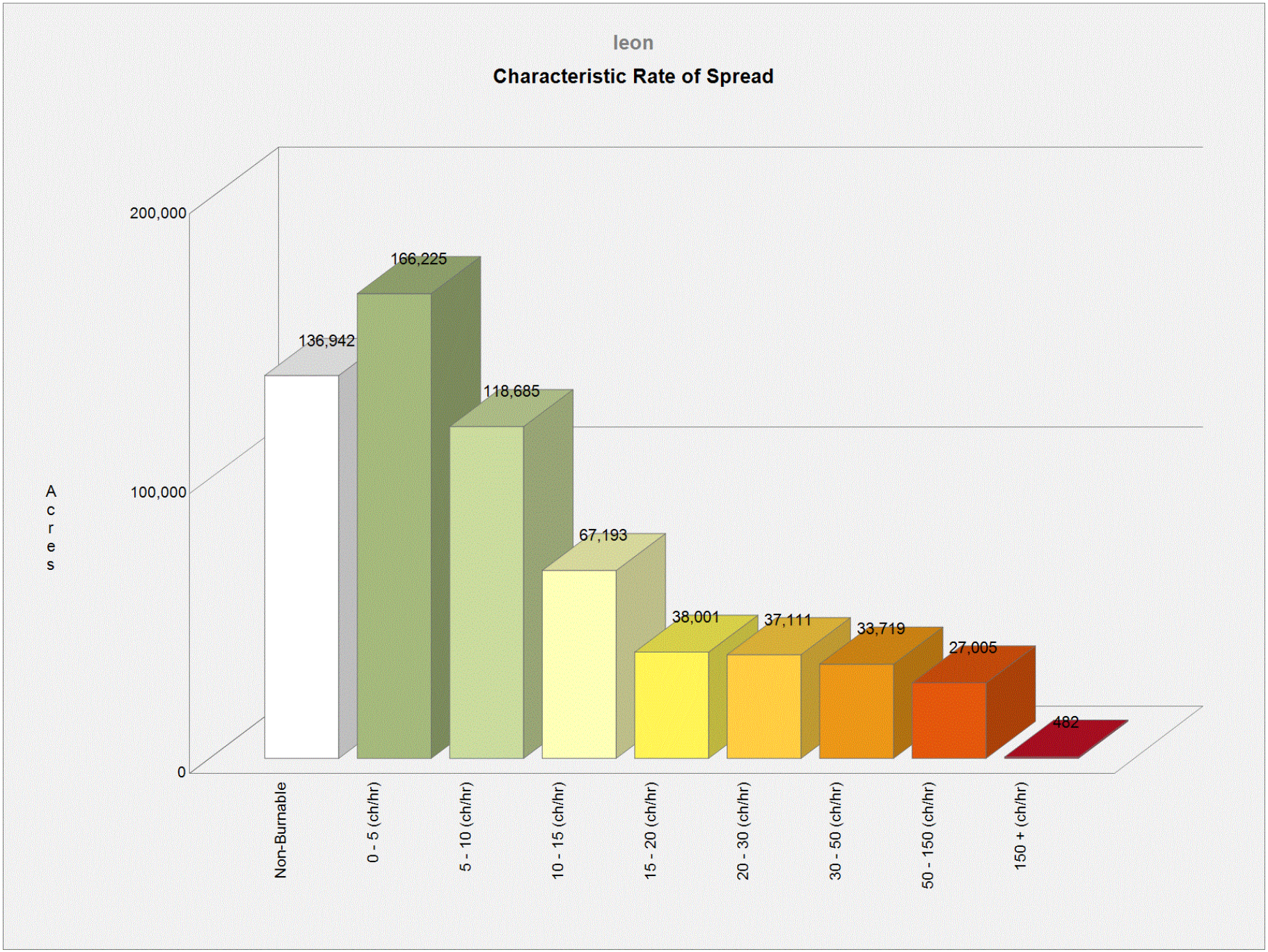
Description

Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the Southern Wildfire Risk Assessment, this measurement represents the maximum rate of spread of the fire front. Rate of Spread is the metric used to derive the Community Protection Zones.

Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in the South. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform.

For all Southern states, except Florida and Texas, this dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. For Texas, the 2010 Texas risk update data is portrayed. For Florida, the 2010 Florida risk assessment update data is shown.

Rate of Spread	Acres	Percent
Non-Burnable	136,942	21.9 %
0 - 5 (ch/hr)	166,225	26.6 %
5 - 10 (ch/hr)	118,685	19.0 %
10 – 15 (ch/hr)	67,193	10.7 %
15 - 20 (ch/hr)	38,001	6.1 %
20 - 30 (ch/hr)	37,111	5.9 %
30 - 50 (ch/hr)	33,719	5.4 %
50 - 150 (ch/hr)	27,005	4.3 %
150 + (ch/hr)	482	0.1 %
Total	**625,363**	**100.0 %**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Characteristic Rate of Spread
Acres
200,000
100,000
0
136,942
166,225
118,685
67,193
38,001
37,111
33,719
27,005
482
Non-Burnable
0 - 5 (ch/hr)
5 - 10 (ch/hr)
10 - 15 (ch/hr)
15 - 20 (ch/hr)
20 - 30 (ch/hr)
30 - 50 (ch/hr)
50 - 150 (ch/hr)
150 + (ch/hr)

Characteristic Flame Length

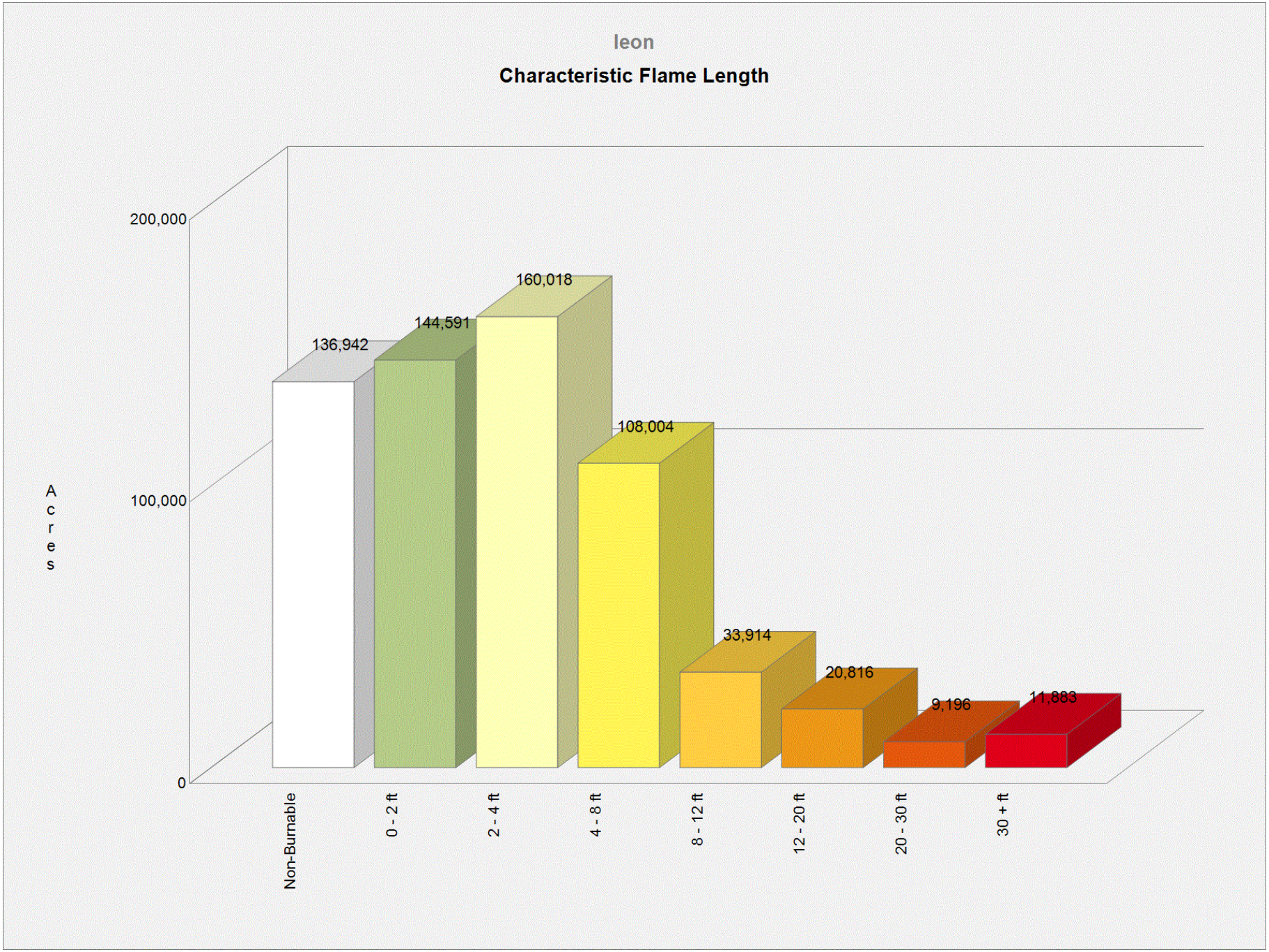
Description

Characteristic Flame Length is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally the ground surface. It is an indicator of fire intensity and is often used to estimate how much heat the fire is generating. Flame length is typically measured in feet (ft). Flame length is the measure of fire intensity used to generate the response index outputs for the SWRA.

Flame length is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in the South. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform.

For all Southern states, except Florida and Texas, this dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. For Texas, the 2010 Texas risk update data is portrayed. For Florida, the 2010 Florida risk assessment update data is shown.

