City of Tallahassee / Leon County
Local Mitigation Strategy

Updated May 2017

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EXECUTIVE SUMMARY

The *Tallahassee-Leon County Local Mitigation Strategy* (LMS) is a comprehensive plan intended to reduce the community's long-term vulnerability to natural and technological hazards through various forms of mitigation. 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.

The Plan is organized into four chapters:

- Chapter 1 describes the role of the LMS Committee and the larger 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 Working Group. These include program and policy initiatives such as ordinances or updates to existing codes and plans. These are often ongoing, non-capital programs that have been directed by local elected officials. Mitigation projects are capital improvements such as road paving and culvert repairs and other infrastructure upgrades or replacements. For these efforts, local government may require outside funding assistance. To assist the latter, 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 address hazards that affect various areas and constituencies of Leon County, while trying to protect the public at large from these hazards. This is also intended to be an evolving list that will 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 will meet annually to review and update this strategy. These procedures are detailed in Chapter 4, while the LMS Steering Committee bylaws are included in Technical 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* 2015 Update will be adopted by resolution by both the Leon County Board of Commissioners and the Tallahassee City Commission. Adoption of the LMS will not have any effect on the Tallahassee-Leon County Comprehensive Plan at this time, as the policy changes identified in the most recent update have been provided within the Tallahassee – Leon County Local Government Comprehensive Plan. Adoption of the LMS will allow 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 framework for applying these funds.

Glossary of Natural Hazard and Mitigation Terms[1]

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.

[1] Pasco County Local Mitigation Strategy, 2014.

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.

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

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 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 entered into an inter-local agreement to administer a state contract to prepare an LMS that would benefit both local governments.

The original LMS Committee was assembled by the Apalachee Regional Planning Council to create the 1999 edition of the LMS. 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 via the Division of Emergency Management.

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 a 1998 interlocal agreement between the City of Tallahassee and Leon County, 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 was updated in 2005, 2010, 2015, and 2017 with input provided by the Steering Committee the local government departments listed in the bylaws, the Apalachee Regional Planning Council, the Capital Chapter of the American Red Cross, the Division of Emergency Management (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 participating local governments and represents a consistent, comprehensive set of goals, initiative and programs and capital projects intended to reduce risks for the citizens of both the unincorporated areas of Leon County as well as those residing in the incorporated area (i.e., the City of Tallahassee). This document, which has been updated several times, also serves as the City of Tallahassee's Floodplain Management Plan. Other than in its capacity as the Local Mitigation Strategy for Leon County in general, the document provides no other role for developing areas and/or rural communities in the unincorporated county such as Woodville, Miccosukee, or Bradfordville.

Since the initial adoption of the LMS, the LMS Steering Committee has continued to meet on a regular basis and to endorse specific projects for funding through Federal disaster assistance programs. As of 2015, the LMS Committee has submitted requests for approximately $14.4 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 Benefits of Hazard Mitigation

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 hazards. Hurricanes, tornados, floods, hazardous material spills, fires, and sinkholes are some of the hazards experienced by Florida communities. 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.

A local mitigation strategy 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 evacuation, damage to their homes and personal property, lower home values, and higher insurance premiums.

Disasters also cost local governments in time and revenues. 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. 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. 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* will 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

The *Tallahassee-Leon County Local Mitigation Strategy* was largely developed by the LMS Committee, a working group comprised of City and County personnel, and representatives from various private, public, and non-profit sector interests. Beginning in October 1998, the group met numerous times 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 Technical Appendix C.)

The original LMS Committee was eventually divided into two groups for efficiency: the Steering Committee, whose function was to direct the course of the local mitigation strategy development; and 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 Steering 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 to undertake long-range mitigation planning and implementation of the LMS. 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.

The following lists include all current members of the Steering Committee and the Working Group. The primary roles of Steering Committee members are also defined.

Table 1.1: 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 Sheriff's Office	Public Safety	Voting
Leon County Emergency Management	Emergency Management	Voting
Tallahassee Department of Department of Underground Utilities and Public Infrastructure	Drainage, Flood Control	Voting
Tallahassee Fire Department	Fire; Emergency Rescue; HazMat Response	Voting
Tallahassee Police Department	Public Safety	Voting
Tallahassee-Leon County Planning Department	Mitigation Planning; Comprehensive Planning	Voting
Tallahassee/Leon County MIS/GIS	Environmental and Property Data; Mapping	Voting
Capital Area Chapter of the 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)
Apalachee Regional Planning Council	Regional Planning	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)

Officers

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Under the LMS Committee bylaws, the LMS coordinator is a designated staff of the Tallahassee-Leon County Planning Department, a joint 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, hazard mitigation in general, and grants processing.

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 departments with emergency response, hazard mitigation, and development responsibilities, as well as other departments providing significant services in these areas. Additional stakeholders include all of the local major hospitals and institutions of higher learning, and the leadership of the local Council of Neighborhood Associations. Regional agencies providing assistance and coordination include the Apalachee Regional Planning Council and the Northwest Florida Water Management District.

1.5 Current LMS Update and Adoption Process

Details of how the four chapters of the LMS were updated are discussed below.

Chapter One – The Planning Process

This chapter was revised to include the procedures employed to prepare the 2017 LMS update. The Planning Process section describes how the LMS has been developed and updated. Chapter One also describes the current composition of the LMS Steering Committee and Working Group. In re-evaluating local hazard mitigation needs, the LMS Steering Committee voted to add representatives of the three local institutions of higher learning (Florida State University, Florida Agricultural and Mechanical University, and Tallahassee Community College). This section also details how the public was involved in local hazard mitigation planning processes, and also describes opportunities for public participation in the LMS update process.

Chapter Two – Risk Assessment and Vulnerability Analysis

This chapter was revised to evaluate and update with new data where it was available all hazards, including their general description and location, historical occurrences, estimated impacts, probability, and extent, vulnerability, and risk. Risk and vulnerability analyses generated by selected 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 and uses Department of Revenue data to estimate potential dollar losses of vulnerable structures. The Hazus modeling runs utilized were conducted with Hazus-MH 2.0 in late 2011 and early 2012 for the 2012 Tallahassee – Leon County Post-Disaster Redevelopment Plan. The latest versions of Hazus (Hazus-MH 2.1 and 2.2) were released too late to be utilized for this edition of the LMS. Natural hazard profiles evaluated by the Update Subcommittee resulting in the following changes:

1. Hazard profiles for **Hurricanes and Tropical Storms**, **Thunderstorms**, and **Tornados** incorporated into one section called "Severe Weather Events." **Lightning** was added to this section as a new hazard, and **Flooding** was assigned as a stand-alone hazard. These changes make the updated LMS more consistent with the new 2012 Leon County Post Disaster Redevelopment Plan and the existing Leon County Comprehensive Emergency Management Plan.
2. A hazard profile for **Aviation Incidents** was added to reflect increased airport and other aerial activity, and the hazard profiles for E**arthquakes** and **Volcanic Activity** were removed. There are no records of either of the latter in Leon County, and the Update Subcommittee determined that these were unlikely to occur.
3. Similarly, hazard profiles for **Hazardous Materials Storage and Transportation** (previously **Hazardous Materials**), t**errorism**, **Aviation Incidents**, and **Energy Failures/Disruptions** were combined in one section labeled **"Technological and Societal Hazards**."
4. The hazard profile **Southern Pine Beetle Infestation** has been expanded and renamed "**Exotic Pest Infestations**" to reflect potential hazards from global climate change. The hazard profile for '**Pandemic Influenza**' has also been expanded and renamed to "**Diseases and Pandemics**" to reflect the same concerns.

The updated LMS incorporated new development through the Hazus modeling runs, including parcels, value, and population estimates. Additional developments 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 include the Cascade Park and Franklin Avenue improvements, the new Tallahassee – Leon County Public Safety Center, and the new American Red Cross facility adjacent to the Public Safety Center.

Although the original purpose of the LMS was to address community vulnerability to natural hazards, as specified by FEMA regulations, the updated LMS recognizes selected technological and societal hazards. 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 City of Tallahassee Utilities maintains plans and procedures for dealing with power and gas loss during hazard events, both natural and man-made. The Leon County Comprehensive Emergency Management Plan (CEMP) specifically details mitigation actions and local plans for addressing local vulnerability to these hazards.

Chapter Three – Mitigation Strategy

Changes in City of Tallahassee and Leon County priorities were incorporated into the plan in the goals and objectives and the hazard mitigation initiatives. The LMS Steering Committee evaluated and revised the goals and objectives in this chapter to incorporate changes in local government and other stakeholder priorities since the last plan update, as well as the list of mitigation initiatives. For instance, an existing initiative to construct a joint emergency management center was struck from the list because this center has been constructed and is operational. Another initiative was added to address a hazard (lightning) that can now be mitigated through the use of computer technology not previously available. Chapter Two was also updated to reflect the County's application into the Community Rating System program, which is a new priority of Leon County.

A detailed discussion of these changes is in Chapter 3, and modified and completed initiatives are included as a benchmark for progress in Technical Appendix D. As initiatives were re-evaluated and re-prioritized, economic considerations of mitigation initiatives were factored into the prioritization process, and a new Prioritized List of Hazard Mitigation Initiatives was created for the 2017 LMS Update. Lastly, a discussion of Leon County's and the City of Tallahassee's participation in the National Flood Insurance Program was also added to Chapter 3.

Chapter Four – Plan Maintenance

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

The current update was submitted to the Florida Division of Emergency Management in February 2015. Tallahassee - Leon County Planning Department staff requested adoption via resolution of the 2015 LMS update by the Leon County and Tallahassee City commissions at an advertised meeting of each commission in the first quarter of 2015 pending approval from the state Department of Emergency Management and the Federal Emergency Management Agency. The updated plan is available to elected officials, staff, and the public on the Planning Department's website, and a press release was distributed by both the City and the County.

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 2015 LMS update, and to help the LMS Committee and Update Subcommittee assess new local mitigation needs.

2010 Tallahassee-Leon County Local Mitigation Strategy Update

The information included in the 2010 LMS update served as the primary data source for the 2015 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 main comprehensive 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 which must be considered for effective local mitigation planning.

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 its process.

City of Tallahassee/Leon County Local Mitigation Strategy Hazard Mitigation Procedures Initiatives 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.

Other information was utilized in the update of this LMS, including state, federal, and other information sources. Citation footnotes are provided for all information presented in the Risk Assessment and Vulnerability Analysis (Chapter 2 of 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.

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. These meetings were open to the public. 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 2015 LMS update and meeting minutes, please refer to Technical Appendix C.

LMS Planning Process and Schedule (2010-2015)

December 2013

The LMS Committee initiated the 2015 LMS update process at their regular meeting on December 10, 2013. At that meeting, the LMS Committee members discussed the LMS update process and invited Florida Department of Emergency Management (DEM) staff to talk about 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. The direction of the Steering Committee to the Update Subcommittee was to provide the most current data regarding hazard occurrences and mitigation in order to conduct subsequent vulnerability and other analyses.

Spring 2014

The Update Subcommittee met on March 27, 2014 and May 29, 2014. At the March meeting, the Subcommittee reviewed elements of the existing LMS, including hazards, and discussed new flood mapping efforts, major mitigation and emergency management initiatives, studies, and completed projects, and discussed new data and other LMS requirements.

At the May 29 meeting, the Subcommittee reviewed additional LMS materials, including a revised list of hazards from the March meeting, existing LMS goals and objectives, hurricane scenarios used in the PDRP, and wildfire modeling results from the Florida Forest Service. Additional topics discussed by the Subcommittee included repetitive loss properties, critical facilities and their mapping, and Leon County's current NFIP/CRS application.

Summer 2014

During this period, 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 2015 LMS 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 2015 LMS update. Throughout the updated process, DEM staff was consulted for guidance regarding FEMA requirements.

Fall/Winter 2014

Elements of the 2015 LMS update were revised to incorporate changes recommended by the LMS Committee, surrounding counties, and citizens, was presented to the LMS Committee at their annual meeting on December 11, 2014. This meeting was publicly noticed and citizens were welcome to attend this meeting and discuss revisions to the 2015 LMS.

Spring 2015

The 2010 LMS has been accessible to the public on the City of Tallahassee's Hazard Mitigation website at http://www.talgov.com/planning/planning-mitstrat-mitstra.aspx since it was adopted in 2010. The public meeting to present the 2015 update was also advertised on this webpage.

A draft copy of the 2015 update was submitted to the Florida Division of Emergency Management for review on February 24, 2015. To encourage public participation and increase community knowledge regarding the local mitigation strategy and related planning processes, a draft copy of this plan was added to the City of Tallahassee's Hazard Mitigation website at http://www.talgov.com/planning/planning-mitstrat-mitstra.aspx. on February 6, 2015.

The advertised Leon County and City of Tallahassee commission meetings for adoption by resolution of the 2015 LMS update were held respectively on May 12, 2015 and Aprill 22, 2015.

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 open to the public and are promoted in various online and other media by Public Information Officers for both jurisdictions.

In addition to these meetings, an advertised public meeting regarding the 2015 update was held on March 12, 2015. A copy of the public notice, which was provided to the LMS Steering Committee, Working Group, and both Leon County and City of Tallahassee public information offices, is provided in this document as Appendix H. This public notice was also posted to the Planning Department's website in early March.

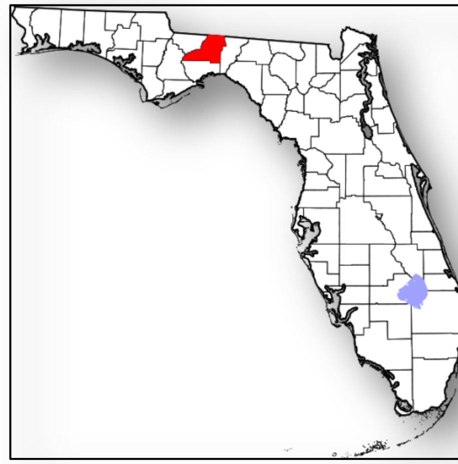
The full 2015 LMS update, including maps and technical appendices, is available on the City of Tallahassee's Hazard Mitigation website at http://www.talgov.com/planning/planning-mitstrat-mitstra.aspx, as well as the latest CRS annual (progress) report and a description of the 2015 LMS update process. 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.

To encourage public participation and increase community knowledge regarding the current LMS update and related planning processes, a draft copy of the 2015 LMS update was also added to the Hazard Mitigation Planning webpage. This draft copy of the 2015 LMS update was added to the website to give the community a reasonable period of time to review the draft document prior to the [TBA] public meeting. If community members are unable to attend any LMS public or other meetings, citizens can contact 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 2015 update advertised were held respectively on April 22 and May 12, 2015. These meetings 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 2015 update to the LMS.

Chapter 2 – Risk Assessment and Vulnerability Analysis

2.1 Leon County Profile



Leon County is located in the northwest region of Florida, traditionally known as the "Florida Panhandle." Leon County covers approximately 702 mi², including 667 mi² 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).

Official 2015 population estimates for the City of Tallahassee and the unincorporated areas within Leon County are presented in Table 2.1.

Table 2.1: Leon County Population Estimates by Jurisdiction, 2010 – 2015.[3]

Jurisdiction	Population Census, 2010	Population Estimate, 2015	% Change 2010-2015	% of Total Population (2015)
Unincorporated	94,111	96,467	2.5%	33.9%
Tallahassee	181,736	189,300	4.2%	66.5%
Countywide Total	275,487	284,800	3.4%	100%

According to the University of Florida, Bureau of Economic and Business Research (2006), 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 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 (2013 estimate)

Table 2.2: Population Projections for Leon County, 2015 – 2040.[4]

Year	City of Tallahassee	Unincorporated Leon County	Countywide Total
2015	189,300	95,500	284,800
2020	200,900	97,500	298,400
2025	211,800	99,300	311,100
2030	221,800	101,100	322,900
2035	230,200	102,500	332,700
2040	237,700	103,800	341,500

2.1.1 Land Uses

To ensure consistency with other local planning mechanisms, the following existing land use figures and descriptions are derived from the 2007 Evaluation and Appraisal Report (EAR), which updated the Tallahassee-Leon County Comprehensive Plan. Based on the results of EAR analysis, the majority of land within Leon County is vacant. Table 2.3 displays Leon County existing land uses by category.

Table 2.3: Leon County Existing Land Uses, 2007.[5]

	City of Tallahassee		Unincorporated Leon County		Leon County	
Existing Land Use	**Acreage**	**Percent**	**Acreage**	**Percent**	**Acreage**	**Percent**
Residential	17,075	28.3%	41,912	11.5%	58,987	13.9%
Motel/Hospital/Clinic	353	0.6%	46	0.0%	399	0.1%
Retail	1,793	3.0%	358	0.1%	2,151	0.5%
Office	1,380	2.3%	327	0.1%	1,707	0.4%
Warehouse	1,137	1.9%	1,514	0.4%	2,651	0.6%
Government Operation	8,514	14.1%	1,750	0.5%	10,264	2.4%
School	2,282	3.8%	536	0.1%	2,818	0.7%
Open Space	10,196	16.9%	122,815	33.7%	133,011	31.3%
Religious/Non-Profit	608	1.0%	636	0.2%	1,244	0.3%
Vacant	17,044	28.2%	194,523	53.4%	211,567	49.8%
Totals	**60,382**	**100.0%**	**364,417**	**100.0%**	**424,799**	**100.0%**

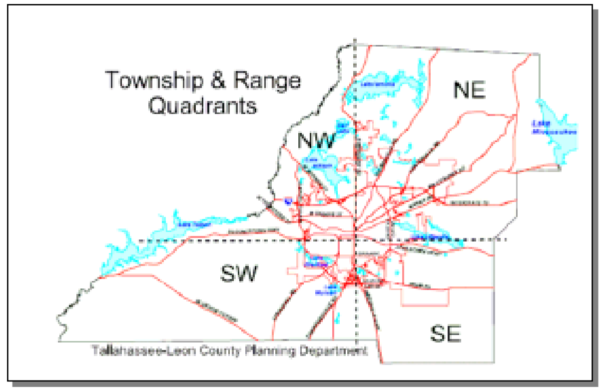
[4] Sources: University of Florida, Bureau of Economic and Business Research (2015-2040 Leon County projections); Tallahassee-Leon County Planning Department (City of Tallahassee and Unincorporated Leon County 2015-2040) projections assuming continued annexations and share of population growth captured by the City between 2000 and 2010 will continue throughout the projected time horizon). Based on the medium population projection, Leon County is expected to add over 100,000 new residents to its population between 2007 (272,896) and 2030 (378,100).
[5] Source: Evaluation and Appraisal Report of the 2010 Tallahassee-Leon County Comprehensive Plan (2007).

Residential Land Use

Acreage devoted to residential development in Leon County is approximately 58,987 acres or 13.9% of the County's land base. Within the limits of the City of Tallahassee the percentage of land in residential use is 28.3% while the percentage is 11.5% within the unincorporated area of Leon County.

Commercial Land Use

The existing land use categories "Motel/Hospital/Clinic", "Retail," "Office," and "Warehouse" were aggregated together for the Commercial land use category. Commercial development constitutes 1.6% of all land in Leon County and 8.6% of developed land. Almost 75% of existing commercial development in Leon County is located in the northern half of the County: 41% of the total in the Northwest quadrant and 31% of the total in the Northeast. Within the City of Tallahassee, commercial development comprises 7.7% of all lands (and 14.1% of developed property). Commercial development in the unincorporated area of the County accounts for 0.6% of all land and about 4.8% of developed property.



Vacant Land Use

For the purposes of this analysis, land categorized as "Vacant" also includes single-family residential development that is located on parcels that are ten acres and larger (wherein these parcels have the greatest potential to be redeveloped). Based on the above definition, vacant land in Leon County consists of approximately 211,567 acres or 49.8% of all land in the County. Vacant lands comprise 8.1% of the area of the City of Tallahassee and 91.9% of the unincorporated County.

2.1.2 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 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.

2.1.3 Future Development Trends

To ensure consistency with other local planning mechanisms, future development trends are derived from the 2007 Evaluation and Appraisal Report (EAR), which provided the basis for the most recent significant update of the Tallahassee-Leon County Comprehensive Plan, as well as additional amendments to the Comprehensive Plan to reflect changes in land use and associated densities and intensities, 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 2030 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 (Figure 1) 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.

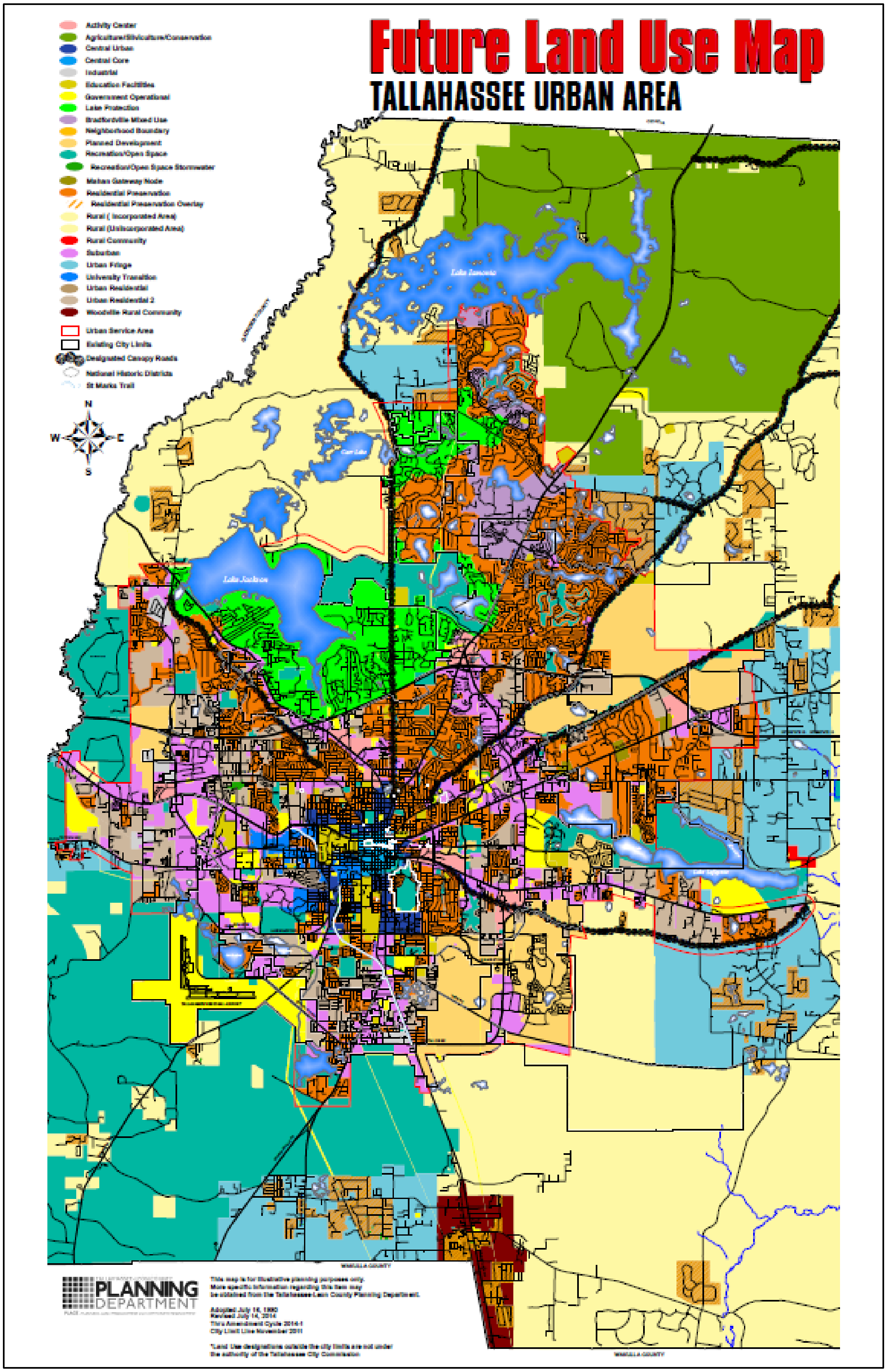
The strict limitations on development in these areas, coupled with the land use categories established in the Plan, helps minimizes vulnerability of newer buildings, infrastructure, and critical facilities within Leon County by limiting their location, density, and impacts. The only exception is residential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

Since 2010, there have been no major changes to the Comprehensive Plan to reflect or accommodate large new developments. 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. Generally, the growth in Leon County since that time has been in large apartment complexes mostly intended for the college and university student population, and the filling in of several planned residential and commercial developments. There are several large planned developments that are positioning themselves for the near future, but the buildout of these developments will likely occur over 5-10 years or more.

Population growth in Leon County and the City of Tallahassee has also slowed in the period 2010-2014. Population growth for the area under both jurisdictions grew by a modest 2.1 percent in that period (approximately 5,800 new residents).[6] Table 2.2 above indicates population estimates for the County to the year 2040. As the County grows in population, many of the planned developments are intended to capture this growth.

[6] U.S. Department of Commerce, Bureau of the Census (1930-2010), University of Florida, Bureau of Economic and Business Research (2014 estimate).

Figure 1: Leon County Urban Area Future Land Use Map, 2014.



2.2 Hazard Risks and Vulnerability

The 2007 Leon County CEMP and the 2015 LMS identify multiple hazards to Leon County and the City of Tallahassee. Hurricanes and wildfires are both considered to be high risk hazards as listed in the Leon County CEMP, while flooding, tornados and thunderstorms are listed as medium risk hazards.

The 2010 Leon County 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 2012 Tallahassee – Leon County Post-Disaster Redevelopment Plan, have been updated by the LMS Update Committee as part of the 2015 LMS update process.

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 2.4 lists the federal disaster declarations that have been issued since 1982.

Table 2.4: Recently Declared Disasters in Leon County, 1985 – 2014.[7]

Declaration	Date	Event	Primary Damage
#756	Nov-85	Hurricane Kate	Debris; Power Outages
#862	Apr-90	Unnamed Storm	Flooding; Power Outages; Debris
#966	Mar-93	Winter Storm	Flooding; Power Outages; Debris
#1035	Jul-94	T.S. Alberto	Flooding; Debris; Power Outages
#1069	Oct-95	Hurricane Opal	Flooding; Debris; Power Outages
#1223	Jun-98	Wildfires	Fire Damage
#2201	Jul-98	Drought	Crop Damage, Severe Heat
#1249	Sep-98	Hurricane Georges	Erosion, and Debris
#1339	Apr-99	Fire; Drought	Fire Damage, Crop Damage, Severe Heat
#1344	Oct-00	T.S. Helene	Riverine and Local Flooding
#1381	Jun-01	T.S. Allison	Riverine and Local Flooding
#1545	Sep-04	Hurricane Frances	Flooding; Debris
#1551	Sep-04	Hurricane Ivan	Flooding; Debris
#1561	Sep-04	Hurricane Jeanne	Debris
#1595	Jul-05	Hurricane Dennis	Debris
#1785	Aug-08	T.S. Fay	Flooding; Debris; Power Outages
#1831	Apr-09	Severe Storms	Flooding; Wind Damage

There have been a few local events that have not warrant 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.

Hurricane Hermine struck the Big Bend region of Florida on September 2, 2016, including Leon County and the City of Tallahassee. Hermine was declared a major disaster (DR-4280) by President Barack Obama on September 28, 2016.

[7] Source: Florida Division of Emergency Management, Bureau of Recovery and Mitigation.

2.2.1 Risk

Risk Classification

The Hazard Identification and Vulnerability Assessment uses the same risk classification system as the Leon County Comprehensive Emergency Management Plan. This system classifies the degree of risk to the residents of Leon County from potential hazards as low, medium or high risk as follows:

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.[8]

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.

Risk Ratings

Risks are rated to help prioritize mitigation objectives and initiatives. Ratings incorporate magnitude or severity of risk and its likelihood of occurrence. The risk ratings for hazards identified in the 2010 edition of the LMS were scored with a set of scoring procedures developed by the Apalachee Regional Planning Council in 2004 through the use of Mitigation 20/20™ software. This software application was used to derive a hazard score, or Risk Rating, for each identified hazard.

The Update Committee in 2014 did not utilize this software application because it is no longer maintained. Instead, the Committee created a relative ranking of hazard risks based on expert knowledge of local hazards and historical events. This revised ranking was presented to the LMS Steering Committee and Working Group at a meeting of the LMS Steering Committee on December 11, 2014. The new Risk Rating scores and ranking for each hazard is listed in Table 2.5.

Table 2.5: Leon County Hazards by Risk Rating, 2014-15.

High Risk	**Medium Risk**	**Low Risk**
Hurricanes and Tropical Storms	Thunderstorms	Wildfires
Flooding	Tornados	Sinkholes
	Lightning	Terrorism
	Droughts	Dam Failure
	Hazardous Materials Storage and Transportation	Storm Surge/Tsunami
	Energy Failures/Disruptions	Exotic Pest Infestations
		Diseases and Pandemics
		Aviation Incidents

[8] Leon County Comprehensive Emergency Management Plan.

2.2.2 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.

The previous editions of the LMS have used a variety of results from different models to estimate vulnerability to hazards. These modeling efforts and their results are summarized below.

<u>MEMPHIS</u>

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.

<u>TAOS Model</u>

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

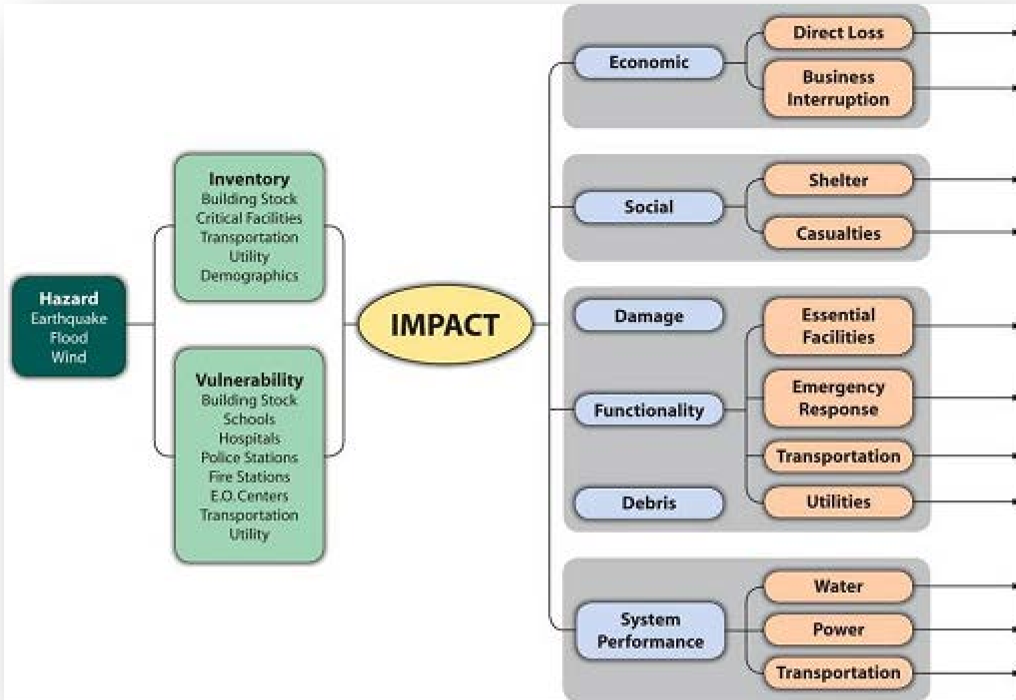
FEMA's Hazus software is a nationally standardized GIS-based software package that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses GIS technology to estimate the physical, economic, and social impacts of disasters. It graphically illustrates the limits of identified high-risk locations due to earthquake, hurricane and floods. Users can visualize the spatial relationships between populations and other more permanently fixed geographic assets or resources for the specific hazard being modeled, which is a crucial function in the pre-disaster planning process.

Hazus was used to model and generate estimated potential losses for hurricane winds and flooding. The model uses Census 2000 data to determine vulnerable population concentrations. Hazus-MH 2.0 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 2.0 risk assessment methodology uses hazard and inventory parameters (e.g., wind speed and building types) to determine the impact (i.e., damages and losses) on the built environment.

Hazus 2.0 was utilized to model floods and hurricanes for the Tallahassee – Leon County Post-Disaster Redevelopment Plan. (The latest versions of Hazus (Hazus-MH 2.1 and 2.2) were released too late to be utilized for this edition of the LMS.) As of this time, Hazus 2.2 is available for download from FEMA.

The figure below displays the data input and output of the Hazus-MH 2.0 model.

Figure 2: Conceptual Model of Hazus Methodology



Each of these models has their advantages and disadvantages and degree of usefulness. In this report, data and analysis results are used from different modeling efforts where available and appropriate.

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 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.

2.3 Vulnerability Assessment

This section describes Leon County and the City of Tallahassee's vulnerability to natural and technological and societal hazards.

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.

The various hazards identified by the LMS Steering Committee as potentially affecting Leon County and the City of Tallahassee include:

Table 2.6: Hazards identified in the 2015 LMS.

- 1.0 Severe Weather Events
  - 1.1 Hurricanes & Tropical Storms
  - 1.2 Thunderstorms
  - 1.3 Tornados
  - 1.4 Lightning
  - 1.5 Drought
- 2.0 Flooding
- 3.0 Wildfires
- 4.0 Sinkholes
- 5.0 Storm Surge/Tsunami
- 6.0 Dam Failure
- 7.0 Exotic Pest Infestations
- 8.0 Diseases and Pandemics
- 9.0 Technological and Societal Hazards
  - 9.1 Hazardous Materials Storage and Transportation
  - 9.2 Terrorism
  - 9.3 Aviation Incidents
  - 9.4 Energy Failures/Disruptions

Each hazard identified in Table 2.6 is 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)

2.3.1 Hurricanes and Tropical Storms

This section combines the hazard profile and vulnerability analysis for tropical storms and hurricanes since these events are so closely related.

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 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 1 to November the 30 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 2.7 provides a summary of different category storms as ranked by the Saffir-Simpson Scale.

Table 2.7: 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

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.) Table 2.8 lists tropical storms and hurricanes that have passed within this area since 1985.

[9] http://www.aoml.noaa.gov/hrd/tcfaq/A1.html.
[10] NOAA Hurricane Research Division "Frequently Asked Questions."