Flame Length	Acres	Percent
Non-Burnable	136,942	21.9 %
0 - 2 ft	144,591	23.1 %
2 - 4 ft	160,018	25.6 %
4 - 8 ft	108,004	17.3 %
8 - 12 ft	33,914	5.4 %
12 - 20 ft	20,816	3.3 %
20 - 30 ft	9,196	1.5 %
30 + ft	11,883	1.9 %
Total	**625,364**	**100.0 %**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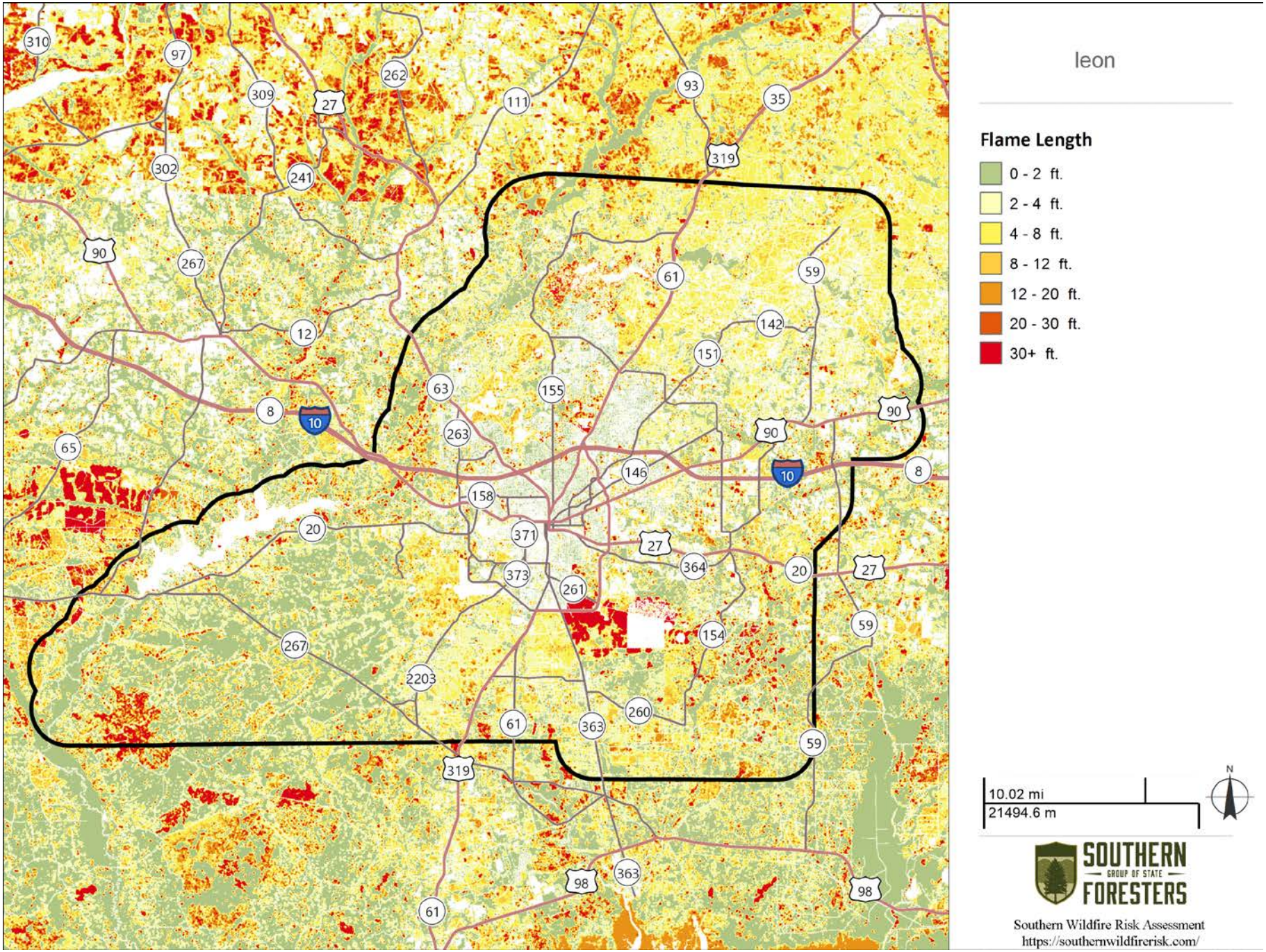
Characteristic Flame Length
Acres
200,000
100,000
0
136,942
144,591
160,018
108,004
33,914
20,816
9,196
11,883
Non-Burnable
0 - 2 ft
2 - 4 ft
4 - 8 ft
8 - 12 ft
12 - 20 ft
20 - 30 ft
30 + ft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Flame Length
0 - 2 ft.
2 - 4 ft.
4 - 8 ft.
8 - 12 ft.
12 - 20 ft.
20 - 30 ft.
30+ ft.
10.02 mi
21494.6 m
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SOUTHERN GROUP OF STATE FORESTERS
Southern Wildfire Risk Assessment
https://southernwildfirerisk.com/

Characteristic Fire Intensity Scale

Description

Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on a weighted average of four percentile weather categories. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of 5 classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities. Refer to descriptions below.

- **Class 1, Very Low:**
  Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.

- **Class 2, Low:**
  Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

- **Class 3, Moderate:**
  Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.

- **Class 4, High:**
  Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.

- **Class 5, Very High:**
  Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

For all Southern states, except Texas, this dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. For Texas, the 2010 Texas risk update data is portrayed.

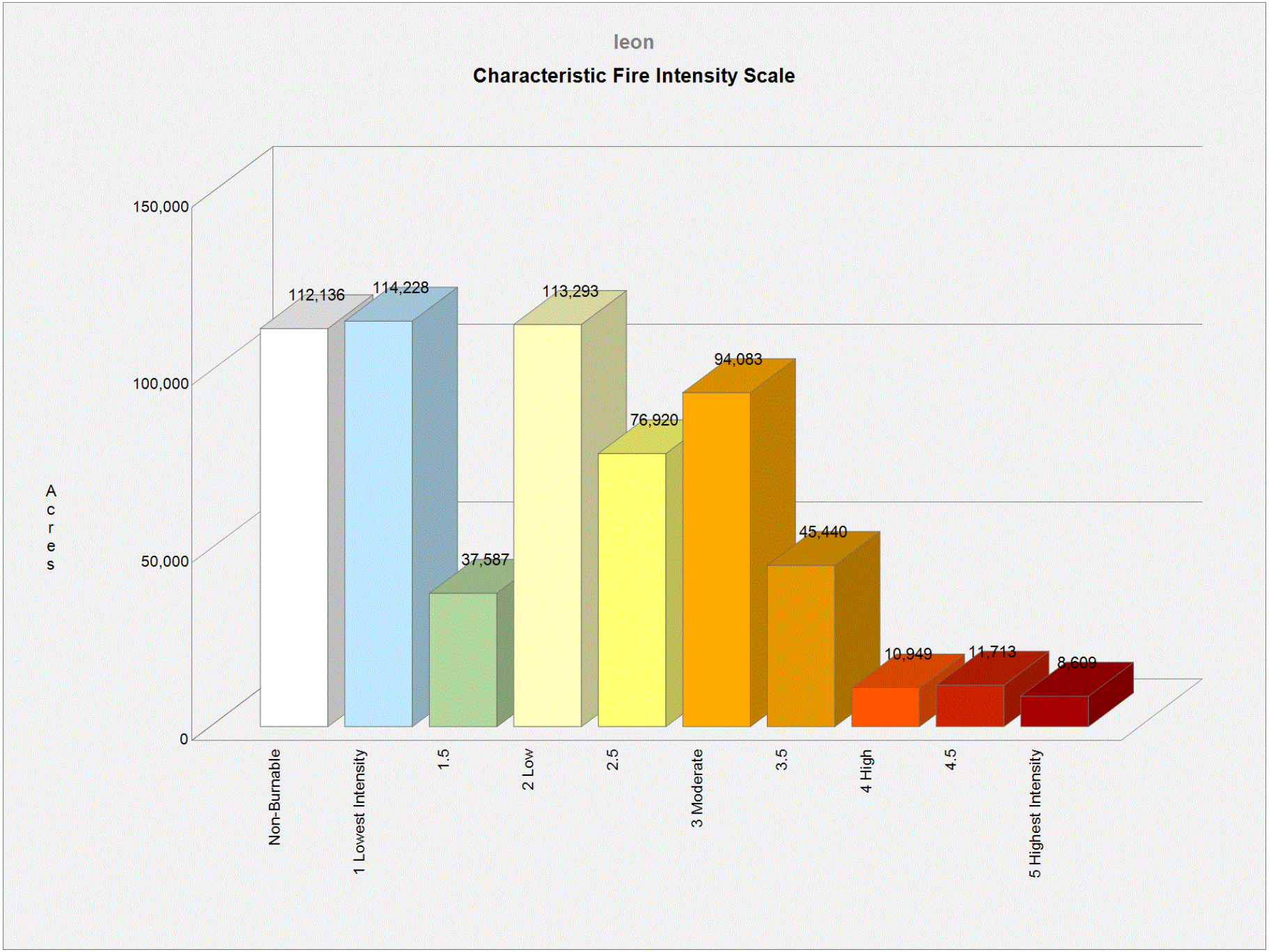
To aid in viewing on the map, FIS is presented in 1/2 class increments. Please consult the SouthWRAP User Manual for a more detailed description of the FIS class descriptions.

Since all areas in the South have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire region.

Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in the South. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform.