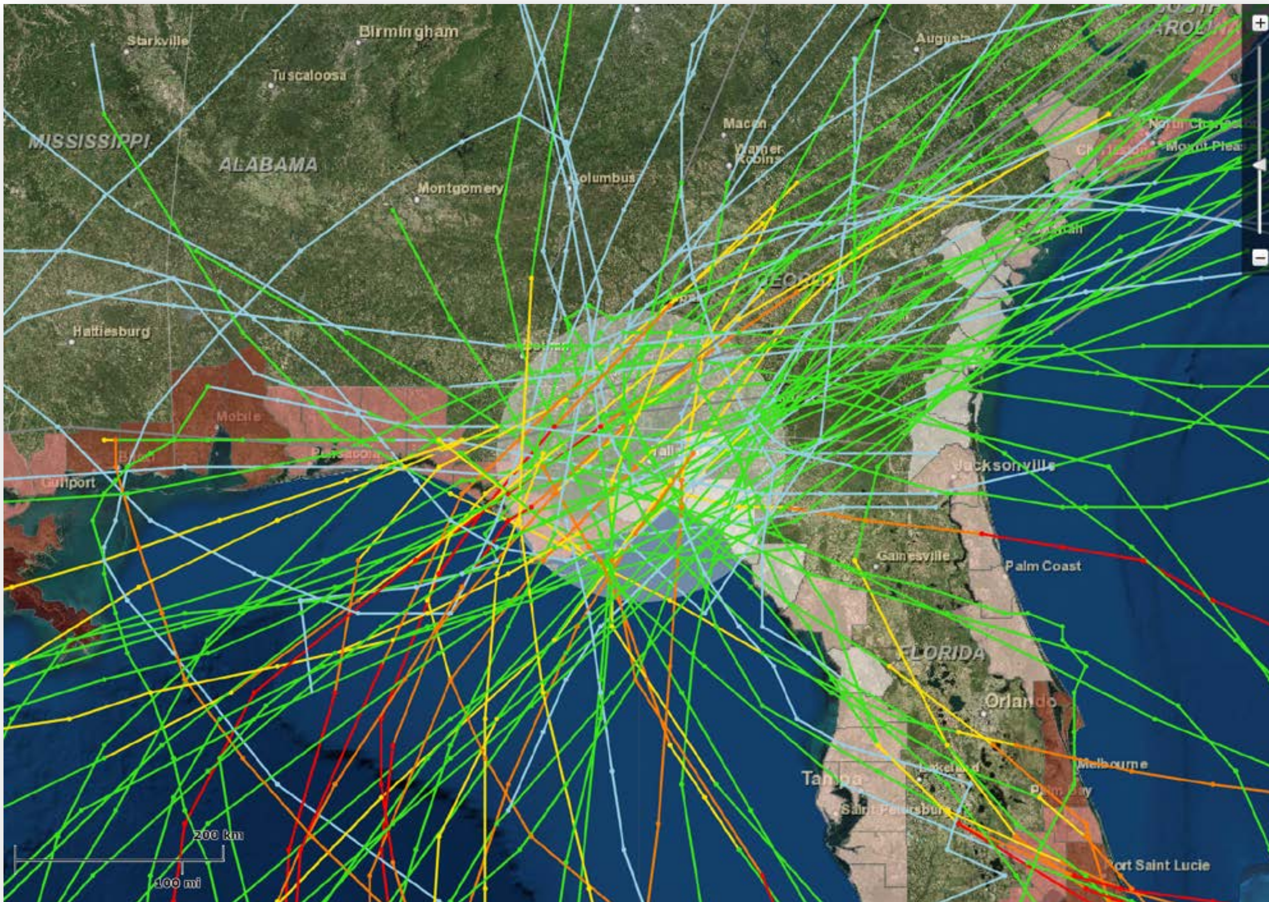
Table 2.8: Tropical Storms/Hurricanes within 65 Miles of Tallahassee since 1985.[11]

Name	Date
Kate	Nov, 1985
Charley	Aug, 1986
unnamed	Aug, 1987
Marco	Oct, 1990
Beryl	Aug, 1994
Allison	June, 1995
Jerry	Aug, 1995
Josephine	Oct, 1996
Earl	Aug/ Sep, 1998
Georges	Sep/Oct, 1998
Bonnie	Aug, 2004
Frances	August/September 2004
Jeanne	September 2004
Tammy	October 2005
Alberto	June 2006
Fay	August 2008
Beryl	May/June 2012
Andrea	June 2013

Although the last few years have seen few such events passing through or very near Leon County, a major hurricane or tropical storm can be expected to impact the county every so often. 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.

[11]Leon County Division of Emergency Management; NOAA, National Climate Data Center, 2009.

Figure 3: Historical Track of Hurricanes Passing within 65 miles of Leon County, 1985 – 2013.[12]



As Figure 3 indicates, there have been many hurricanes and tropical storms passing through or near Leon County. These storms are more common than many people realize, and they can do 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 still produce localized flooding from heavy rainfall.

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.[42] In Leon County, where the state capital Tallahassee is, 57% of homes lost power, including approximately 80% of the city proper, 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 a number of people. Hermine was the first hurricane to directly affect the city since Hurricane Kate in 1985. Throughout Leon County,

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

45 homes or businesses were destroyed, 187 suffered severe damage, and 259 experienced minor damage. Losses across Leon County reached $10.3 million.[13]

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 hazards associated with hurricanes, and both can be tremendously destructive and deadly. These hazards include tornados, heavy rainfall, waves in coastal areas, and flooding. Since 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.

Probability of Landfall

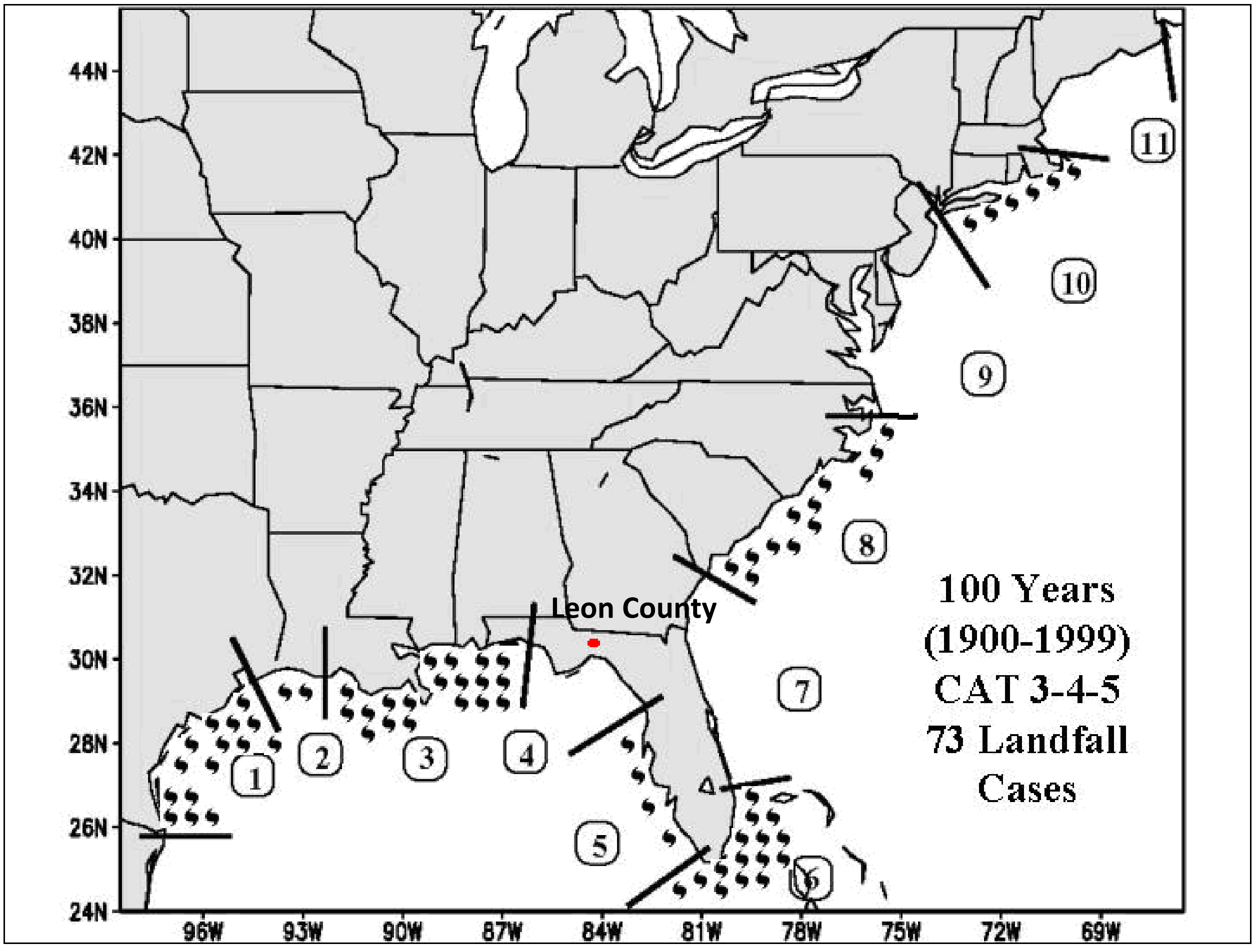
The United States Landfalling Hurricane Probability Project is a joint effort between the Tropical Meteorology Project at Colorado State University (CSU), Fort Collins, CO and the GeoGraphics Laboratory at Bridgewater State College, Bridgewater, MA. Coordinated by Dr. William Gray, the project has calculated 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[14] 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.

[13] https://en.wikipedia.org/wiki/Hurricane_Hermine#cite_note-60.

[14] United States Landfalling Hurricane Probability Project, http://www.e-transit.org/hurricane/welcome.html.

Figure 4: Landfall Probabilities Regional Map, 2014.[15]



The following tables display the tropical cyclone landfall and wind gust probabilities for Region Four and Leon County, Florida during 2014.

[15]Gray, W. Tropical Meteorology Research Project and GeoGraphics Laboratory, 2009

Table 2.9: 2014 Tropical Cyclone Landfall Probabilities by Region (Climatology in Parentheses), 2014.[16]

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	20.2% (29.3%)	9.3% (13.9%)	1.0% (1.6%)

Table 2.10: Tropical Cyclone Landfall Probabilities by County (Climatology in Parentheses), 2014.[17]

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	2.5% (3.9%)	1.1% (1.7%)	0.1% (0.2%)	14.8% (21.9%)	4.1% (6.3%)	2.1% (1.6%)

Table 2.11: 50-Year Tropical Cyclone Landfall Probabilities by Region (Climatology in Parentheses), 2014.[18]

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 2.12: Tropical Cyclone Landfall Probabilities by County, 2014.[19]

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.

Table 2.13 indicates the probabilities of storm landfall by ten-day periods for the U.S. Gulf Coast (Regions 1-4). As previously noted, the most high-risk months for tropical storm and hurricane-related hazard activity are August and September.

[16] United States Landfalling Hurricane Probability Project, http://www.e-transit.org/hurricane/welcome.html.
[17] Ibid.
[18] Ibid.
[19] Ibid.

Table 2.13: Probabilities of Storm Landfall by Ten-day Periods for Regions 1-4 (the Gulf Coast).[20]

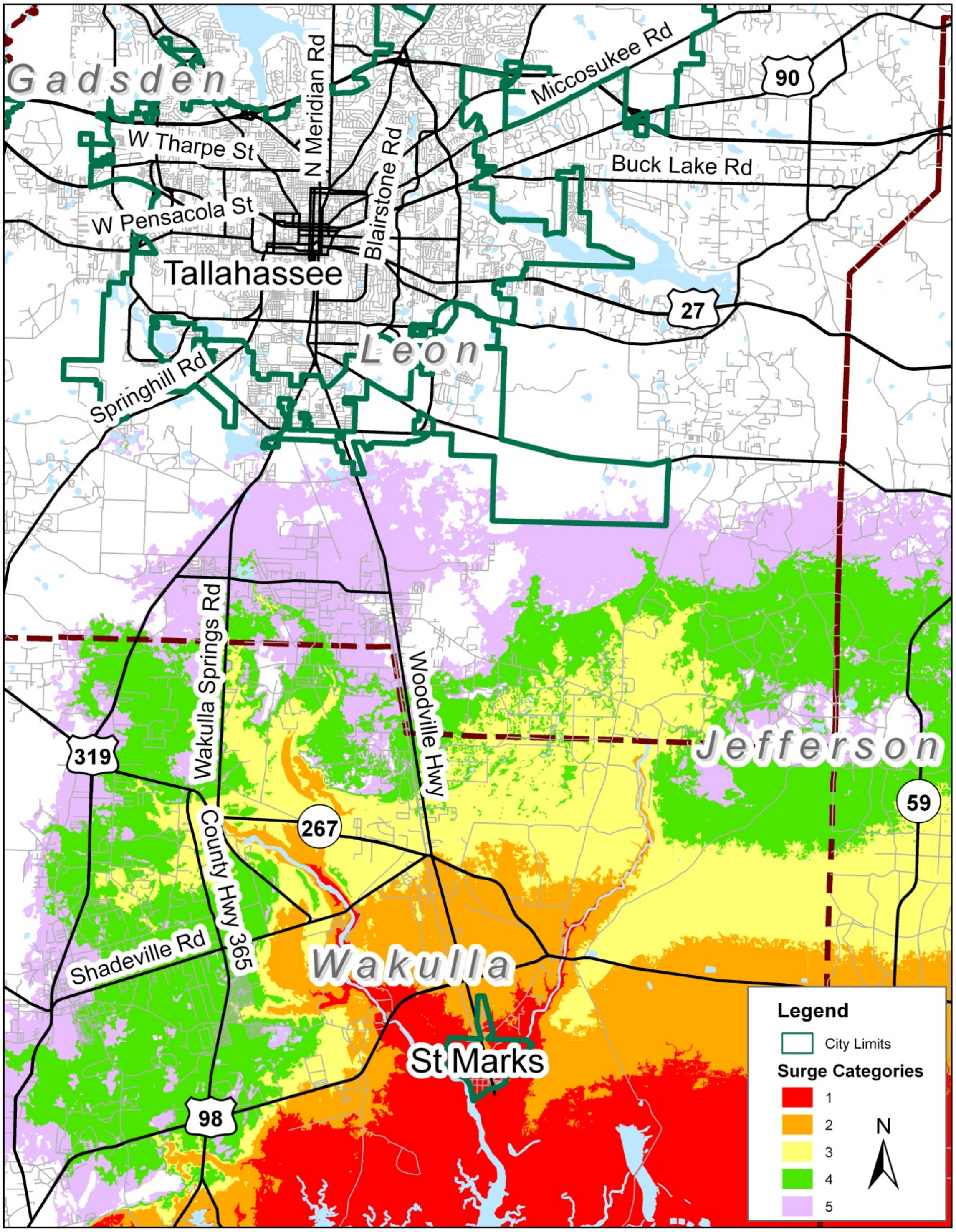
Date	Named Storm	Hurricane	Major Hurricane
Jan-May	1.4%	0.4%	0.2%
6/1-6/10	3.1%	1.6%	0.7%
6/11-6/20	4.8%	3.0%	1.7%
6/21-6/30	5.2%	4.3%	2.2%
7/1-7/10	4.7%	4.5%	2.7%
7/11-7/20	4.3%	4.6%	2.9%
7/21-7/31	5.1%	5.5%	5.1%
8/1-8/10	6.4%	7.2%	7.7%
8/11-8/20	7.7%	9.1%	10.9%
8/21-8/31	9.0%	10.3%	12.3%
9/1-9/10	10.5%	11.4%	13.5%
9/11-9/20	11.2%	11.3%	13.5%
9/21-9/30	10.3%	10.3%	12.1%
10/1-10/10	7.7%	7.7%	8.5%
10/11-10/20	4.8%	4.9%	4.3%
10/21-10/31	2.3%	2.2%	1.4%
11/1-11/10	1.0%	0.9%	0.2%
11/11-11/20	0.3%	0.3%	0.0%
11/21-11/30	0.2%	0.3%	0.0%
Dec	0.1%	0.2%	0.0%
Total	**100%**	**100%**	**100%**

Tables 2.9 and 2.10 indicate a relatively low probability of a tropical cyclone (tropical storm or hurricane) making landfall in 2014 in Region 4 (Big Bend coast of Florida) or Leon County. However, Tables 2.11 and 2.12 clearly indicate 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.

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. The following figure indicates vulnerability within Leon County to flood damage from a tropical cyclone storm surge.

[20] Gray, W. Tropical Meteorology Research Project and GeoGraphics Laboratory, 2009, http://www.e-transit.org/hurricane/welcome.html.

Figure 5: Estimated Hurricane Storm Surge within Franklin and Leon counties.[21]



[21] Apalachee Regional Planning Council, 2009.

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.

Hazus-MH 2.0

FEMA's Hazus-MH 2.0 software is a nationally applicable standardized methodology that contains models for estimating potential losses from floods and hurricanes. This software allows users to conduct interactive queries, perform multivariate spatial analysis, edit data, create maps and present the results of all these operations in a consolidated report. Hazus-MH 2.0 was used to model and generate estimated potential losses for hurricane winds and flooding.

Hazus-MH 2.0 Hurricane Wind Model

The Hazus-MH 2.0 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 2.0 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 2.0 is available through FEMA at: www.fema.gov/plan/prevent/hazus/.

The LMS Working Group is aware of the release of Hazus 2.1. The principal enhancements incorporated into version 2.1 include compatibility with ArcGIS 10.0 and the ability of Hazus to take advantage of a 64-bit processing environment. In addition to the IT-related modifications, there were some changes to the wind field component of the Hurricane Model, and changes to return periods used in the Flood Module Average Annualized Loss methodology.

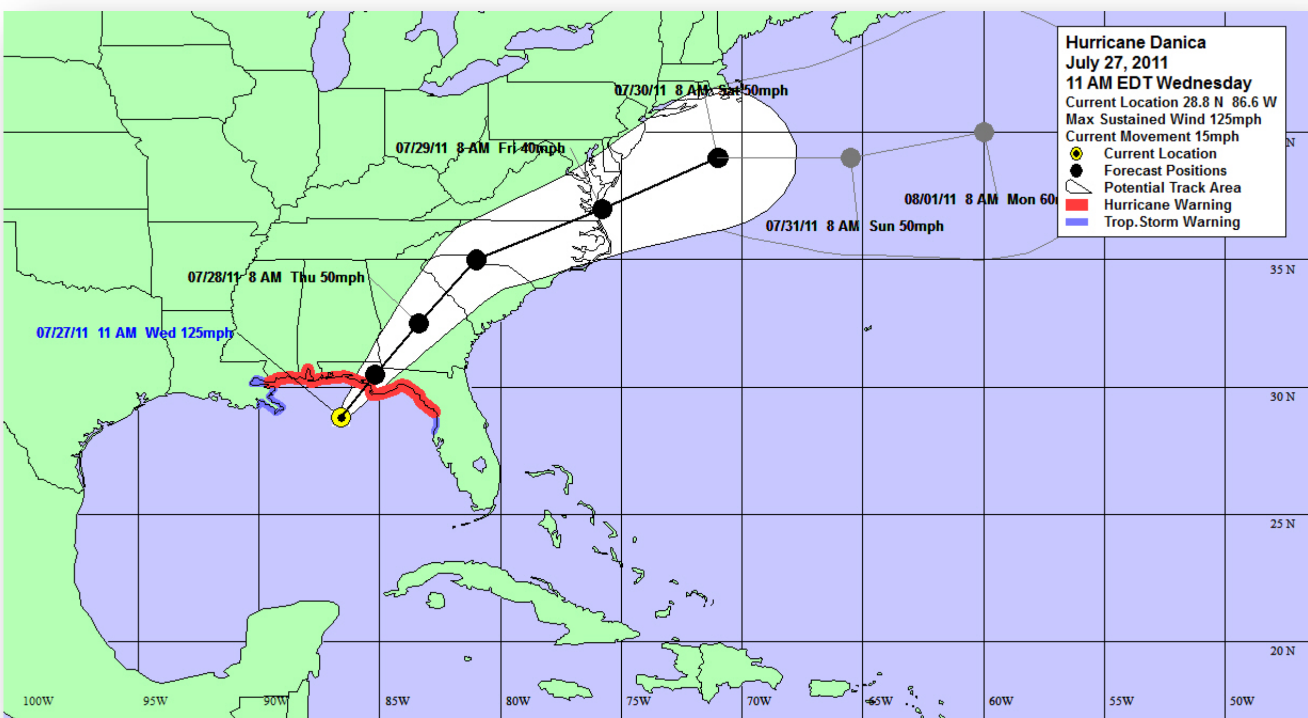
A Hazus 2.0 loss analysis using the Hurricane Module and the Flood Module were used to produce the Leon County Post Disaster Recovery Plan in 2012. This was a hybrid Level I – Level II approach that used the default inventory data. Given that the Hazus 2.1 release contained no updates to the underlying Census data, or to the underlying inventory data, it was decided to use the results from the PDRP analysis for the LMS revision. This allows the local government to maintain consistency between these two documents.

A Hazus upgrade is pending that will include the use of the 2010 Census data and an upgrade to default inventory data. When this version becomes available, the operational practices the Tallahassee-Leon County Emergency Managers require that Hazus be rerun to reflect the more modern loss scenario. These results will be incorporated into Emergency Management best practices, and, additionally submitted to the LMS Steering Committee for their review. If direction is given, an addendum to the LMS will be provided using the new results.

<u>Hazus Analysis and Results</u>

For comparison purposes, the LMS Update Subcommittee agreed to use two deterministic scenarios to examine potential impact from a tropical weather event. The Tallahassee Office of the National Weather Service provided three tropical weather scenarios for input into the Hazus-MH 2.0 Wind Model. These scenarios included a slow moving, category 1 hurricane with heavy rain, a category 1 storm with a similar path to hurricane Kate and the devastating storm of 1877 and the same hurricane as a Category 3 storm. The figure below shows the path of the category 3 hurricane.

Figure 6: Model Category 3 Hurricane Path



Based on the default data included in Hazus-MH, which uses U.S. Census 2000 tract data and 2006 R.S. Means building valuations, there is an estimated 96,877 buildings with a total dollar exposure of over $16 billion dollars in Leon County. The building count and dollar exposure, by property type, are listed in table below.

Table 2.14: General Building Stock in Leon County as of 2006.[22]

Property Type	Number of Properties	Value
Residential	71,205	$12,174,373,000
Commercial	17,244	$2,940,634.000
Government	2,131	$372,588,000
Industrial	2,034	$342,449,000
Education	1,647	$278,244,000
Religious	2,423	$407,518,000
Agriculture	291	$46,716,000

The table below lists the facilities included in the Hazus-MH 2.0 model; whenever possible local data was used to augment the model data. The facilities identified with an asterisk (*) are considered to be "essential" facilities by FEMA and are included in calculating damages.

Table 2.15: Essential Facilities.[23]

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

[22] Hazus-MH 2.0.
[23] Ibid.

Category 3 Hurricane Deterministic Scenario

HAZUS-MH 2.0 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).

Category 1 Hurricane Deterministic Scenario

The economic loss from a category 1 hurricane is significantly less than that of the same hurricane categorized as a category 3 storm. The Hazus model run estimated total property damages are $178 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 2.0 for an impact from a category 1 hurricane.

Table 2.16: Economic Loss - Category 1 Hurricane.[24]

Property Type	Value
Residential	$147,949,000
Commercial	$8,443,000
Industrial	$555,000
Other	$1,458,000
Business Interruption	$19,217,000
Total Direct Economic Loss	$177,622,000

Table 2.17: Damage by Property Type – Category 1 Hurricane.[25]

Property Type	Moderate	Severe	Destruction
Residential	646	11	0
Commercial	86	3	0
Government	3	0	0
Industrial	8	1	0
Education	1	0	0
Religious	3	0	0
Agriculture	4	4	0

Slow Moving Category 1-2 Hurricane

This scenario had a completely different storm track than that of the deterministic scenario used above. In this scenario, the storm made landfall with the eye going directly over the City of Tallahassee. This scenario accounted for heavy driving rain and the damage associated with a slower moving tropical weather event. Total property damage losses totaled $887 million with residential structures accounting for 77% of the total loss.

[24] Hazus-MH 2.0.
[25] Ibid.

Table 2.18: Economic Loss from Slow Moving Hurricane.[26]

Property Type	Value
Residential	$603,599,000
Commercial	$101,407,000
Industrial	$11,486,000
Other	$33,249,000
Business Interruption	$137,183,000
Total Direct Economic Loss	$886,924,000

Based on the category 3 hurricane deterministic scenario input into HAZUS-MH 2.0, the model estimates that approximately 14,000 buildings will be moderately damaged and 325 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 2.19: Economic Loss - Category 3 Hurricane.[27]

Property Type	Value
Residential	$815,451,000
Commercial	$155,732,000
Industrial	$19,667,000
Other	$51,642,000
Business Interruption	$209,048,000
Total Direct Economic Loss	$1,251,540,000

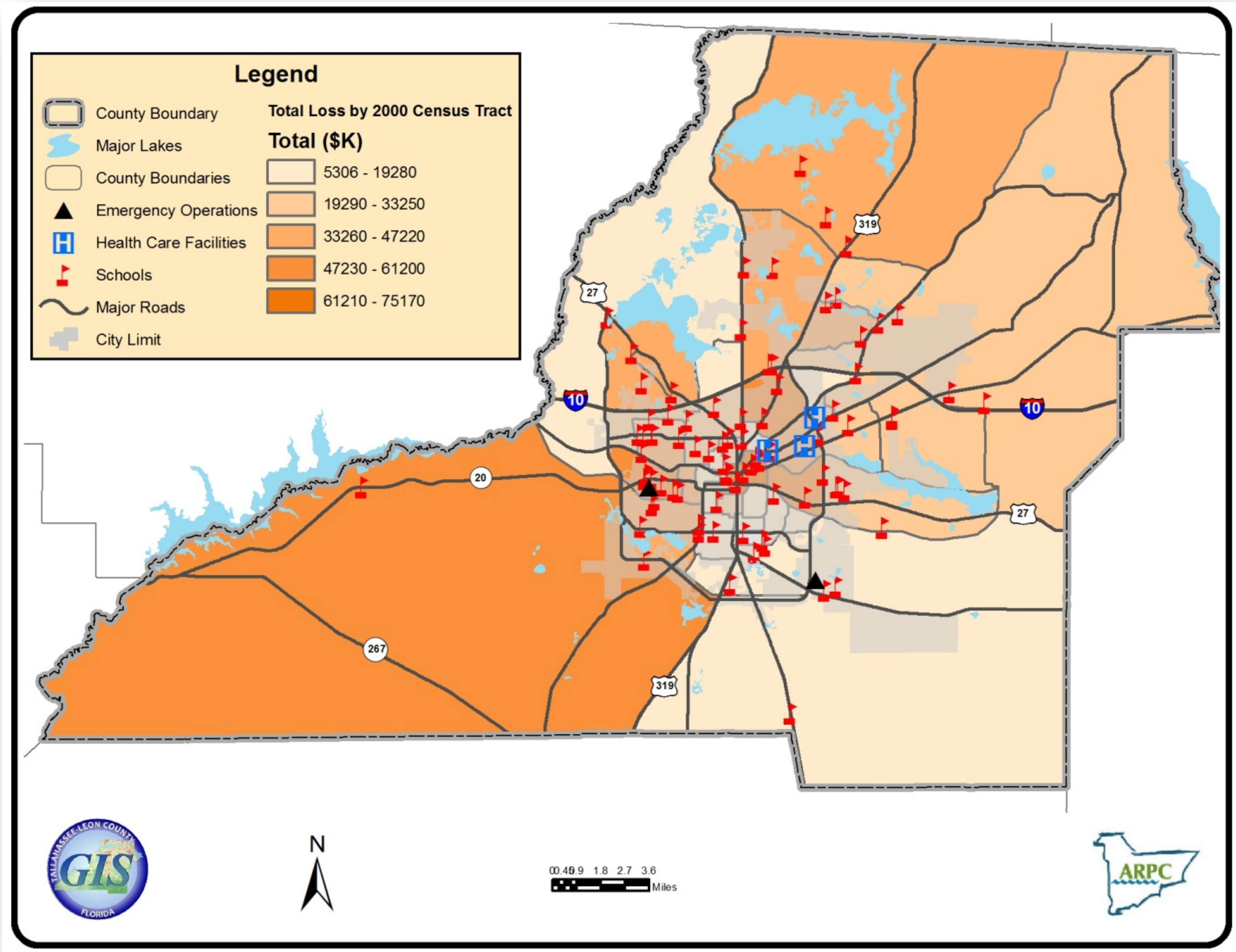
Table 2.20: Damage by Property Type – Category 3 Hurricane.[28]

Property Type	Moderate	Severe	Destruction
Residential	10,560	1,046	311
Commercial	1,203	307	6
Government	85	29	0
Industrial	258	86	3
Education	46	15	0
Religious	102	26	0
Agriculture	51	27	5

As indicated by Table 2.16, the total property damage losses were $1.25 billion. As indicated by Table 2.17, the largest loss was sustained by residential occupancies which account for over 75% of the total loss. Approximately 1,375 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 used for the HAZUS MH3 model.

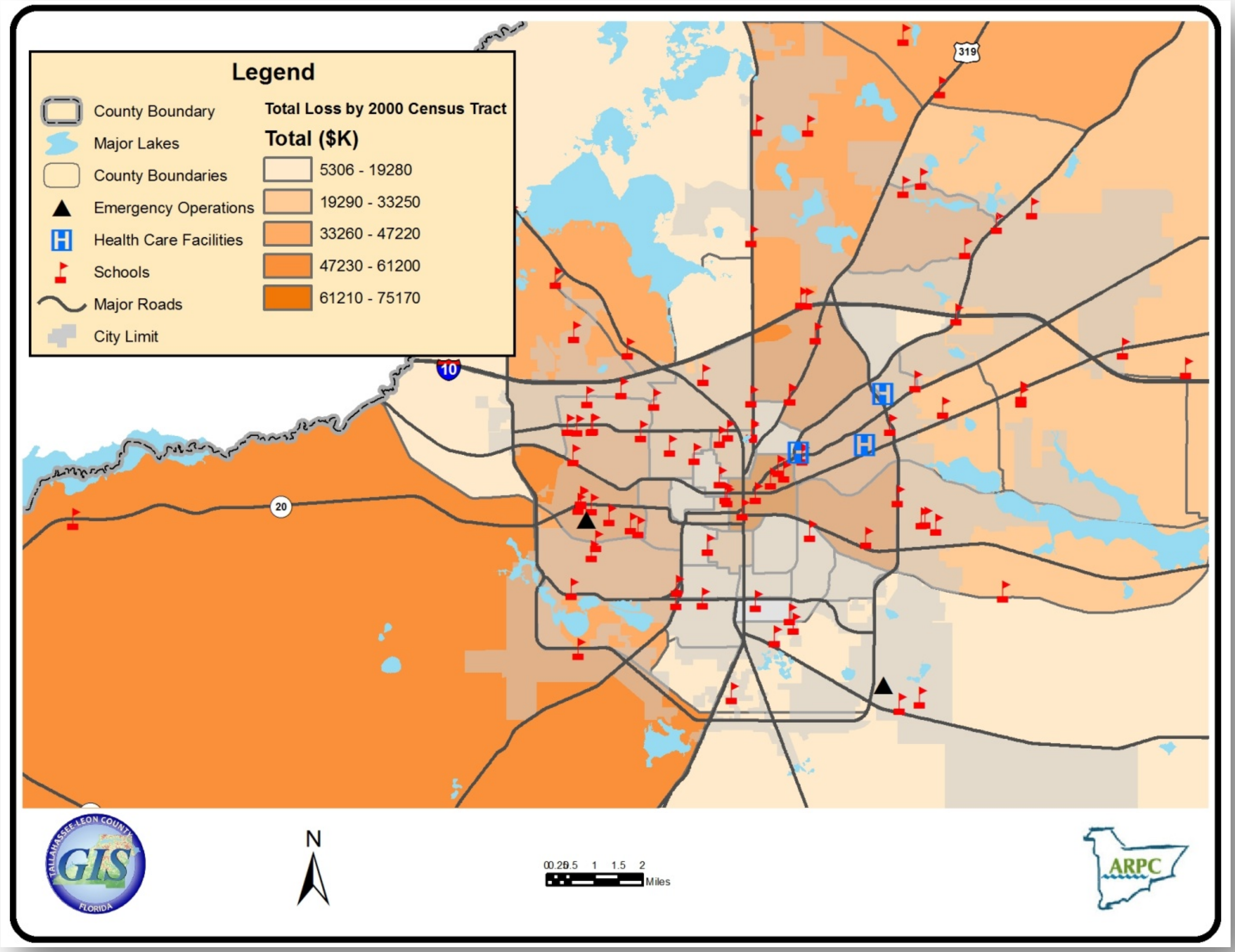
[26] Ibid.
[27] Ibid.
[28] Ibid.

Figure 7: Category 3 Hurricane Loss by Census Tract – Leon County.[29]



[29] Hazus-MH 2.0. Losses are calculated for a hypothetical category 3 hurricane.

Figure 8: Category 3 Hurricane Loss by Census Tract – City of Tallahassee.[30]



[30] Ibid.

Evacuation Behavior 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 county while less than 10% intend to use public shelter. The table below display evacuation rates for Leon County.

Table 2.21: Leon County Evacuation Rates.[31]

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%

Vulnerability Summary

Leon County and the City of Tallahassee are vulnerable to property damage from wind, water, and flooding resulting from hurricanes and tropical storms. Wind and water damages are highly correlated with storm intensity; property-specific and area-wide flooding is correlated with storm size and speed, and not necessarily intensity. Due to Leon County's inland location, the majority of the damages will come from high winds.

Many areas within Leon County and the City of Tallahassee have a moderate to heavy tree cover. High winds can topple trees, which can damage structures and infrastructure. Since the majority of electric and telephone lines are aboveground (and many newer underground lines are primarily served by existing overhead lines), power outages are expected to occur in the presence of high winds and heavy rain. This is even more of an issue in the unincorporated areas served by Talquin Electric due to a denser canopy of trees. Blocked road access is also an important response/recovery debris issue.

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.[32]

[31] Apalachee Regional Evacuation Study, 2010.

[32] 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.

The data generated by the TAOS model are presented in Table 2.9. 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 2.22: Debris Produced by Tropical Storms and Hurricanes.[33]

Structure Type	Debris Of 10 Cubic Yards Or More Per Acre[34]											
	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

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.