The fire intensity scale map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Class	Acres	Percent
Non-Burnable	112,136	17.9 %
1 Lowest Intensity	114,228	18.3 %
1.5	37,587	6.0 %
2 Low	113,293	18.1 %
2.5	76,920	12.3 %
3 Moderate	94,083	15.1 %
3.5	45,440	7.3 %
4 High	10,949	1.8 %
4.5	11,713	1.9 %
5 Highest Intensity	8,609	1.4 %
Total	**624,958**	**100.0 %**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Characteristic Fire Intensity Scale
Acres
150,000
100,000
50,000
0
112,136
114,228
37,587
113,293
76,920
94,083
45,440
10,949
11,713
8,609
Non-Burnable
1 Lowest Intensity
1.5
2 Low
2.5
3 Moderate
3.5
4 High
4.5
5 Highest Intensity

Fire Type – Extreme

Description

There are two primary fire types – surface fire and canopy fire. Canopy fire can be further subdivided into passive canopy fire and active canopy fire. A short description of each of these is provided below.

Surface Fire
A fire that spreads through surface fuel without consuming any overlying canopy fuel. Surface fuels include grass, timber litter, shrub/brush, slash and other dead or live vegetation within about 6 feet of the ground.

Passive Canopy Fire
A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott & Reinhardt, 2001).

Active Canopy Fire
A crown fire in which the entire fuel complex (canopy) is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott & Reinhardt, 2001).





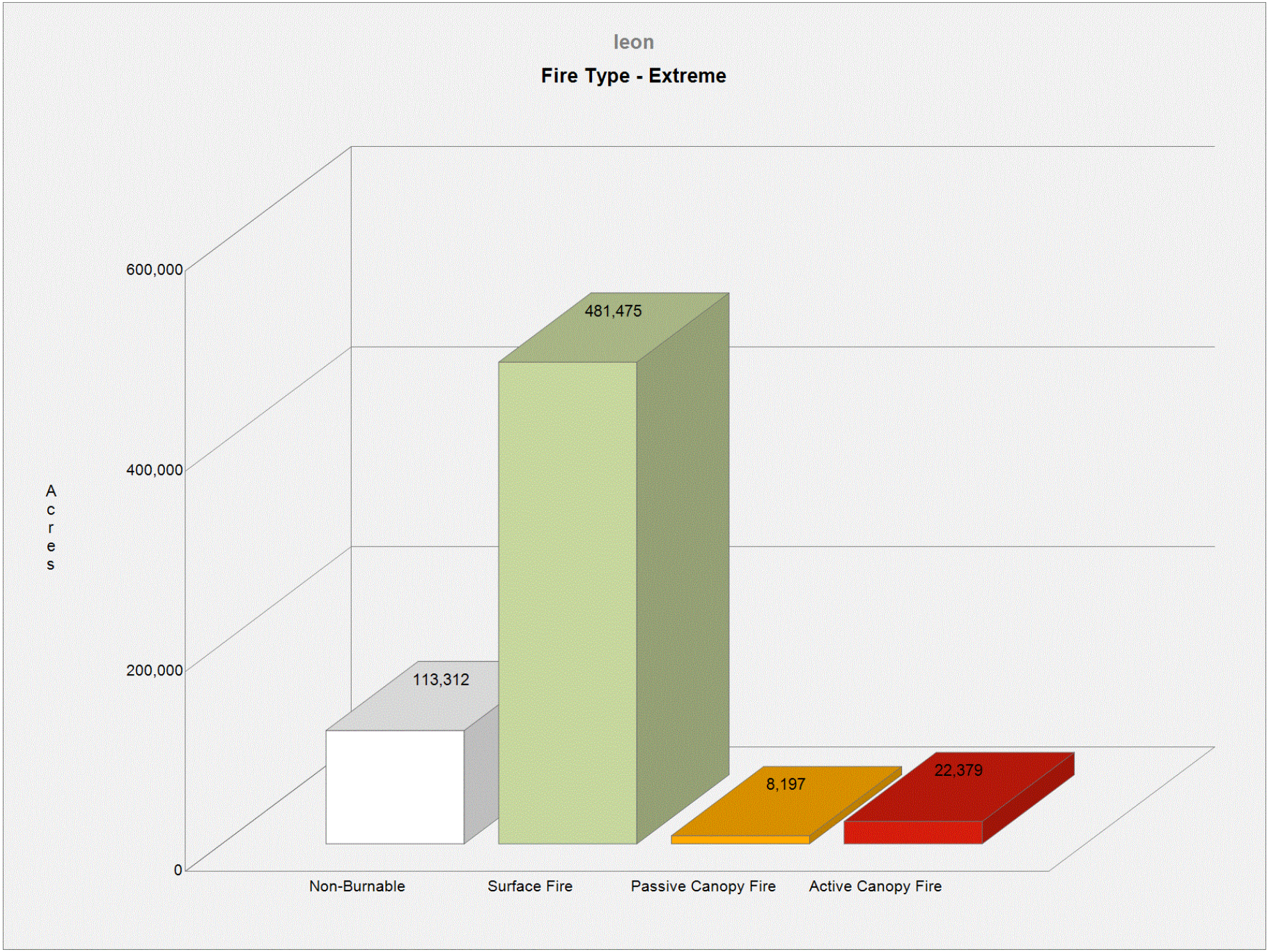

Fire Type – Extreme represents the potential fire type under the extreme percentile weather category. The extreme percentile weather category represents the average weather based on the top three percent fire weather days in the analysis period. It is not intended to represent a worst case scenario weather event. Accordingly, the potential fire type is based on fuel conditions, extreme percentile weather, and topography.

Canopy fires are very dangerous, destructive and difficult to control due to their increased fire intensity. From a planning perspective, it is important to identify where these conditions are likely to occur on the landscape so that special preparedness measure can be taken if necessary. The Fire Type – Extreme layer shows the footprint of where these areas are most likely to occur. However, it is important to note that canopy fires are not restricted to these areas. Under the right conditions, it can occur in other canopied areas.

For all Southern states, except Florida and Texas, this dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. For Texas, the 2010 Texas risk update data is portrayed. For Florida, the 2010 Florida risk assessment update data is shown.

The fire type - extreme map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Fire Type	Acres	Percent
Non-Burnable	113,312	18.1 %
Surface Fire	481,475	77.0 %
Passive Canopy	8,197	1.3 %
Active Canopy	22,379	3.6 %
Total	**625,363**	**100.0 %**


leon
Fire Type - Extreme
600,000
400,000
200,000
0
Acres
481,475
113,312
8,197
22,379
Non-Burnable
Surface Fire
Passive Canopy Fire
Active Canopy Fire

Surface Fuels

Description

Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters needed by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, such as rate of spread, flame length, fireline intensity, and other fire behavior metrics. As the name might suggest, surface fuels only account for the surface fire potential. Canopy fire potential is computed through a separate but linked process. The Southern Wildfire Risk Assessment accounts for both surface and canopy fire potential in the fire behavior outputs.

Surface fuels are typically categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter and 4) slash. There are two standard fire behavior fuel model sets published for use. The Fire Behavior Prediction System 1982 Fuel Model Set (Anderson, 1982) contains 13 fuel models and the Fire Behavior Prediction System 2005 Fuel Model Set (Scott & Burgan 2005) contains 40 fuel models.

The SWRA Surface Fuels have been updated to use the FBPS 2005 40 fuel model set from the LANDFIRE 2010 products, supplemented with additional enhancements obtained through calibration workshops with the Southern states. Florida uses FBPS 1982 fuel models derived based on spectral classification of Landsat Thematic Mapper (TM) satellite imagery derived as part of the Florida Forest Service fuels mapping and risk assessment projects. Texas fuels represent 2010 updates conducted as part of a statewide fuels and canopy mapping effort.