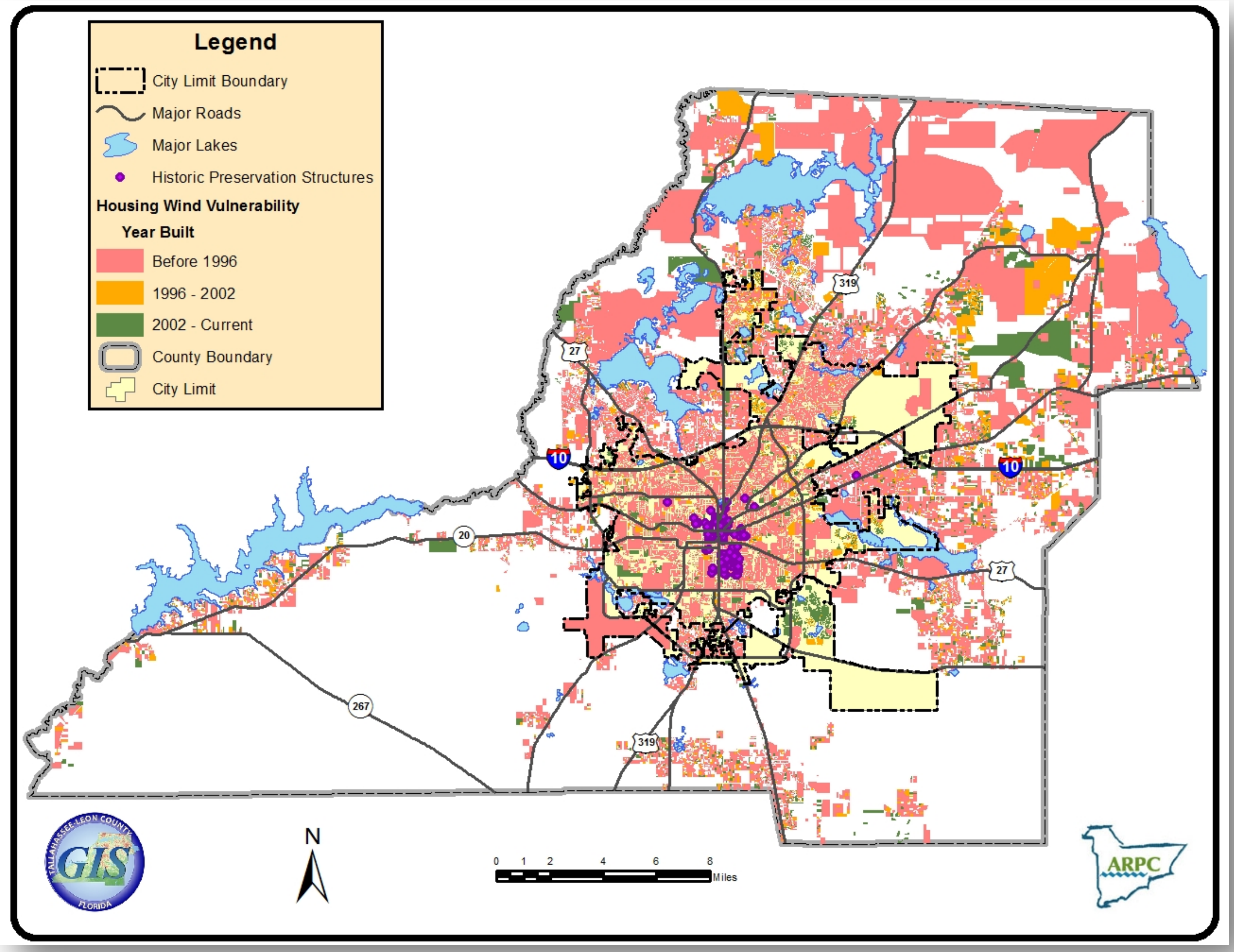
Trimming trees is regularly conducted by the City of Tallahassee. Many homeowners also trim trees on their property for the same reasons. Keeping trees trimmed and healthy is one of the single best actions homeowners and other property owners can take to mitigate the effects of major storms.

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.

[33] Source: DCA, TAOS, 1999.

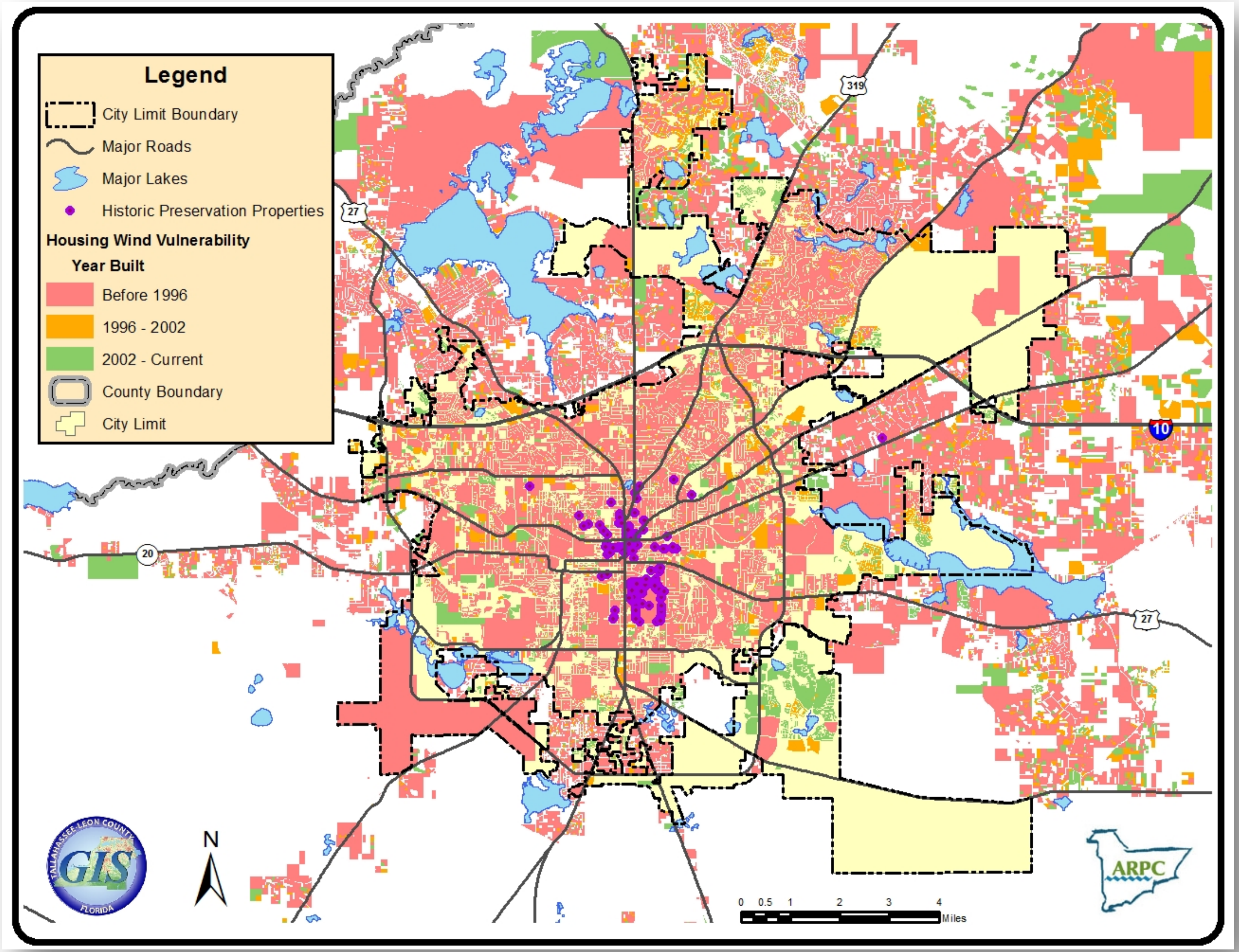
[34] All parcels are affected with 10 cubic yards or more of debris/acre in Category 3-5 storms.

Figure 9: Housing Vulnerability – Leon County.[35]



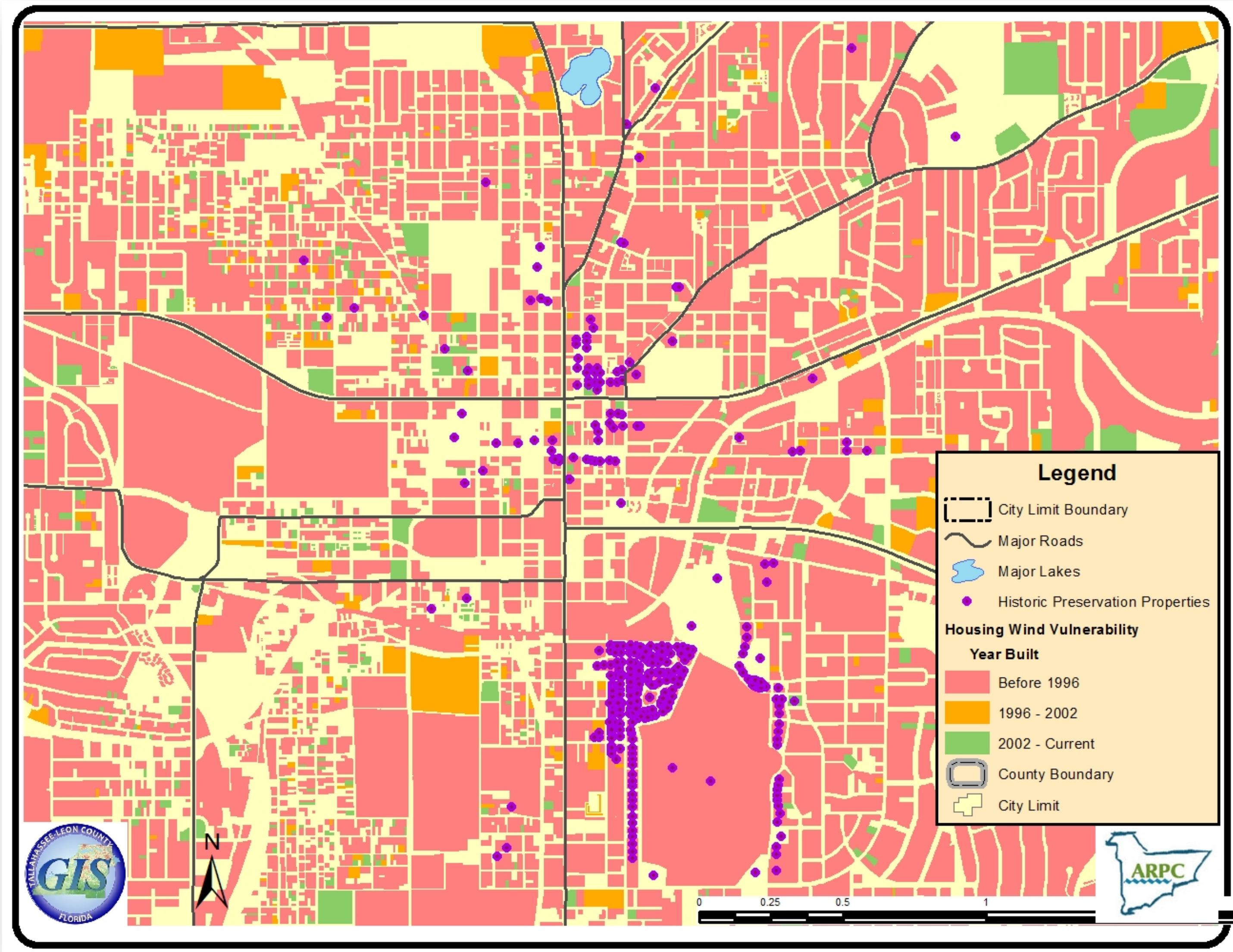
[35] Tallahassee – Leon County Geographic Information Systems.

Figure 10: Housing Vulnerability – City of Tallahassee.[36]



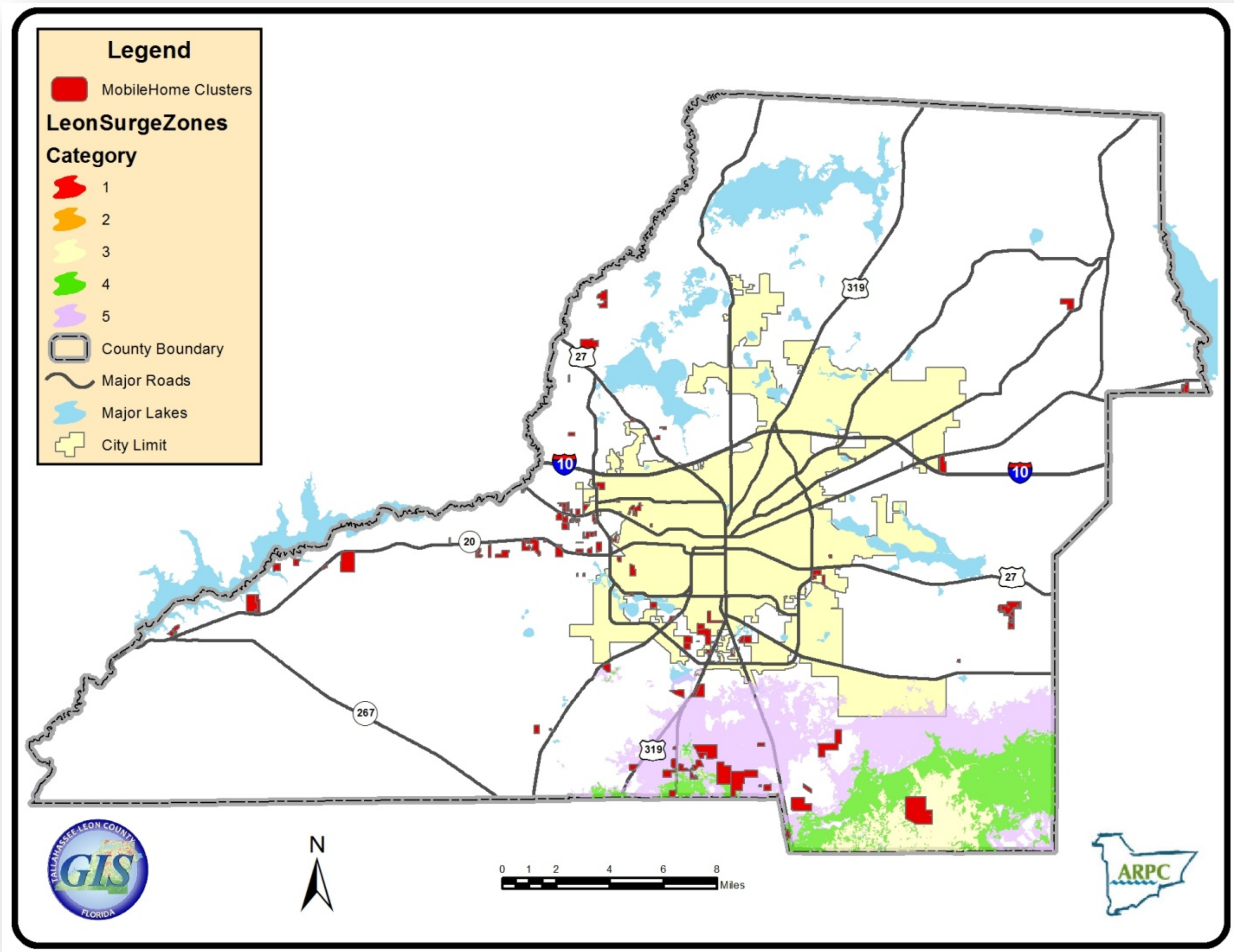
[36] Ibid.

Figure 11: Historic Properties in the City of Tallahassee.[37]



[37] Ibid.

Figure 12: Mobile Home Cluster and Hurricane Storm Surge.[38]



[38] Ibid.

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.

2.3.2 Thunderstorms

General Description and Location

According to the National Oceanic and Atmospheric Administration (NOAA), a thunderstorm is a rain shower during which thunder is heard. Since 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.[39]

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 least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado.[40] The Beaufort Wind Scale in Table 2.23 below is used to describe wind speeds associated with thunderstorms.

[39] NOAA National Severe Storms Laboratory, 2009, http://www.nssl.noaa.gov/primer/tstorm/tst_basics.html.
[40] FEMA, Thunderstorms, http://www.fema.gov/kids/thunder.htm.

Table 2.23: Beaufort Wind Scale.[41]

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 ft.) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 ft.) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

Hail

Hail is a dangerous by-product of thunderstorms. Hail is precipitation in the form of lumps of ice produced by convective clouds. Because hail needs convective clouds and strong updrafts to increase in size, hail storms are more frequent in warmer months (spring and early summer) when these conditions are present.[42] The TORRO Hailstorm Intensity scale in Table 2.4 below describes typical damage associated with hail size.

[41]Beaufort Wind Scale, 2009, http://www.spc.noaa.gov/faq/tornado/beaufort.html.
[42] National Weather Service website, http://www.erh.noaa.gov/er/cae/svrwx/hail.htm.

Table 2.24: TORRO Hailstorm Intensity Scale.[43]

Classification	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-**15**	>20	Slight general damage to plants, crops
H2	Significant	10-**20**	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-**60**		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-**75**		Severe roof damage, risk of serious injuries
H8	Destructive	60-**90**		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-**100**		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

* Approximate range (typical maximum size in bold), since other factors (e.g. number and density of hailstones, hail fall speed and surface wind speeds) affect severity.