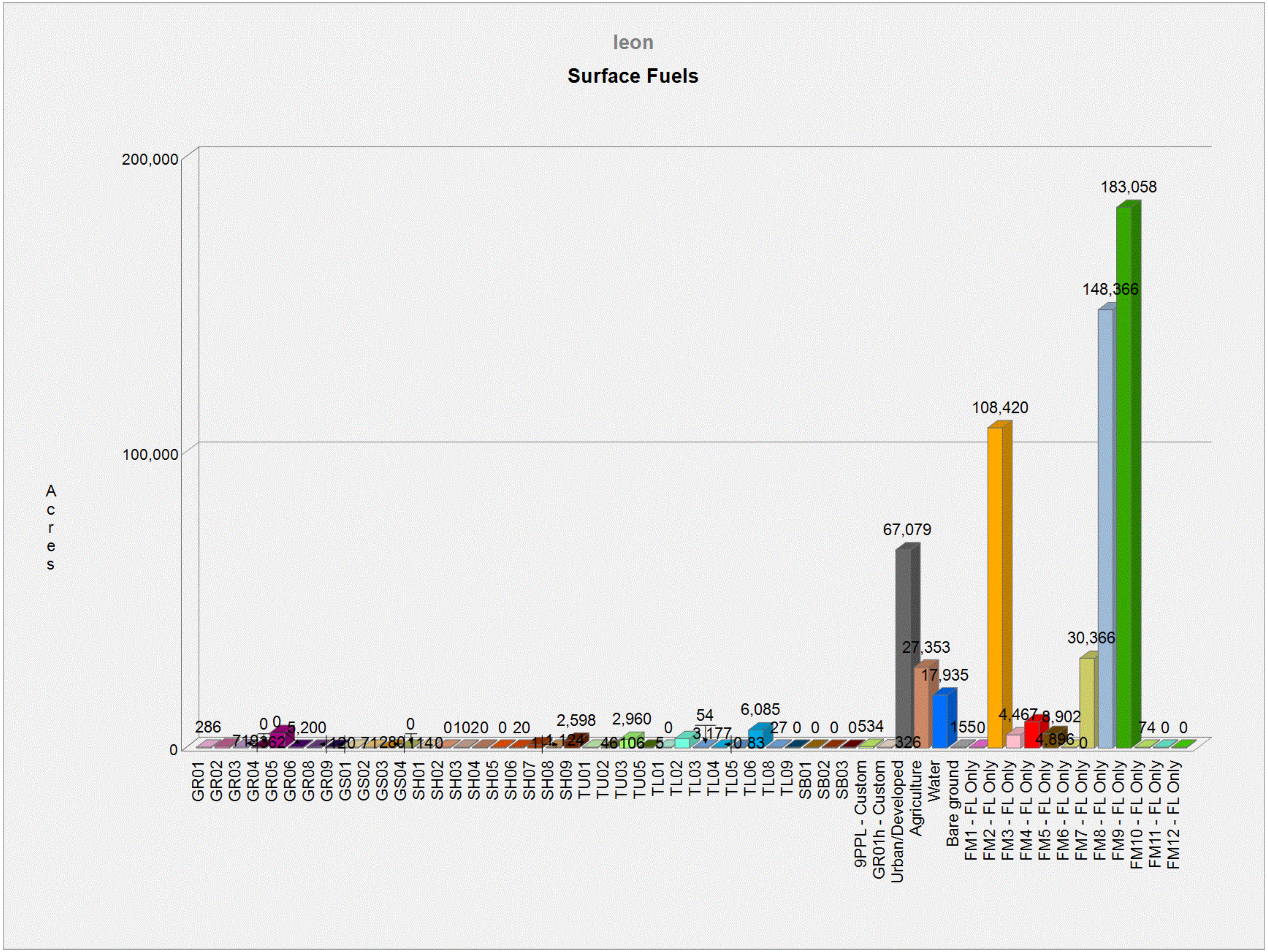
For the remaining 11 Southern states, the recently completed SWRA Update project produced a new surface fuels dataset based on 2010 LANDFIRE products. A detailed fuels calibration process was undertaken that involved collaboration with Southern state fuels and fire behavior specialists supported by federal partner involvement. Workshops were held to review the LANDFIRE fuels product and calibrate the data by modifying specific fuels classes to better reflect local knowledge and input. A key component of this calibration task involved using image processing techniques to better delineate conifer areas, and in particular pine areas (plantations and natural stands). The fuels layer represents 2010 conditions.

Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
Grass Fuels Type Models (nearly pure grass and/or forb type)				
GR01	2005	Grass is short, patchy, and possibly heavily grazed. Spread rate moderate; flame length low.	286	0.0 %
GR02	2005	Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate.	719	0.1 %
GR03	2005	Very coarse grass, average depth about 2 feet. Spread rate high; flame length moderate.	362	0.1 %
GR04	2005	Moderately coarse continuous grass, average depth about 2 feet. Spread rate very high; flame length high.	0	0.0 %
GR05	2005	Dense, coarse grass, average depth about 1 to 2 feet. Spread rate very high; flame length high.	5,200	0.8 %
GR06	2005	Dryland grass about 1 to 2 feet tall. Spread rate very high; flame length very high.	0	0.0 %
GR08	2005	Heavy, coarse, continuous grass 3 to 5 feet tall. Spread rate very high; flame length very high.	12	0.0 %
GR09	2005	Very heavy, coarse, continuous grass 5 to 8 feet tall. Spread rate extreme; flame length extreme.	0	0.0 %
Grass-Shrub Fuels Type Models (mixture of grass and shrub, up to 50 percent shrub coverage)				
GS01	2005	Shrubs are about 1 foot high, low grass load. Spread rate moderate; flame length low.	71	0.0 %
GS02	2005	Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate.	280	0.0 %
GS03	2005	Moderate grass/shrub load, average grass/shrub depth less than 2 feet. Spread rate high; flame length moderate.	114	0.0 %
GS04	2005	Heavy grass/shrub load, depth greater than 2 feet. Spread rate high; flame length very high.	0	0.0 %
Shrub Fuel Type Models (Shrubs cover at least 50 percent of the site, grass sparse to nonexistent)				
SH01	2005	Low shrub fuel load, fuelbed depth about 1 foot; some grass may be present. Spread rate very low; flame length very low.	0	0.0 %
SH02	2005	Moderate fuel load (higher than SH01), depth about 1 foot, no grass fuel present. Spread rate low; flame length low.	0	0.0 %
SH03	2005	Moderate shrub load, possibly with pine overstory or herbaceous fuel, fuel bed depth 2 to 3 feet. Spread rate low; flame length low.	102	0.0 %
SH04	2005	Low to moderate shrub and litter load, possibly with pine overstory, fuel bed depth about 3 feet. Spread rate high; flame length moderate.	0	0.0 %

Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
SH05	2005	Heavy shrub load, depth 4 to 6 feet. Spread rate very high; flame length very high.	0	0.0 %
SH06	2005	Dense shrubs, little or no herb fuel, depth about 2 feet. Spread rate high; flame length high.	20	0.0 %
SH07	2005	Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than SH05, but flame length similar. Spread rate high; flame length very high.	1,124	0.2 %
SH08	2005	Dense shrubs, little or no herb fuel, depth about 3 feet. Spread rates high; flame length high.	1	0.0 %
SH09	2005	Dense, finely branched shrubs with significant fine dead fuel, about 4 to 6 feet tall; some herbaceous fuel may be present. Spread rate high, flame length very high.	2,598	0.4 %
Timber-Understory Fuel Type Models (Grass or shrubs mixed with litter from forest canopy)				
TU01	2005	Fuelbed is low load of grass and/or shrub with litter. Spread rate low; flame length low.	46	0.0 %
TU02	2005	Fuelbed is moderate litter load with shrub component. Spread rate moderate; flame length low.	106	0.0 %
TU03	2005	Fuelbed is moderate litter load with grass and shrub components. Spread rate high; flame length moderate.	2,960	0.5 %
TU05	2005	Fuelbed is high load conifer litter with shrub understory. Spread rate moderate; flame length moderate.	5	0.0 %
Timber Litter Fuel Type Models (dead and down woody fuel litter beneath a forest canopy)				
TL01	2005	Light to moderate load, fuels 1 to 2 inches deep. Spread rate very low; flame length very low.	0	0.0 %
TL02	2005	Low load, compact. Spread rate very low; flame length very low.	3,177	0.5 %
TL03	2005	Moderate load conifer litter. Spread rate very low; flame length low.	54	0.0 %
TL04	2005	Moderate load, includes small diameter downed logs. Spread rate low; flame length low.	0	0.0 %
TL05	2005	High load conifer litter; light slash or mortality fuel. Spread rate low; flame length low.	83	0.0 %
TL06	2005	Moderate load, less compact. Spread rate moderate; flame length low.	6,085	1.0 %
TL08	2005	Moderate load and compactness may include small amount of herbaceous load. Spread rate moderate; flame length low.	27	0.0 %

Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
TL09	2005	Very high load broadleaf litter; heavy needle-drape in otherwise sparse shrub layer. Spread rate moderate; flame length moderate.	0	0.0 %
Slash-Blowdown Fuel Type Models (activity fuel/slash or debris from wind damage)				
SB01	2005	Low load activity fuel. Spread rate moderate; flame length low.	0	0.0 %
SB02	2005	Moderate load activity or low load blowdown. Spread rate moderate; flame length moderate.	0	0.0 %
SB03	2005	High load activity fuel or moderate load blowdown. Spread rate high; flame length high.	0	0.0 %
Custom Fuel Type Models (all states except Florida)				
9PPL	Custom	Long-needle (pine litter, plantations) with a high load	534	0.1 %
GR01h	Custom	Pasture and hayland	326	0.1 %
Non-burnable Fuel Type Models (insufficient wildland fuel to carry a wildland fire under any condition)				
NB01	2005	Urban or suburban development; insufficient wildland fuel to carry wildland fire. Includes roads.	67,079	10.7 %
NB03	2005	Agricultural field, maintained in nonburnable condition.	27,353	4.4 %
NB08	2005	Open water	17,935	2.9 %
NB09	2005	Bare ground	155	0.0 %
1982 Fire Behavior Prediction System – ONLY USED FOR FLORIDA ASSESSMENT				
FM 1	1982	Short grass	0	0.0 %
FM 2	1982	Timber grass and understory	108,420	17.3 %
FM 3	1982	Tall grass	4,467	0.7 %
FM 4	1982	Chaparral	8,902	1.4 %

Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
FM 5	1982	Brush	4,896	0.8 %
FM 6	1982	Dormant brush	0	0.0 %
FM 7	1982	Southern rough	30,366	4.9 %
FM 8	1982	Compact timber litter	148,366	23.7 %
FM 9	1982	Hardwood litter	183,058	29.3 %
FM 10	1982	Timber (understory)	74	0.0 %
FM 11	1982	Light logging slash	0	0.0 %
FM 12	1982	Medium logging slash	0	0.0 %
			625,363	**100.0 %**


leon
Surface Fuels
Acres
200,000
100,000
0
GR01
GR02
GR03
GR04
GR05
GR06
GR08
GR09
GS01
GS02
GS03
GS04
SH01
SH02
SH03
SH04
SH05
SH06
SH07
SH08
SH09
TU01
TU02
TU03
TU05
TL01
TL02
TL03
TL04
TL05
TL06
TL08
TL09
SB01
SB02
SB03
9PPL - Custom
GR01h - Custom
Urban/Developed
Agriculture
Water
Bare ground
FM1 - FL Only
FM2 - FL Only
FM3 - FL Only
FM4 - FL Only
FM5 - FL Only
FM6 - FL Only
FM7 - FL Only
FM8 - FL Only
FM9 - FL Only
FM10 - FL Only
FM11 - FL Only
FM12 - FL Only
286
5,200
2,598
2,960
54
6,085
67,079
27,353
17,935
108,420
4,467
8,902
4,896
30,366
148,366
183,058
74

Dozer Operability Rating

Description

The Dozer Operability Rating (DOR) expresses how difficult it is to operate a dozer in an area based on limitations associated with slope and vegetation/fuel type. Using the fireline production rates published in the NWCG Fireline Handbook 3 (PMS 410-1) as a guide, operability values were assigned to a matrix based on 6 slope classes and 10 vegetation/fuels classes. The possible values range from 1 to 9, with 1 representing no limitations and 9 being inoperable.