Evidence indicates that maximum hailstone size is the most important parameter relating to structural damage, especially towards the more severe end of the scale. Hailstone shapes are also an important feature, as spiked or jagged hail can also increase some aspects of damage. Table 2.25 below describes the typical size and shape associated with TORRO hail codes.

Table 2.25: Hail Size and Diameter in Relation to TORRO Hailstorm Intensity Scale.[44]

Size code	Maximum Diameter mm	Description
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

[43] Tornado and Storm Research Organization, 2009
[44] Tornado and Storm Research Organization, 2009

Thunderstorms can occur anywhere within both Leon County and the City of Tallahassee. Hail is rare, but can be associated with thunderstorms in these same areas.

Historical Occurrences

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 a 28.5-year period from the Tallahassee Municipal Airport weather station indicates an annual average of 64.59 inches, with 1964's 103.5 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 35 percent of annual precipitation. The average storm for the period produced 0.7 inches, with average peak intensity recorded at just under 0.5 inches/hour. Airport weather station data was used to calculate 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. In March of 1991, a 10 to 25 year event dumped 7.17 to 9.12 inches of rain during a 24-hour period. Prior to this, a similarly sized storm had not been recorded for 20 years, when 8.43 inches were recorded in 20 hours in July 1970. The most notable events for the study period occurred in September 1969, when 13.8 inches were recorded in a 74-hour period, and November 1972 when 1.64 inches fell within 15 minutes. Table 2.26 provides a summary of the most severe rainfall events recorded in Leon County and Tallahassee between 1958 and 2014. 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 Table 2.26.

Table 2.26: Severe Storm Events in Leon County by Rank, 1958 – 2014.[45]

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	2	6.48	4.83	155yr/1hr	
2	September 22, 1969	13.78	34	5.20	2.18	125yr/48hr	
3	June 11, 2001	10.58	45	5.68	4.53	115yr/1hr	T.S. Alison
4	March 3, 2002	11.58	10	3.48	2.40	105yr/4hr	
5	September 22, 2000	8.62	28	4.40	3.04	105yr/4hr	T.S. Helene
6	July 22, 1970	8.17	10	5.32	3.46	90yr/4hr	T.S. Becky
7	August 25, 2008	12.82	38	2.20	1.33	65yr/72hr	T.S. Fay
8	December 4, 1964	9.75	18	2.4	2.15	40yr/24hr	
9	July 18, 1964	9.86	26	4.20	3.44	40yr/2hr	
10	August 6, 2001	10.18	12	3.64	2.23	35yr/48hr	T.S. Barry
11	August 18, 1998	4.45	4	5.16	3.82	35yr/1hr	
12	March 3, 1991	9.46	7	2.64	1.91	35yr/24hr	
13	June 15, 1968	3.90	1	4.80	3.70	25yr/1hr	
14	March 2, 1994	8.21	6	3.12	1.49	25yr/8hr	
15	July 13, 1998	5.93	39	3.56	2.96	15yr/2hr	

According to data maintained by the NOAA National Climatic Data Center, 172 thunderstorm events occurred in Leon County between 01/01/2010 and 12/31/2014 (see Technical Appendix K).[46] Wind gusts associated with these events ranged from 41 to 60 knots. One fatality was recorded as a result of one of these events, and 52 of these events caused varying amounts of property damage.

The Leon County CEMP states an estimated one hundred and forty two (142) severe thunderstorm events endured in Leon County between 1971 and 2005 containing damaging winds of 58 miles per hour or greater and/or hail of ¾ of an inch or greater. According to these data, Leon County experienced 11 historical occurrences of hail damage between 1955 and 2002, and the City of Tallahassee experience two occurrences in that same time period. (Specific TORRO Hailstorm Intensity or other hail damage data for these jurisdictions are not available.)

Estimated Impacts, Probability, and Extent

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.

[45] City of Tallahassee, Stormwater Management Division, 2014.
[46] NOAA National Climatic Data Center, http://www.ncdc.noaa.gov/.

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.

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 and has overwhelmed 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, since 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** 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 property damage from flooding, hail, lightning, and tornados associated with thunderstorms. The vulnerability to these individual effects is described elsewhere in this document. Areas and features specifically vulnerable to flooding from severe thunderstorms include:

- 8,285 parcels identified as having at least a portion of their property in the 100-year floodplain (Table 2.29)
- Mobile homes and septic tanks in 100-year floodplains (Figures 21 and 22)
- 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
- Flood Problem Areas as Identified in the Leon County Stormwater Master Plan (Table 2.30)
- Other flooded structures, properties, and local 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.

People participating in leisure activities such as fishing, camping, boating, soccer and golf are vulnerable to severe thunderstorms, 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. 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.

Risk Assessment

Thunderstorms are classified in this LMS as a **medium risk** to Leon County and the City of Tallahassee.

2.3.3 Tornados

General Description and Location

Tornadoes are among the most violent storms on the planet. 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.

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. Since 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. According to the Tornado Project, the Fujita (or simple “F”) Scale of tornado intensity is 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. Table 2.27 below describes Fujita Scale ratings and the associated wind speeds and type of damage for each F-Scale tornado number.

Tornados can occur anywhere within both 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.

Table 2.27. Fujita Scale of Tornado Intensity.[47]

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages signboards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

Historical Occurrences

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. Populations especially vulnerable are those residing in older manufactured homes and substandard site built homes.

There have been sixteen reported tornados in Leon County from 1945-2006 including an F1 tornado that damaged the Tallahassee-Leon County Civic Center and the South Ride Road area on November 11, 1995. Table 2.28 lists all of the reported tornado sightings for Leon County from 1950 through 2014.

A study by Global Institutional Solutions (GIS) reported a total of 19 tornados documented in Leon County for the period 1950-2013.[48] This number may be considered conservative since many tornados may briefly touchdown in unpopulated areas and go unreported. The GIS study presented a table of

[47] The Tornado Project Online, 2009. http://www.tornadoproject.com/fscale/fscale.htm#top.
[48] Global Institutional Solutions, 2014

recorded tornados by Fujita scale in Florida which indicates that 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.

No tornados reported at a F3 scale or higher have been reported to date in Leon County. This is also true for Gadsden, Liberty, Wakulla and Jefferson counties. Based on historic records, 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. Table 2.28 details historical occurrences of tornado events in Leon County from 1950 through 2014.

Table 2.28: Leon County Tornado History, 1950-2014.[49]

#	Date	F-scale	Dead	Injured
1	January 28, 1952	F2	0	0
2	December 6, 1953	F2	0	0
3	April 10, 1960	F2	0	0
4	June 10, 1965	F0	0	0
5	March 28,1972 (2)	F2	0	1
6	May 22, 1976	F0	0	0
7	May 16, 1983	F1	0	0
8	May 2, 1985	F0	0	0
9	June 9, 1989 (3)	F0	0	0
10	November 11, 1995	F1	0	0
11	August 12, 2003	F0	0	0
12	September 16, 2004	F0	0	0
13	December 5, 2005	F0	0	0
14	March 7, 2008	F1	0	1
15	June 4, 2009	F0	0	0
16	December 9, 2009	F0	0	0
17	April 7, 2014	F0	0	0

The aforementioned GIS study also ranked Florida counties by incidence of tornados. Leon County was ranking #52 out of 67 total counties.

Estimated Impacts, Probability, and Extent

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

[49] Storm Prediction Center, National Weather Service, National Oceanic and Atmospheric Administration.

manufactured homes. 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. Since tornados can occur anywhere in the County, all citizens, structures, and critical facilities and systems can be potentially affected.

Tornados in Leon County have caused two injuries recorded between 1950 and 2014. On March 7, 2008, a category F1 (maximum wind speeds 73-112 mph) tornado injured one person and caused $1 million in damages.[50] 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).[51]

Historical records reveal the frequency of tornados is approximately once every four years in Leon County. This frequency is roughly the midpoint for occurrences in the Big Bend area counties. Based on the information presented in Table 2.28, there were ten F0 tornadoes, three F1 tornados, and four F2 tornados recorded in Leon County between 1950 and 2011. The area affected by tornados is relatively small, depending on their speed, size, and height above ground, but these effects can be significant.

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. The potential extent of these impacts from these anticipated events are summarized above in Table 2.27. However, the exact extent 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** as defined under Section 2.2.1 Risk.

Vulnerability Summary

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities and populations within Leon County and the City of Tallahassee are considered to be exposed to this hazard, and so could potentially be impacted. 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

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

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.

<u>Risk Assessment</u>

Based on the historical record, the potential damage, and the size and breadth of the urban area of Tallahassee, tornado events are considered a **medium risk** to Leon County and the City of Tallahassee.

2.3.5 Lightning

General Description and Location

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.[52] 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

The NOAA National Climatic Data Center recorded 901,381 lightning flashes in Florida in 2012, and indicated that Florida averages about 1.4 million lightning strikes a year.[53]

Because of this prevalence of strikes, Florida tops the national list for lightning deaths with 471 deaths between 1959 and 2013.[54] According to the NOAA National Climatic Data Center, 52 fatalities from lightning were recorded in Florida between 2003 and 2012.[55] There are no recorded fatalities from lightning in Leon County.

Lightning strikes are recorded when they cause damage, including wild or structural fires. According to data maintained by the NOAA National Climatic Data Center, seven lightning strike events occurred in Leon County between 01/01/2010 and 12/31/2014 (See Technical Appendix L).[56] No injuries or fatalities were recorded as a result of these events, and all of these events caused varying amounts of property damage.

The Tallahassee Fire Department has recorded 75 structure fires resulting in nearly $1.5 million of property damage caused by lightning strikes from 2004-2009.[57] 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.[58] On June 8, 2014, there were three structure fires created by lightning in the City of Tallahassee.[59]

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[52] http://en.wikipedia.org/wiki/Lightning.
[53] NOAA National Climatic Data Center, http://www.ncdc.noaa.gov/.
[54] http://articles.orlandosentinel.com/2013-07-05/news/os-lightning-deaths-florida-20130705_1_lightning-alley-lightning-deaths-john-jensenius.
[55] NOAA National Climatic Data Center, http://www.ncdc.noaa.gov/.
[56] Ibid.
[57] Tallahassee Fire Department, 2009.
[58] 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.
[59] National Weather Service Weather Forecast Office, <http://www.srh.noaa.gov/tae/?n=LSRTAE_060914>.

The following figure indicates lightning fatalities by state from 1959 through 2013. Florida has the most fatalities. An additional six fatalities were recorded in Florida in 2014. This is twice that recorded in Wisconsin that year, but it does not change the relative 2013 ranking.

Figure 13: Lightning fatalities by state 1959-2013.[60]

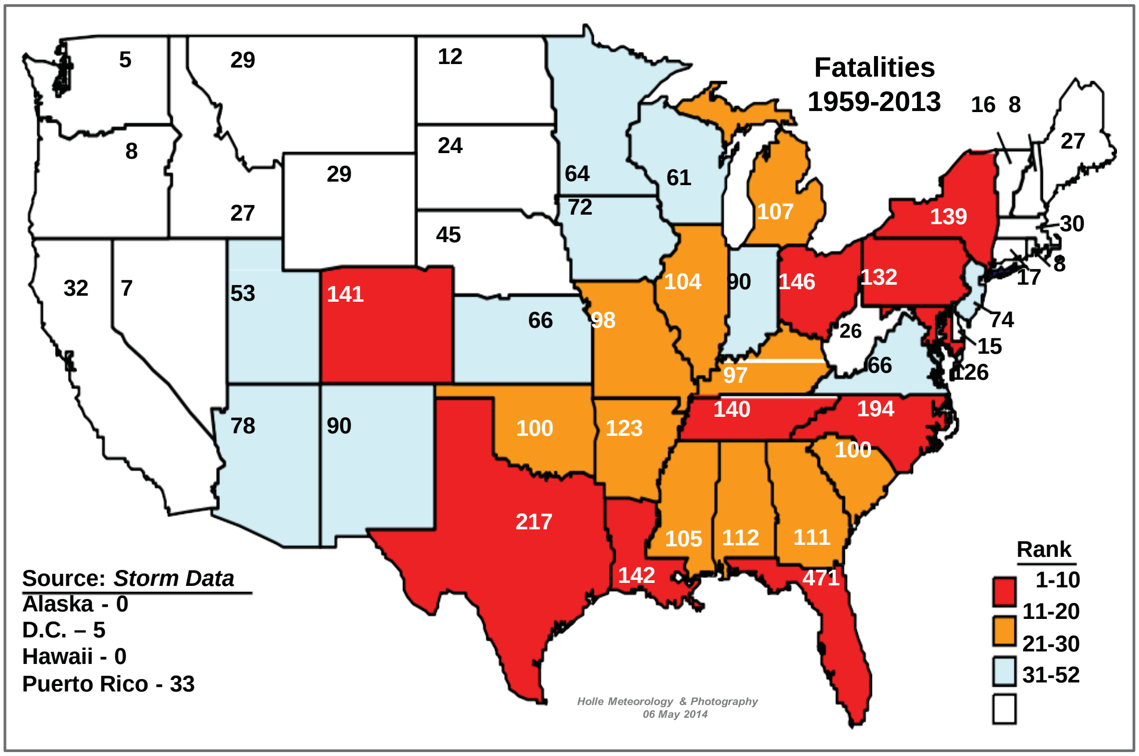


Figure 14 is a lightning flash density map of Leon County that indicates the annual average Cloud to Ground (CG) lightning flashes per square kilometer per year, a standard measure of total lightning activity.

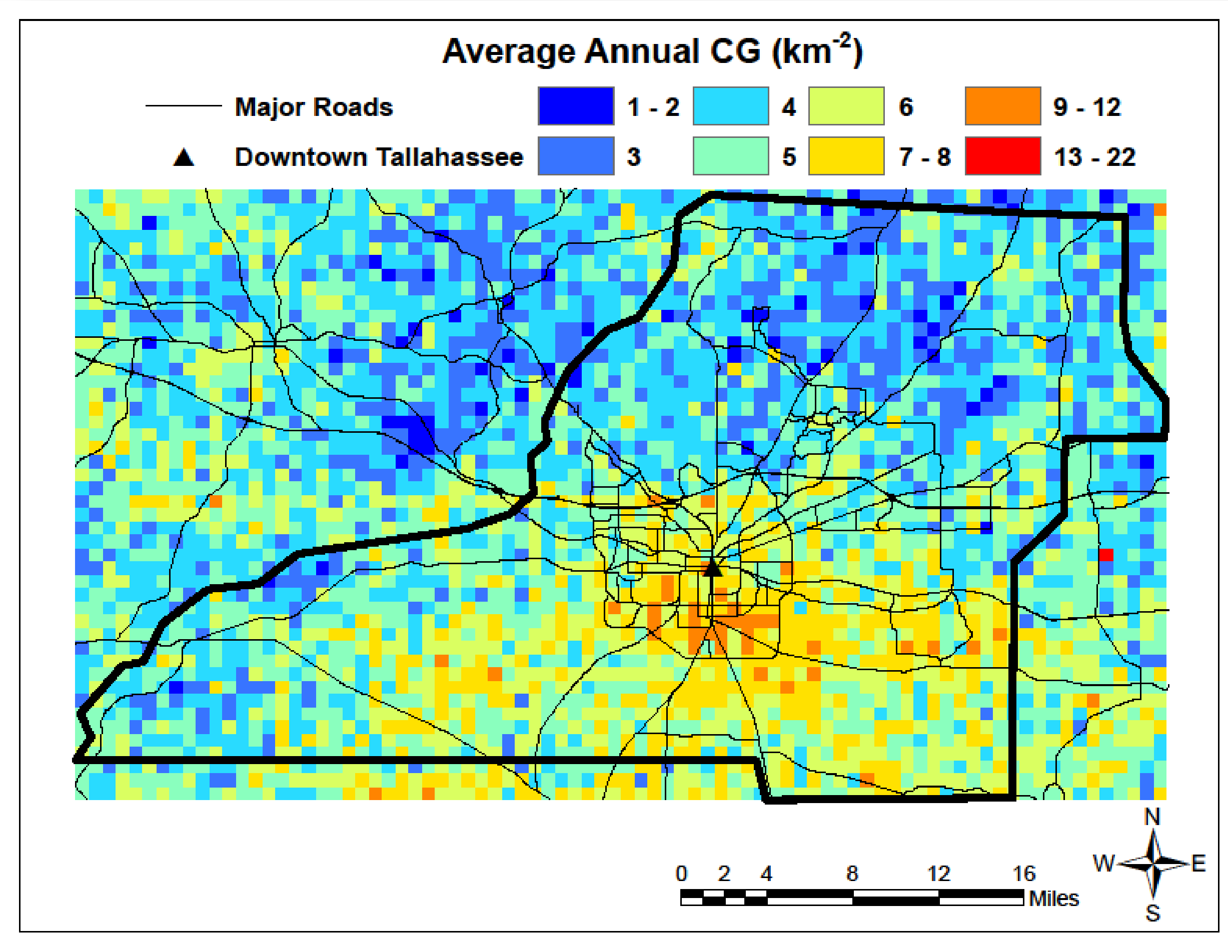
<u>Estimated Impacts, Probability, and Extent</u>

Lightning is a serious hazard, and can cause injuries and fatalities. On average, 73 people are killed each year by lightning in the U.S. Florida typically leads the nation in lightning deaths and injuries with an average of 9 deaths and 60 injuries directly due to lightning each year. Lightning fatalities are often associated with individuals who are outside for various reasons.