Class	Acres	Percent
1 (No Expected Limitations)	28,174	4.7 %
2 (Slight)	118,901	19.7 %
3 (Slight to Moderate)	104,968	17.3 %
4 (Moderate)	78,676	13.0 %
5 (Moderate to Significant)	150,608	24.9 %
6 (Significant)	209	0.0 %
7 (Significant to Severe)	0	0.0 %
8 (Severe)	123,475	20.4 %
9 (Inoperable)	0	0.0 %
Total	**605,011**	**100.0 %**

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Thompson, M. P., D. E. Calkin, M. A. Finney, A. A. Ager, and J. W. Gilbertson-Day. 2011. Integrated National-Scale Assessment of Wildfire Risk to Human and Ecological Values. Stochastic Environmental Research and Risk Assessment 25:761-780.

More information about the Fire Program Analysis project is available from http://www.forestsandrangelands.gov/WFIT/applications/FPA/index.shtml

More information about the Oak Ridge National Laboratory LandScan data is available from

http://web.ornl.gov/sci/landscan/landscan_documentation.shtml

More information about the U.S. Forest Service SILVIS data is available from http://silvis.forest.wisc.edu/maps/wui_main

SOUTHERN GROUP OF STATE FORESTERS
WILDFIRE RISK ASSESSMENT PORTAL

APPENDIX G:

PUBLIC MEETING NOTICES

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Thursday, January 10, 2019
8:00 a.m. – 9:00 a.m.

Conference Room 4F
4th Floor, City Hall
300 S. Adams Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of October 18, 2018 minutes
3. Old Business:
   (a) Status of Hurricane Hermine Disaster Hazard Mitigation Grant Program (HMGP) Grant Applications (Planning)
   (b) Status of Required Five-Year Update of LMS (Planning)
4. New Business:
   (a) Status of Hurricane Michael HMGP Program (Jason Pettus)
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Monday, August 12, 2019
9:30 a.m. – 11:00 a.m.

DSEM Conference Room
2nd Floor, Renaissance Center
435 N Macomb Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of January 10, 2019 minutes
3. Old Business:
   (a) Status of Required Five-Year LMS Update (Planning)
4. New Business:
   (a) Hurricane Michael Notice of Funding Availability (TBD)
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Tuesday, December 3, 2019
2:00 p.m. – 4:30 p.m.

DSEM Conference Room
2nd Floor, Renaissance Center
435 N Macomb Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of August 12, 2019 minutes
3. Old Business:
   (a) Hurricane Michael Notice of Funding Availability (Planning) – Project Review & Ranking
   (b) Status of Required Five-Year LMS Update (Planning)
4. New Business:
   (a) Election of Officers for 2020
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Tuesday, December 17, 2019
1:00 p.m. – 3:00 p.m.

DSEM Conference Room
2nd Floor, Renaissance Center
435 N Macomb Street
Tallahassee, Florida 32301

1. Introductions
2. Agenda Modifications
3. Review of December 3, 2019 minutes
3. Old Business:
   (a) Hurricane Michael Notice of Funding Availability (TBD)
4. New Business:
   (a) Consideration of New Committee Members
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION STEERING COMMITTEE

MEETING AGENDA

Thursday, February 20, 2020
10:00 p.m. – 12:00 p.m.

Gathering Room
Leon County Division of Facilities Management
1907 South Monroe Street
Tallahassee, Fl 32301

1. Introductions
2. Agenda Modifications
3. Review of December 17, 2019 minutes
3. Old Business:
   (a) Priority List of Proposed Hurricane Michael HMGP Projects
   (b) Status of Five-Year LMS Update (Planning)
4. New Business:
   (a) TBA
5. Adjourn

Committee Coordinator: Stephen Hodges, Senior Planner, Tallahassee – Leon County Planning Department

COVID-19 Local Impacts

Information updates and changes to City services (/publicsafety/covid-19.aspx)

The Tallahassee-Leon County Local Mitigation Strategy (LMS) is a countywide comprehensive hazard mitigation plan intended to make our community safer and more resistant to natural and other types of hazards.

This LMS identifies and analyzes hazards faced by the community, and proposes a series of mitigation initiatives, including objectives, programs, or specific projects that are intended to reduce potential impacts. This plan also ensures the community's eligibility for federal and state assistance.

The LMS reduces exposure to hazards and minimized their potential effects (including the costs associated with these hazards) by:

- Identifying potential hazards, such as hurricanes, tornadoes, floods, fires, and hazardous materials releases;
- Determining where the community is most vulnerable to these hazards;
- Assessing the critical facilities and other structures that are most vulnerable to hazards, including potential damages and costs;
- Prioritizing list of mitigation projects to take advantage of available funding;
- Identifying funding sources for mitigation projects; and
- Advocating hazard awareness and education for the community.

The LMS is prepared and updated annually as necessary with guidance from a steering committee composed of selected local, state, and regional government agencies, local colleges and universities, the Red Cross, the business community, and neighborhood representatives.

2018 LMS Update

Below is a progress report on the City of Tallahassee/Leon County Local Mitigation Strategy Initiative. This report was prepared by the Water Resources Engineering Division to meet requirements of the Community

Rating System (CRS) annual recertification. Because of the City participation in the CRS program, Tallahassee floodplain property owners receive up to 20% discount on their flood insurance premiums.

The report contains a review of each item in the Local Mitigation Strategy Initiatives including statements discussing how much has been accomplished to date as well as discussion of why any objectives have not been reached. To meet the annual recertification requirements, please forward this memorandum with the report to the City Commission. The attached report will be released to the media and made available to the public. No action is required by the Commission. This is for informational purposes only.

2018 Tallahassee – Leon County Local Mitigation Strategy (/Uploads/Public/Documents/place/lms2018.pdf)

Five-Year LMS Update

The Federal Emergency Management Agency requires that local governments update their LMS at least every five years. The Planning Department has been updating the adopted LMS in 2019-2020 by working with a planning subcommittee composed of local and state government staff, along with representatives of several non-profit organizations within the community. The Steering Committee has also met several times to discuss these proposed changes, as well as develop projects intended for hazard mitigation grant funding made available to counties affected by Hurricane Michael.

A draft of the LMS has been submitted to the State of Florida's Division of Emergency Management (DEM) for review. (DEM has authority under FEMA to review LMS plans for consistency with federal regulations.) A copy of this draft plan is linked below.

Draft 2020 LMS Update (/Uploads/Public/Documents/place/lms2020.pdf)

The public is encouraged to review this document and submit comments by mid-April as appropriate to the LMS Coordinator:

Stephen M. Hodges, AICP
Senior Planner, Comprehensive Planning & Urban Design
Tallahassee-Leon County Planning Department
Renaissance Center
435 N Macomb St., Tallahassee, FL 32310
850-891-6400 • stephen.hodges@talgov.com (mailto:stephen.hodges@talgov.com)

The Planning Department has scheduled a public meeting on March 24, 2020 from 5-7 p.m. to solicit input on the draft LMS prior to submitting this plan to the Tallahassee City Commission and the Leon County Board of County Commissioners for adoption on April 22, 2020 and April 28, 2020 respectively. This meeting was intended to be held at the Renaissance Center in Frenchtown. However, given the Coronavirus local and state emergency declarations, access to this building is not possible at this time or to any other public meeting spaces. Therefore, this meeting will have to be virtual (online). Details are being worked out presently.

There will also be additional opportunities for the public to provide comments as part of the adoption meetings with the Commissions. Please contact staff for details.

CONTACT INFO

Tallahassee-Leon County Planning Department
435 North Macomb Street
Tallahassee FL 32301
850-891-6400
Maps and Directions (https://www.google.com/maps/place/435 North Macomb Street+Tallahassee+FL+32301)
Contact Us (mailto:planning@talgov.com)

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DISCLAIMER (/Main/disclaim.aspx)

APPENDIX I:

Proposed Hazard Mitigation Projects
for Hurricane Michael
Hazard Mitigation Grant Program Funding

Priority Ranking	Project Name	Implementing Agency or Organization	Jurisdiction	Hazards Mitigated	Potential Funding Sources	Estimated Total Cost	Amount Requested (75% of Total)	Cumulative Amount Requests	25% Match	New, Deferred, Completed, or Deleted	Initiative(s) Project is Consistent With
1	Rural Fire Station Hardening (Stations #11 & #14)	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$886,000	$664,500	$664,500	$221,500	New	#1
2	Fleet Facility Resilience	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$580,000	$435,000	$1,099,500	$145,000	New	#1
3	Leon County Detention Facility Wind Entry Point Mitigation Project	Leon County Sheriff's Office	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,779,716	$1,334,787	$2,434,287	$444,929	New	#1
4	Gemini Building Hardening	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$200,000	$150,000	$2,584,287	$50,000	New	#1
5	Install Permanent Generators at Four Well Sites and Four Sewer Pump Lift Stations	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$517,000	$387,750	$2,972,037	$129,250	New	#1
6	Power Redundancy at Pump Stations 167 and 141	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$464,000	$348,000	$3,320,037	$116,000	New	#1
7	Electric Undergrounding for Pump Stations 74 and 22	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$530,000	$397,500	$3,717,537	$132,500	New	#1
8	Jack McClean Park Resilience Hub	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$500,000	$375,000	$4,092,537	$125,000	New	#1
9	Gemini Building Power Redundancy	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,400,000	$1,050,000	$5,142,537	$350,000	New	#1
10	Raymond Tucker Road/Golden Pheasant/Windwood Hill Drainage Improvements	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$3,500,000	$2,625,000	$7,767,537	$875,000	New	#9
11	Power Redundancy at Pump Stations 73, 99, & 118	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$696,000	$522,000	$8,289,537	$174,000	New	#1
12	Leon County Detention Facility Roof Wind Mitigation Project	Leon County Sheriff's Office	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$8,070,930	$6,053,198	$14,342,735	$2,017,733	New	#1
13	Baum Road Drainage Improvements	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$758,500	$568,875	$14,911,610	$189,625	New	#9
14	Maylor Road Accessibility Enhancement and Flood Mitigation	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$3,220,000	$2,415,000	$17,326,610	$805,000	New	#9
15	Utility Operations Center Resiliency	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$3,000,000	$2,250,000	$19,576,610	$750,000	New	#1
16	Recovery Center Generators and Wind Mitigation Studies	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$957,100	$717,825	$20,294,435	$239,275	New	#1

17	HOPE: New metal roof	BBHC	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$45,000	$33,750	$20,328,185	$11,250	New	#1
18	Home Front: Purchase and installation of a generator to provide power to 52 residences as well as installation, permitting, and engineering	BBHC	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$299,000	$224,250	$20,552,435	$74,750	New	#1
19	Balkin: Purchase and installation of a generator to include all 17 residences as well as installation, permitting, and engineering	BBHC	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$128,800	$96,600	$20,649,035	$32,200	New	#1
20	Generator for Shelter	Capital City Youth Services	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$110,000	$82,500	$20,731,535	$27,500	New	#1
21	Generator for Shelter	Refuge House	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$94,320	$70,740	$20,802,275	$23,580	New	#1
22	Roof Replacement – Public Works Building	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$415,000	$311,250	$21,113,525	$103,750	New	#1
23	Administration Building Wind Hazard Mitigation Project	Leon County Sheriff's Office	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,183,617	$887,713	$22,001,237	$295,904	New	#1
24	Roof Replacement – Courthouse Main	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$500,000	$375,000	$22,376,237	$125,000	New	#1
25	Installation of Safety Glass at the Kearney Center	CESC Health Services	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$23,408	$17,556	$22,393,793	$5,852	New	#1
26	Upgrading Overhead Wire to Tree Wire	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$3,726,400	$2,794,800	$25,188,593	$931,600	New	#1
27	Transmission Line Back feed	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,743,240	$1,307,430	$26,496,023	$435,810	New	#1
28	Lake Henrietta Sediment Removal	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$1,440,000	$1,080,000	$27,576,023	$360,000	New	#9
29	Westgate: Nine (9) house generators	CESC Health Services	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$915,000	$686,250	$28,262,273	$228,750	New	#1
30	Roof Replacement – Orange Ave. Health Department	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$250,000	$187,500	$28,449,773	$62,500	New	#1
31	Electrical Undergrounding in Medical Corridor	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$17,000,000	$12,750,000	$41,199,773	$4,250,000	New	#1
32	Roof Replacement – Fort Braden Community Center	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$50,000	$37,500	$41,237,273	$12,500	New	#1
33	Service Wire Overhead to Underground Conversions (25%)	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$6,930,250	$5,197,688	$46,434,961	$1,732,563	New	#1

34	Roof Replacement – Main Library	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$400,000	$300,000	$46,734,961	$100,000	New	#1
35	Pump Station 12 Replacement	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding, Extreme Temperatures	HMGP	$7,000,000	$5,250,000	$51,984,961	$1,750,000	New	#1
36	GIS 3D Modeling	Leon County	Leon County & City of Tallahassee	All	HMGP	$80,000	$60,000	$52,044,961	$20,000	New	#5, #15
37	Miracle Hill Permanent Generator	Miracle Hill	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$500,000	$375,000	$52,419,961	$125,000	New	#1
38	Rural Fire Station Hardening (Stations #10, #12, & #13)	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,481,500	$1,111,125	$53,156,086	$370,375	New	#1
	TOTAL					**$71,374,781**	**$53,531,086**		**$17,843,695**		

APPENDIX I:

Hurricane Michael HMGP Mitigation Projects Summary Ranking

Project Name	Organization	Estimated Total Cost	Amount Requested (75% of Total)	Cumulative Amount Requests	25% Match	Total Scores	Rank
Rural Fire Station Hardening	City of Tallahassee	$650,000	$487,500	$487,500	$162,500	404	1
Fleet Facility Hardening	City of Tallahassee	$580,000	$435,000	$922,500	$145,000	374	2
Leon County Detention Facility Wind Entry Point Mitigation Project	Leon County Sheriff's Office	$1,571,911	$1,178,933	$2,101,433	$392,978	370	3
Gemini Building Hardening	City of Tallahassee	$200,000	$150,000	$2,251,433	$50,000	335	4
Install Permanent Generators at Four Well Sites and Four Sewer Pump Lift Stations	Talquin Electric Cooperative	$517,000	$387,750	$2,639,183	$129,250	311	5
Power Redundancy at Pump Stations 167 and 141	City of Tallahassee	$464,000	$348,000	$2,987,183	$116,000	304	6
Electric Undergrounding for Pump Stations 74 and 22	City of Tallahassee	$530,000	$397,500	$3,384,683	$132,500	303	7
Jack McClean Park Resilience Hub	City of Tallahassee	$350,000	$262,500	$3,647,183	$87,500	294	8
Gemini Building Power Redundancy	City of Tallahassee	$1,400,000	$1,050,000	$4,697,183	$350,000	290	9
Raymond Tucker Road/Golden Pheasant/Windwood Hill Drainage Improvements	Leon County	$3,500,000	$2,625,000	$7,322,183	$875,000	275	10
Power Redundancy at Pump Stations 73, 118 & 158	City of Tallahassee	$696,000	$522,000	$7,844,183	$174,000	264	11
Leon County Detention Facility Roof Wind Mitigation Project	Leon County Sheriff's Office	$8,070,930	$6,053,197	$13,897,380	$2,017,733	260	12
Baum Road Drainage Improvements	Leon County	$758,500	$568,875	$14,466,255	$189,625	255	13
Maylor Road Accessibility Enhancement and Flood Mitigation	Leon County	$3,220,000	$2,415,000	$16,881,255	$805,000	247	14
Utility Operations Center Resiliency	City of Tallahassee	$3,000,000	$2,250,000	$19,131,255	$750,000	224	15
Recovery Center Generators and Wind Mitigation Studies	Leon County	$957,100	$717,825	$19,849,080	$239,275	224	16
HOPE: Fund new roof	BBHC	$20,000	$15,000	$19,864,080	$5,000	203	17
Home Front: Purchase and installation of a generator	BBHC	$10,000	$7,500	$19,871,580	$2,500	201	18
Balkin: Purchase and installation of a generator	BBHC	$10,000	$7,500	$19,879,080	$2,500	197	19
Generator for Shelter	Capital City Youth Services	$75,000	$56,250	$19,935,330	$18,750	188	20
Generator for Shelter	Refuge House	$94,320	$70,740	$20,006,070	$23,580	187	21
Roof Replacement – Public Works Building	Leon County	$415,000	$311,250	$20,317,320	$103,750	187	22
Administration Building Wind Hazard Mitigation Project	Leon County Sheriff's Office	$1,183,617	$887,713	$21,205,033	$295,904	185	23
Roof Replacement – Courthouse Main	Leon County	$500,000	$375,000	$21,580,033	$125,000	182	24
The Dwellings: House generator	CESC Health Services	$10,000	$7,500	$21,587,533	$2,500	178	25
Upgrading Overhead Wire to Tree Wire	Talquin Electric Cooperative	$3,726,400	$2,794,800	$24,382,333	$931,600	176	26
Transmission Line Back feed	Talquin Electric Cooperative	$1,743,240	$1,307,430	$25,689,763	$435,810	174	27
Lake Henrietta Sediment Removal	Leon County	$1,440,000	$1,080,000	$26,769,763	$360,000	169	28
Westgate: Nine (9) house generators	CESC Health Services	$90,000	$67,500	$26,837,263	$22,500	168	29
Roof Replacement – Orange Ave. Health Department	Leon County	$250,000	$187,500	$27,024,763	$62,500	152	30
Roof Replacement – Fort Braden Community Center	Leon County	$50,000	$37,500	$39,812,263	$12,500	132	32
Electrical Undergrounding in Medical Corridor	City of Tallahassee	$17,000,000	$12,750,000	$39,774,763	$4,250,000	132	31
Service Wire Overhead to Underground Conversions (25%)	Talquin Electric Cooperative	$6,930,250	$5,197,688	$45,009,951	$1,732,563	131	33
Roof Replacement – Main Library	Leon County	$400,000	$300,000	$45,309,951	$100,000	128	34
Pump Station 12 Replacement	City of Tallahassee	$7,000,000	$5,250,000	$50,559,951	$1,750,000	113	35
GIS 3D Modeling	Leon County	$80,000	$60,000	$50,619,951	$20,000	65	36
Miracle Hill Permanent Generator	Miracle Hill	$500,000	$375,000	$50,994,951	$125,000	n/a	37
TOTAL		**$67,993,268**	**$50,994,951**		**$16,998,318**		

APPENDIX J:

2017 HMGP Proposed Projects Endorsement Letter

28 April 2017

Mr. Miles Anderson, State Hazard Mitigation Officer
Florida Division of Emergency Management
2555 Shumard Oaks Boulevard
Tallahassee, Florida 32399-2100

Re: Hazard Mitigation Grant Program (HMGP) applications for 4280-DRFL, Hurricane Hermine

Dear Mr. Anderson,

The City of Tallahassee/Leon County Local Mitigation Strategy (LMS) Steering Committee on February 8, 2017 unanimously endorsed, and then prioritized on April 18, 2017, the following projects for HMGP funding from 4280-DRFL, Hurricane Hermine. These projects align with our LMS goals and objectives as noted, and with the State's mitigation goals and objectives (in accordance with the Code of Federal Regulations 44§ 201.6).