Lightning also causes forest and structure fires. Lightning can blow out electrical systems and other infrastructure, kill trees, and cause physical damage to structures.

[60] National Weather Service, http://www.crh.noaa.gov/lsx/?n=summerweathersafetyweek.

Figure 14: Lightning Flash Density Map of Leon County, Florida.[61]

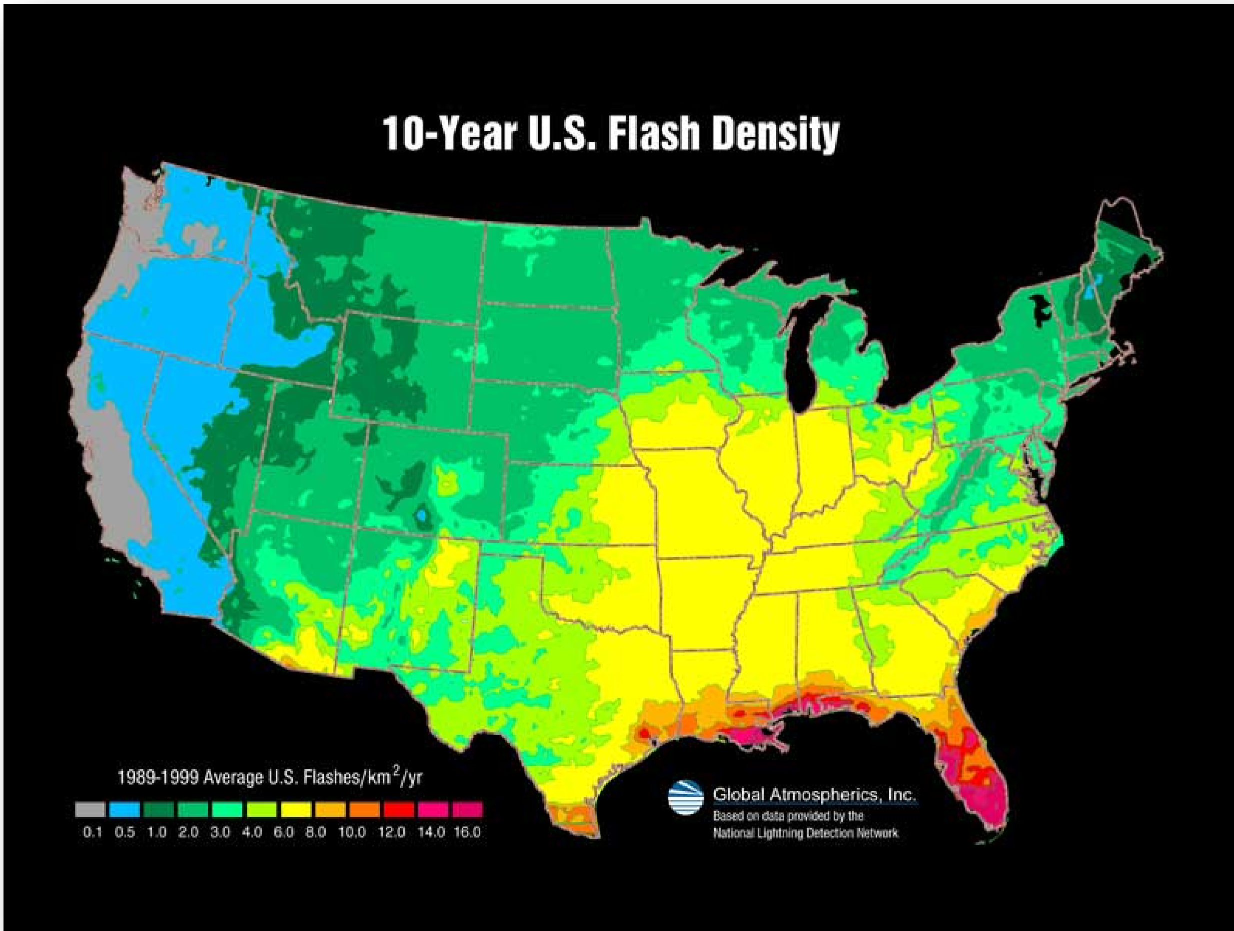


The average annual number of CG flashes ranges within the county from 1-2 to 9-12, depending on location. The southern portions of the urban area of Tallahassee, as well as several large areas south of the city, are more prone to lightning than other areas within the county.

The following figure indicates however that Leon County has a substantially lower flash density than coastal areas and the interior of Central Florida.

[61] Florida State University, Department of Meteorology.

Figure 15: 10-year U.S. Flash Density[62]



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.[63] However, the vulnerability is heightened in certain locations as described below.

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** as defined under Section 2.2.1 Risk. The expected or anticipated number of lightning events (CG strikes) per year would be up to 12, depending on location within the County as indicated by Figure 15. These events would be associated with severe and other thunderstorms at least four times per year, as indicated in section 2.3.2 of this document.

[62] American Red Cross, Capital Area Chapter Blog (2011), https://cacarc.wordpress.com/2011/06/20/2011-national-lightning-safety-awareness-week-facts-about-lightning/.
[63] Tallahassee Fire Department.

Vulnerability Summary

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.[64]

Risk Assessment

Lightning is considered a **medium risk** to the residents and structures within Leon County.

[64] Ibid.

2.3.5 Drought

General Description and Location

Drought is a part of the local climate, just like hurricanes, thunderstorms, wildfires, and tornados. Unlike the 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 on the basis of the severity of these impacts.[65]

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.[66] 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.

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.

The whole or portions 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.

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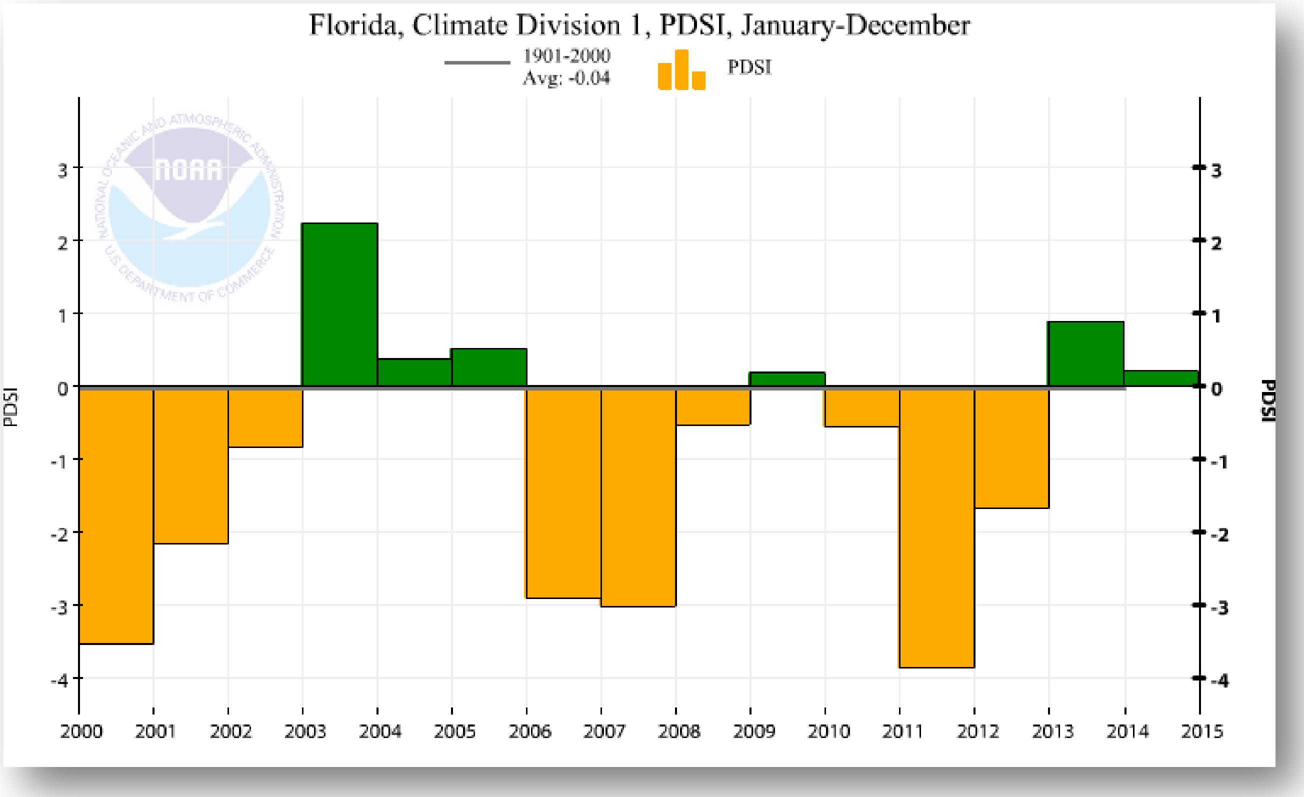
[65] Ibid..

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

Historical Occurrences

The following figure indicates the PDSI for Leon County from 2000-2015.

Figure 16: Florida Drought Map for February 24, 2015.[67]



This figure indicates that there were three periods of drought in the last 15 years, and that Leon County's last severe drought period occurred from 2010 to 2013. These drought periods brought about the disappearance of Lake Jackson and dried out much of Lakes Miccosukee, Lafayette, and Iamonia.

Estimated Impacts, Probability, and Extent

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.

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

[67] National Climatic Data Center, < http://www.ncdc.noaa.gov/cag/>.

maximum extent possible. However, no water supply shortages were been reported during either period.

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. 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.

2.3.6 Flooding

General Description and Location

A flood is an overflow of water that submerges land which is usually dry.[68] 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 affects portions of Leon County and the City of Tallahassee.

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.

Flooding in Florida typically is caused by heavy or prolonged rainfall from tropical storms and hurricanes. The annual rainfall in Tallahassee is approximately 62 inches/year, but this rainfall tends to be seasonal and episodic.

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 amount of impervious surfaces. 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 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.

Flooding affects areas in both Leon County and the City of Tallahassee. Many areas around streams, rivers, lakes, and wetlands 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.

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.

Historical Occurrences

Leon County and the City of Tallahassee have experienced numerous significant rainfall events in the last 55 years, with at least one or more annual rainfall amounts ranging between 5 to 9 inches. The most severe rainfall events listed in Table 2.26 above have caused localized flooding, but other events since then have caused nuisance and/or hazard/damage flooding in areas of the county.

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.

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

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.[69]

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 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.

Estimated Impacts, Probability, and Extent

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 a watershed. Other variables include the length of a rain event, the amount of rainfall, and the frequency between storms. Maps 20 and 21 indicate Zone AE depth to flooding; these maps indicate the computed elevation to which floodwater is anticipated to rise during the base flood (0.1' to 25', depending on location).

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. 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.

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

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

Floodplain Development

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. As indicated by Table 2.29, there are 10,597 parcels within the boundaries of the 100-year floodplain in Leon County as of 2014 (including both incorporated and unincorporated areas) as designated by the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM). These parcels account for over $6 billion worth of property and structures with the potential for damage in the event of a 100-year flood. Many waterbodies in Leon County have also been mapped in a special flood hazard area. Participation in the National Flood Insurance Program (NFIP) affords some protection for these properties. As of January 31, 2009, 3,832 NFIP policies had been issued in Leon County.

Table 2.29: Parcels within Leon County and the City of Tallahassee in the 100-Year Floodplain, 2014.[70]

Land Use	**Number of Parcels**
Government Operation	7
Hotel/Motel	1
Medical	4
Multi-Family	103
Office	75
Religious/Non-profit	29
Retail	117
Schools	16
Single Family Attached	531
Single Family Detached/Mobile Home	3602
Transportation/Communications/Utilities	25
Two-Family Dwelling	61
Vacant	59
Warehouse	59
Total	**4,729**

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

[70] Tallahassee-Leon County Planning Department, Existing Land Use Database, 2013.

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 Problems Identified within the City and County Stormwater Management Plans

In May of 1995, the Leon County Stormwater Master Plan (LCSWMP) was completed to address the remaining 18 major basins. The updated list of flood problem areas identified in the LCSWMP is displayed in Table 2.30**.** This list is current through 2015.

Table 2.30. Flood Problem Areas as Identified in the LCSWMP, 2009.

Basin	Location
	Capitola and Chaires Communities
	Capitola Road
	Baum Road
	Benjamin Chaires Road
	Tram Road
	Old Plank Road
	Natural Bridge Road
	Regiment Loop
	Louvinia Creek Tributaries
St. Marks River	Chicken Branch
	Fairbanks Ferry Road and Court
	Meridian Road at double bridges
	Orchard Pond outfall
	Autumn Woods
	Stoneler Road
	Houston Road
	Crooked Road
	Polk Creek Tributaries
Ochlockonee River	Harvey Creek Tributaries
	Waterfront Drive
	County Road 12
	Beth Page Road
	Luna Plantation
Lake Iamonia	Killearn Lakes Plantation
	Wadesboro Road
	Capitola Road
	Robinson Farms Road
	Jefferson Road
Black Creek	Farms Road
	Sportsmans Paradise
	Miccosukee Road
	Veterans Memorial Drive
	Jefferson Road
Patty Sink Drain	Old Magnolia Road
	Lafayette Oaks
	Timberlake
	Fred George Sink: Wood Hill, Sherborne
	Woodville Township
	Copeland Sink
	Patty Sink
	Lake Amelia Davis/Forest Lake Estates
	Maylor Closed Basin
	Old Bainbridge Rd at Homewood Drive
	Madam Mary Closed Basin
Closed Basins	Balkin Road Closed Basin/Cascade MHP
Apalachicola National Forest	L L Wallace Road

Other Flood Problem Areas

In previous updates of the Tallahassee-Leon County LMS, two tables identifying flood-prone areas throughout Leon County were included in this section. A table (not included here) describing *Properties with Reported Flood Problems* was derived from flood impact data was collected by the Capital Area Chapter of the Red Cross and Leon County Department of Public Works personnel as part of the damage assessment process following Tropical Storm Beryl (August 16, 1994) and Tropical Depression #10 (October 10, 1994). Over 340 properties were reported as having varying degrees of flooding, with some structures suffering major damage while other parcels experienced only nuisance flooding (i.e. access road flooded but no structural damage.

The City of Tallahassee also provided information on 37 flood problem areas that were identified for potential funding by the Sales Tax Task Force Team in 1998. This table included flood and erosion control projects covering 25 streets and 12 larger floodprone areas, such as creeks, ponds and drainage areas. Many of these projects have been completed, including the Franklin Avenue project and the Capital Cascade project.

On November 27, 2001 the Board of County Commissioners amended the LMS to incorporate by reference the “October 2001 Leon County Flooded Structures Inventory,” which includes all of the records provided by County and City stormwater departments and the Red Cross following the major storm events of 2000 and 2001 (i.e., Tropical Storms Helene, Allison and Barry). The Inventory had a total of 881 properties with documented flooding histories and takes the place of the two previously discussed tables. Based on actions taken by the County and City to acquire flooded structures and properties, as well as other projects alleviating flooding issues, this list is no longer accurate, and has therefore been removed from this update. Both the City and the County departments responsible for addressing these issues maintain lists of flooded structures and properties, but these lists are for internal use only. 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.

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, depicted in the following figure.

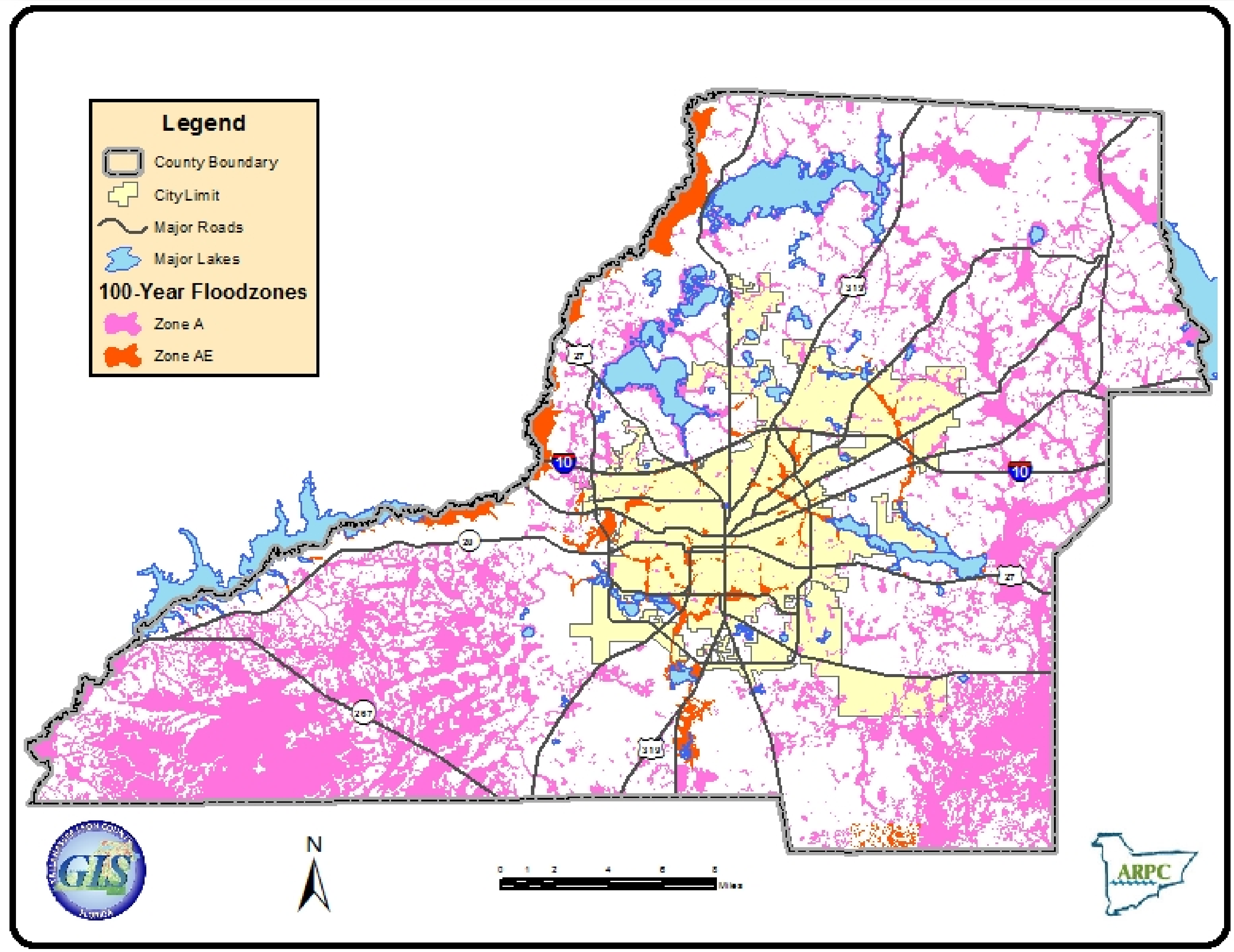
Table 2.31. Description of FEMA FIRM Zones.[71]

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.

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) are indicated in the following maps. These FIRM data are current.

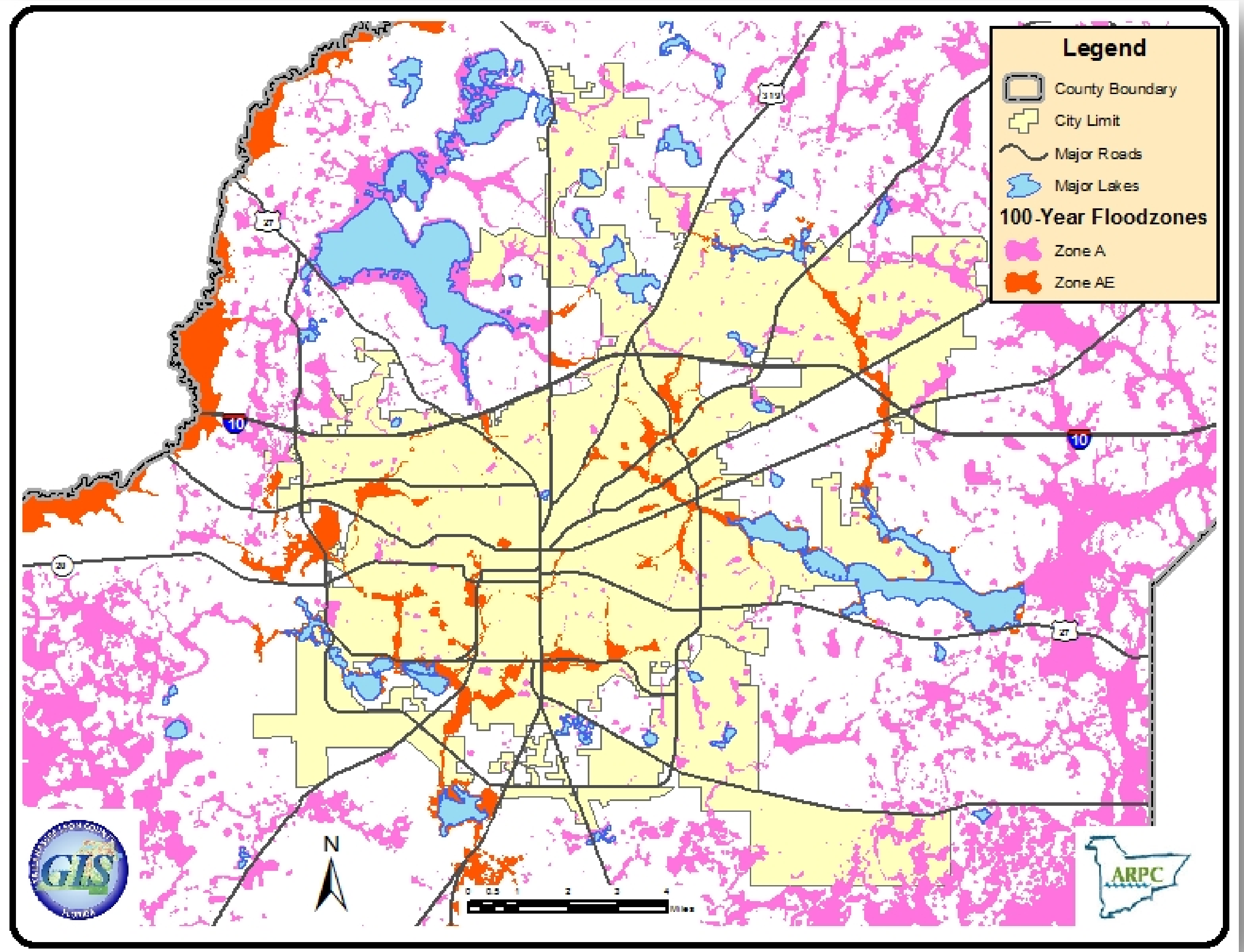
[71] FEMA.

Figure 17: 100-Year Flood Plain in Leon County, Florida.[72]



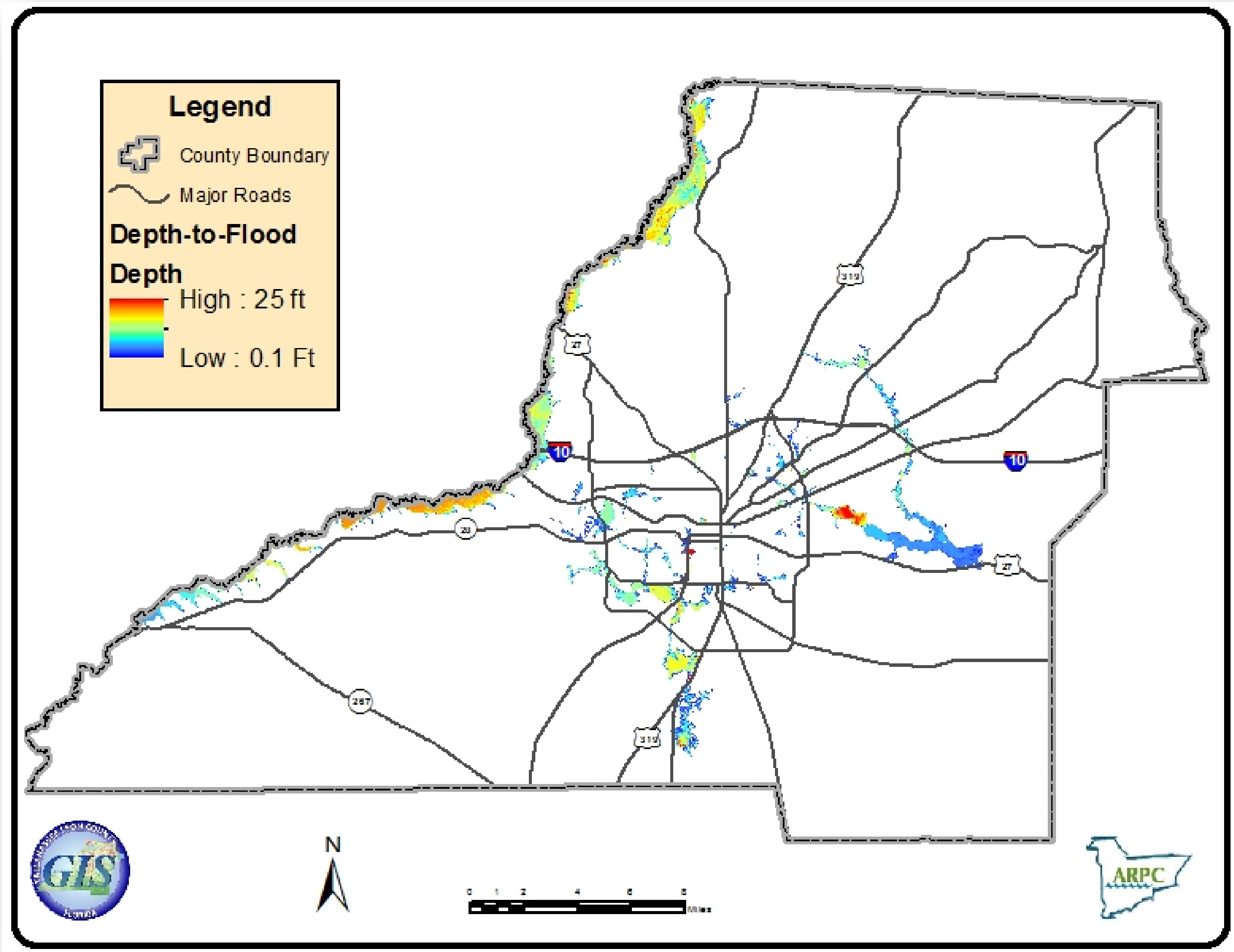
[72] Tallahassee-Leon County Geographic Information Systems.

Figure 18: 100-Year Floodplain in the City of Tallahassee, Florida.[73]7



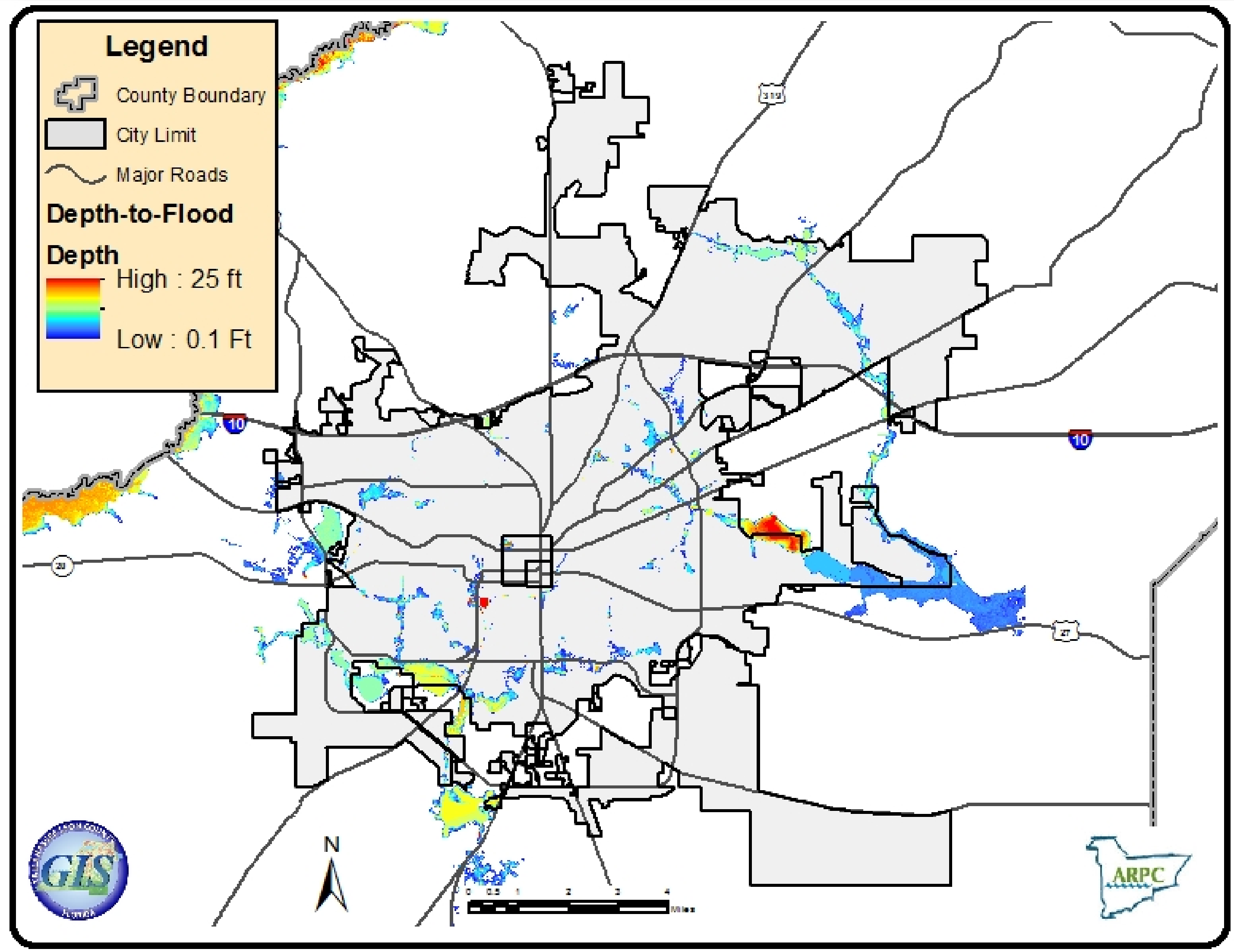
[73] Ibid.

Figure 19: Zone AE Depth-to-Flood in Leon County, Florida.[74]



[74] Ibid.

Figure 20: Zone AE Depth-to-Flood in the City of Tallahassee, Florida.[75]



[75] Ibid.

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 2.0 model to calculate potential economic loss and this process was described in section IIA2c above. Figures 19 and 20 indicate the depth of flooding for Zone AE.

Flood Mitigation Policies and Programs

Institutional Responses to Flooding

The Tallahassee – Leon Count y Comprehensive Plan has a number of policies that address development within floodprone areas and floodplains. Both Leon County and the City of Tallahassee have adopted and continue to enforce minimum 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 also funds a significant amount of public stormwater infrastructure. Several of the most recent and notable improvement projects in the urban area include (not in order of importance or significance):

1. Cascade Park Stormwater Facility Project (Blueprint 2000)
2. Franklin Avenue Road Reconstruction Project (Blueprint 2000)
3. Shamrock North at Edenderry & Bay Shore Stormwater Improvements Project (COT)
4. Stonehouse Road Project (COT)
5. Killarney Way at Shamrock Stormwater Improvements Project (COT)
6. Think About Personal Pollution (TAPP) campaign (COT)
7. FSU-COT Regional Stormwater Facility Project (COT)
8. Betton-Cline-Chamberlain Stormwater Facility Project (COT)
9. Carter-Howell-Strong Park Stormwater Facility Project (COT)
10. Upper Lake Lafayette Nutrient Reduction Facility (COT)
11. Hilaman Outfall Ditch Project (COT)
12. Lake Jackson Dredging (LC and NWFWMD)
13. Lake Munson Drawdown and Dam Replacement (LC)
14. Orange Avenue Construction Project (LC)
15. Raymond Tucker, Golden Pheasant & Windwood Hills Drainage Project (LC)

In 1993, a combined City of Tallahassee-Leon County Stormwater Management Plan was developed to manage water quality problems and flood protection needs in the Lake Munson, Lake Jackson, Lake Lafayette, and Fred George basins. These four basins encompass all lands within the City, in addition to a significant portion of the unincorporated area.

This joint stormwater plan has been replaced by jurisdiction-specific plans and program. The City of Tallahassee Stormwater Management program is funded by a stormwater utility fee with nearly 86,000 residential accounts and over 8,500 non-residential accounts. The stormwater utility generates approximately $15.9 million per year, and employs over 95 positions including scientists, biologists, engineers, planners, administrators and maintenance personnel. The City's stormwater program provides a number functions including:

- 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 33,000 drainage structures, over 420 stormwater ponds, 60 miles of major drainage ditches, 370 miles of roadside ditches and over 490 miles of drainage pipes.

Leon County also has a comprehensive stormwater management program similar in ways to the City's efforts. 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 right-of-ways 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.

Participation in the National Flood Insurance Program

Flooding is a serious risk in Florida, and is one of the most common hazards encountered in Leon County and the City of Tallahassee. This drives local government participation in the National Flood Insurance Program (NFIP). Both Leon County and the City of Tallahassee participate in the NFIP.

Insurance to cover flooding is not typically provided in a homeowner's policy, 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 flood insurance, a community must join the NFIP and agree to enforce sound floodplain management standards. When this happens, the residents in that community are allowed to participate in and purchase flood insurance coverage through the NFIP. To be eligible to participate in the NFIP, communities must 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.

As of 2015, Leon County has 1,681 policies in force and Tallahassee has 2,175 policies. 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 2.32: NFIP Flood Losses and Payments by Jurisdiction, 1978 – March 2011.[76]

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

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

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 participates in the CRS. In April 2013, Leon County requested entry into the CRS program. A new application Verification Visit was conducted by an ISO/CRS Specialist on July 10, 2014. Leon County received a preliminary results letter in December 2014 and anticipates an effective date of May 1, 2015.

Other Flood Mitigation Measures

The City of Tallahassee and Leon County recently 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.

[76] FEMA NFIP.

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 2.33: Economic Loss from 100-Year Flood Event.[77]

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 2.34: Critical Facilities Located in Known Hazard Zones.[78]

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.

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.

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

[77] Hazus-MH 2.0.
[78] Tallahassee Leon County Geographic Information Systems.

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 affect Leon County and the City of Tallahassee.

Design Storm[79]	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, since 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.

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.

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

Vulnerability Summary