The projects identified below also conform to the mitigation initiatives listed in our LMS. These initiatives include various broad programs and more narrowly defined projects intended to address and mitigate hazards identified in the LMS. Some of these programs and projects are narrowly focused, whereas others are more general in nature. All of the proposed local projects that will be submitted for funding were reviewed by the Steering Committee and found to be consistent with the hazard mitigation initiatives as previously established by the Committee in the LMS.

The City of Tallahassee/Leon County LMS group presents the projects below in the order in which they are to be considered for funding:

FEMA-4280-DR-FL

Funding Priority	Project Name or Description	Applicant	Goal/Objective Consistency/Implementation	LMS Initiative No.	Estimated Federal Share
1	Improving Operational Reliability of Water Supply Well #18	City of Tallahassee	Goal 1 Objective 1.2	1	$150,000
2	Providing Redundant Electrical Circuits to the Main Pump Station #PS 149	City of Tallahassee	Goal 1 Objective 1.2	1	$558,750
3	Permanent Generators at Branch Libraries and Community Centers	Leon County	Goal 1 Objective 1.2	1	$669,000
4	Emergency Back-up Power Generator	2-1-1 Big Bend, Inc.	Goal 1 Objective 1.2	1	$40,729.69
5	4908 Crooked Road Property Acquisition	Leon County Development Support and Environmental Management	Goal 1 Objectives 1.1, 1.3 & 1.8	1	$95,856.60
6	12386 Waterfront Drive Structure Elevation	Leon County Development Support and Environmental Management	Goal 1 Objective 1.1	3	$66,352.35
7	Tallahassee Memorial Hospital Generators	Tallahassee Memorial Hospital	Goal 1 Objective 1.2	1	$461,662.50

For further information or inquiry, please contact Stephen Hodges at 850.891.6408 or at stephen.hodges@talgov.com.

Sincerely,

Scott Weisman
LMS Chair

cc: Cherie Bryant
LMS Vice-Chair

SW/smh

February 21, 2020

Mr. Miles Anderson, State Hazard Mitigation Officer
Florida Division of Emergency Management
2555 Shumard Oaks Boulevard
Tallahassee, Florida 32399-2100

Re: Hazard Mitigation Grant Program (HMGP) applications for Hurricane Michael (DR-4399)

Dear Mr. Anderson,

The City of Tallahassee/Leon County Local Mitigation Strategy (LMS) Steering Committee on February 20, 2020 unanimously endorsed a series of hazard mitigation projects proposed for DR-4399 (Hurricane Michael) HMGP funding. These projects have been deemed consistent with our LMS goals and objectives and with the State's mitigation goals and objectives in accordance with the Code of Federal Regulations 44§ 201.6. Attachment #1 indicates the proposed HMGP projects listed in the order in which they are to be considered for funding.

For further information or inquiry concerning the Committee, please contact Stephen Hodges at 850.891.6408 or at stephen.hodges@talgov.com. Thank you.

Sincerely,

Brent Pell
LMS Chair

Attachment:
As Stated

cc: Abena Ojetayo
LMS Vice-Chair

SW/smh

Priority Ranking	Project Name	Implementing Agency or Organization	Jurisdiction	Hazards Mitigated	Potential Funding Sources	Estimated Total Cost	Amount Requested (75% of Total)	Cumulative Amount Requests	25% Match	New, Deferred, Completed, or Deleted	Initiative(s) Project is Consistent With
1	Rural Fire Station Hardening (Stations #11 & #14)	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$886,000	$664,500	$664,500	$221,500	New	#1
2	Fleet Facility Resilience	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$580,000	$435,000	$1,099,500	$145,000	New	#1
3	Leon County Detention Facility Wind Entry Point Mitigation Project	Leon County Sheriff's Office	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,779,716	$1,334,787	$2,434,287	$444,929	New	#1
4	Gemini Building Hardening	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$200,000	$150,000	$2,584,287	$50,000	New	#1
5	Install Permanent Generators at Four Well Sites and Four Sewer Pump Lift Stations	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$517,000	$387,750	$2,972,037	$129,250	New	#1
6	Power Redundancy at Pump Stations 167 and 141	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$464,000	$348,000	$3,320,037	$116,000	New	#1
7	Electric Undergrounding for Pump Stations 74 and 22	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$530,000	$397,500	$3,717,537	$132,500	New	#1
8	Jack McClean Park Resilience Hub	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$500,000	$375,000	$4,092,537	$125,000	New	#1
9	Gemini Building Power Redundancy	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,400,000	$1,050,000	$5,142,537	$350,000	New	#1
10	Raymond Tucker Road/Golden Pheasant/Windwood Hill Drainage Improvements	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$3,500,000	$2,625,000	$7,767,537	$875,000	New	#9
11	Power Redundancy at Pump Stations 73, 99, & 118	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$696,000	$522,000	$8,289,537	$174,000	New	#1
12	Leon County Detention Facility Roof Wind Mitigation Project	Leon County Sheriff's Office	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$8,070,930	$6,053,198	$14,342,735	$2,017,733	New	#1
13	Baum Road Drainage Improvements	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$758,500	$568,875	$14,911,610	$189,625	New	#9
14	Maylor Road Accessibility Enhancement and Flood Mitigation	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$3,220,000	$2,415,000	$17,326,610	$805,000	New	#9
15	Utility Operations Center Resiliency	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$3,000,000	$2,250,000	$19,576,610	$750,000	New	#1
16	Recovery Center Generators and Wind Mitigation Studies	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$957,100	$717,825	$20,294,435	$239,275	New	#1

17	HOPE: New metal roof	BBHC	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$45,000	$33,750	$20,328,185	$11,250	New	#1
18	Home Front: Purchase and installation of a generator to provide power to 52 residences as well as installation, permitting, and engineering	BBHC	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$299,000	$224,250	$20,552,435	$74,750	New	#1
19	Balkin: Purchase and installation of a generator to include all 17 residences as well as installation, permitting, and engineering	BBHC	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$128,800	$96,600	$20,649,035	$32,200	New	#1
20	Generator for Shelter	Capital City Youth Services	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$110,000	$82,500	$20,731,535	$27,500	New	#1
21	Generator for Shelter	Refuge House	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$94,320	$70,740	$20,802,275	$23,580	New	#1
22	Roof Replacement – Public Works Building	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$415,000	$311,250	$21,113,525	$103,750	New	#1
23	Administration Building Wind Hazard Mitigation Project	Leon County Sheriff's Office	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,183,617	$887,713	$22,001,237	$295,904	New	#1
24	Roof Replacement – Courthouse Main	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$500,000	$375,000	$22,376,237	$125,000	New	#1
25	Installation of Safety Glass at the Kearney Center	CESC Health Services	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$23,408	$17,556	$22,393,793	$5,852	New	#1
26	Upgrading Overhead Wire to Tree Wire	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$3,726,400	$2,794,800	$25,188,593	$931,600	New	#1
27	Transmission Line Back feed	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,743,240	$1,307,430	$26,496,023	$435,810	New	#1
28	Lake Henrietta Sediment Removal	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding	HMGP	$1,440,000	$1,080,000	$27,576,023	$360,000	New	#9
29	Westgate: Nine (9) house generators	CESC Health Services	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$915,000	$686,250	$28,262,273	$228,750	New	#1
30	Roof Replacement – Orange Ave. Health Department	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$250,000	$187,500	$28,449,773	$62,500	New	#1
31	Electrical Undergrounding in Medical Corridor	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$17,000,000	$12,750,000	$41,199,773	$4,250,000	New	#1
32	Roof Replacement – Fort Braden Community Center	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$50,000	$37,500	$41,237,273	$12,500	New	#1
33	Service Wire Overhead to Underground Conversions (25%)	Talquin Electric Cooperative	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$6,930,250	$5,197,688	$46,434,961	$1,732,563	New	#1

34	Roof Replacement – Main Library	Leon County	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$400,000	$300,000	$46,734,961	$100,000	New	#1
35	Pump Station 12 Replacement	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Flooding, Extreme Temperatures	HMGP	$7,000,000	$5,250,000	$51,984,961	$1,750,000	New	#1
36	GIS 3D Modeling	Leon County	Leon County & City of Tallahassee	All	HMGP	$80,000	$60,000	$52,044,961	$20,000	New	#5, #15
37	Miracle Hill Permanent Generator	Miracle Hill	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$500,000	$375,000	$52,419,961	$125,000	New	#1
38	Rural Fire Station Hardening (Stations #10, #12, & #13)	City of Tallahassee	Leon County & City of Tallahassee	Hurricanes and Tropical Storms, Severe Storms, Extreme Temperatures	HMGP	$1,481,500	$1,111,125	$53,156,086	$370,375	New	#1
	TOTAL					**$71,374,781**	**$53,531,086**		**$17,843,695**		

APPENDIX L:

Glossary of Natural Hazard and Mitigation Terms

Glossary of Natural Hazard and Mitigation Terms

The following terms are used in the field of hazard mitigation, or describe community facilities, federal programs, processes, or elements of a hazard mitigation or community recovery program.

Aquifer Recharge Areas: Areas contributing to or providing volumes of water, which make a contribution to the storage or regional flow of an aquifer.

Base Flood Elevation (BFE): The highest elevation, expressed in feet above sea level, of the level of flood waters occurring in the regulatory base flood (i.e. 100-year flood event).

Building Codes: Regulations adopted by local government that establish standards for construction, modification, and repair of buildings and other structures.

Coastal High Hazard Area (CHA): Evacuation zone for a Category 1 hurricane as established in the Tampa Bay Regional Planning Council's Hurricane Evacuation Study.

Community Development Block Grants (CDBG): The objective of the CDBG program is to facilitate the development of viable urban communities by providing decent housing and a suitable living environment, while expanding economic opportunities primarily for persons of low and moderate incomes. Funds must be used so as to give maximum feasible priority to activities which will carry out one of the three broad national objectives of: benefit to low and moderate income families; or aid in the prevention or elimination of slums or blight; or activities designed to meet other community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community.

Community Rating System (CRS): An initiative of the Federal Insurance Administration to encourage increased efforts in the reduction of flood losses, facilitate accurate insurance ratings and promote the awareness of flood insurance.

Comprehensive Emergency Management Plan (CEMP): Required by Florida Statues and addresses the four inter-related phases of emergency management: preparedness, response, recovery and mitigation.

Critical Facilities: A structure from which essential services and functions for victim survival, continuation of public safety actions, and/or disaster recovery are performed or provided. These may include one or more of the following: Hospitals, nursing homes, medical service facilities, convalescent and assisted living facilities; police stations, fire stations, storage of critical records; government buildings and law enforcement offices; evacuation shelters and emergency operation centers that are needed for flood response activities before, during, or after a flood; and public and private utility (water and wastewater) facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood; radio/cellular/TV towers; schools and universities ; landfills; and structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials. The term includes facilities that are assigned Risk Category III and Risk Category IV pursuant to the Florida Building Code, Building.

Cultural Facilities: Establishments such as museums or art galleries of an historic, educational or cultural interest that are not operated commercially.

Development: The carrying out of any building activity or mining operation, the making of any material change in the use or appearance of any structure or land, or the dividing of land into three or more parcels.

Disaster: Any natural, technological, or civil emergency that causes damage of sufficient severity and magnitude to result in a request for a declaration of a state of emergency or disaster by a community or state to the President of the United States. Disasters are identified by the severity of resulting damage, as follows:

- Minor Disaster: A disaster that is likely to be within the response capabilities of local government and to result in only a minimal need for State or Federal assistance.
- Major Disaster: A disaster that will likely exceed local capabilities and require a broad range of State and Federal assistance.
- Catastrophic Disaster: A disaster that will require massive state and federal assistance, including immediate military involvement.

Drainage: Surface water runoff or the removal of surface water or groundwater from land by drains, grading or other means.

Emergency Management, Preparedness and Assistance (EMPA) Trust Fund Grant Program: Competitive grant for the state or regional agencies, local governments and private non-profit organizations for the implementation of projects that will further state and local emergency management objectives.

Evacuation Routes: Routes designated by Pasco County Office of Emergency Management and the Tampa Bay Regional Planning Council for the movement of persons to safety in the event of a hurricane.

Floodplain Management Plan: The operation of a program containing corrective and preventive measures for reducing flood damage including, but not limited to, flood control projects, floodplain land use regulations, flood proofing of buildings and emergency preparedness plans.

Flood-prone Areas: Areas inundated during a 100-year event or areas identified by the National Flood Insurance Program as an “A Zone” on Flood Insurance Rate Maps or Flood Hazard Boundary Maps.

Goal: Long-term end toward which programs or activities are ultimately directed.

Habitat: The particular natural community or communities that typically support a population of a particular plant or animal species.

Hazardous Material: Any substance or material in a quantity or form which may be harmful to humans, animals, crops, water systems, or other elements of the environment if accidentally released. Hazardous materials include: explosives, gases (compressed, liquefied, or dissolved), flammable and combustible liquids, flammable solids or substances, oxidizing substances, poisonous and infectious substances, radioactive materials and corrosives.

Hazard Mitigation Grant Program (HMGP): The program operates under the authority of Public Law 100-707, the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 404 provides to eligible applicants 75/25 (75% federal/25% local) matching funds to implement

immediate and long-term hazard mitigation measures. Up 15% of the combined Public Assistance (PA) and Individual Assistance (IA) funding distributed during any single disaster is available to fund hazard mitigation projects. Section 406 is site-specific mitigation that is written if authorized by the federal/state/local officials and is in accordance with any applicable rules and regulations.

Historic Resources: All areas, districts or sites containing properties listed on the Florida Master Site File, the National Register of Historic Places, or designated by a local government as historically, architecturally, or archaeologically significant.

Hurricane Shelter: A structure which meets the shelter selection guidelines, designated by local officials to be pre-identified for sheltering residents during a hurricane.

Infrastructure: Man-made structures which serve the common needs of the population, such as: sewage disposal systems, potable water systems, potable water wells serving a system, solid waste disposal sites or retention areas, stormwater systems, utilities, piers, docks, wharves, breakwaters, bulkheads, seawalls, bulwarks, revetments, causeways, marinas, navigation channels, bridges and roadways.

Local Mitigation Strategy (LMS): Plan developed to minimize negative impacts (potential loss of life or property damage) from a natural, man-made or technological disaster.

Long-Term Temporary Housing: Tents, mobile homes, suitable rental housing, or other readily fabricated dwellings set-up for residents to live in until they are able to return to their own homes or find new homes. Utilization of this type of housing can last up to six months or longer.

Mitigate: To offset or reduce negative impacts through measures such as, but not limited to:

- Not taking action or parts of certain action.
- Limiting the degree or magnitude of the action.
- Repairing, rehabilitating, or restoring the affected resources.
- Preserving and maintaining operations over time during the life of the action, and
- Replacing or providing substitute resources or environment.

Mobile Home: A structure, transportable in one or more sections, twelve (12) body feet or more in width, and over forty (40) feet in length, which is built upon an integral chassis and designed to be used as a dwelling unit with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical systems contained herein. If fabricated after June 15, 1976, each section shall bear a HUD label certifying that it was built in compliance with Federal Manufacturing Home Construction and Safety Standards 42 USC 5401 and 24 CR 3282 and 3283.

Mobile Home Park: A mobile home development consisting of a parcel of land under single ownership which has been, or is proposed to be, planned and improved for the placement of mobile homes for non-transient use.

Mobile Home Space: A plot of land for placement one mobile home within a mobile home park.

National Flood Insurance Program (NFIP): A federal program, which authorizes the sale of federally subsidized flood insurance in communities that agree to adopt and implement flood mitigation strategies and regulations.

Non-Special Flood Hazard Area (NSFHA): Moderate-to-low risk areas where the risk of being flooded is reduced but not completely removed. These areas submit over 20% of NFIP claims and receive one-third of disaster assistance for flooding. Flood insurance isn't federally required in moderate-to-low areas, but it is recommended for all property owners and renters. They are shown on FIRMs as zones labeled with the letters B, C or X (or a shaded X).

Objective: A specific, measurable, intermediate end that is achievable and marks progress toward a goal.

Open Space: Undeveloped lands suitable for passive recreation or conservation uses.

Post-Disaster Recovery: Long-term activity designed to return life to normal or improved levels following a disaster.

Project Impact: FEMA initiative that challenges communities to take actions that protect families, businesses and property by reducing the effects of natural disasters.

Public Facilities: Systems or facilities falling into categories such as transportation, sewer, solid waste, drainage, potable water, educational, parks and recreation, and public health.

Recreational Vehicle: Vehicle type unit primarily designed as temporary living quarters for recreational, camping, or travel use, which either has its own motive power or is mounted on or drawn by another vehicle.

Recreational Vehicle (RV) Park: Place set aside and offered by a person, for either direct or indirect remuneration of the owner, leaser, or operator of such place, for the parking, accommodation, or rental of five or more recreational vehicles or tents; and the group camping and similar recreational facilities.

Retrofit: Corrective measures taken on an existing structure to minimize damage caused by water, wind and fire.

Runoff: The part of the rainfall that travels to surface streams and water bodies via surface or subsurface routes.

Special Flood Hazard Area (SFHA): High-risk areas where there is at least a 1 in 4 chance of flooding during a 30-year mortgage. All home and business owners in these areas with mortgages from federally regulated or insured lenders are required to buy flood insurance. These areas are shown on the FIRMs as zones labeled with the letters A or V.

Storm Surge: The abnormal rise in water level caused by the wind and pressure forces of a hurricane or tropical storm. Storm surge produces most of the flood damage and drowning associated with storms that make landfall or that closely approach the coastline.

Stormwater: Flow of water resulting from a rainfall event.

Subdivision: The division of land, lot, tract or parcel into two or more lots, parcels, plats or sites, or other divisions of land for the purpose of sale, lease, offer, or (immediate or future)

development. The term also includes the division of residential, commercial, industrial, agricultural, or other land by means such as deed, metes and bounds description, lease, map or plat.

Undetermined-Risk Areas: No flood-hazard analysis has been conducted in these areas, but a flood risk still exists. Flood insurance rates reflect the uncertainty of the flood risk. These areas are labeled with the letter D on the FIRMs.

Wetlands: Areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils.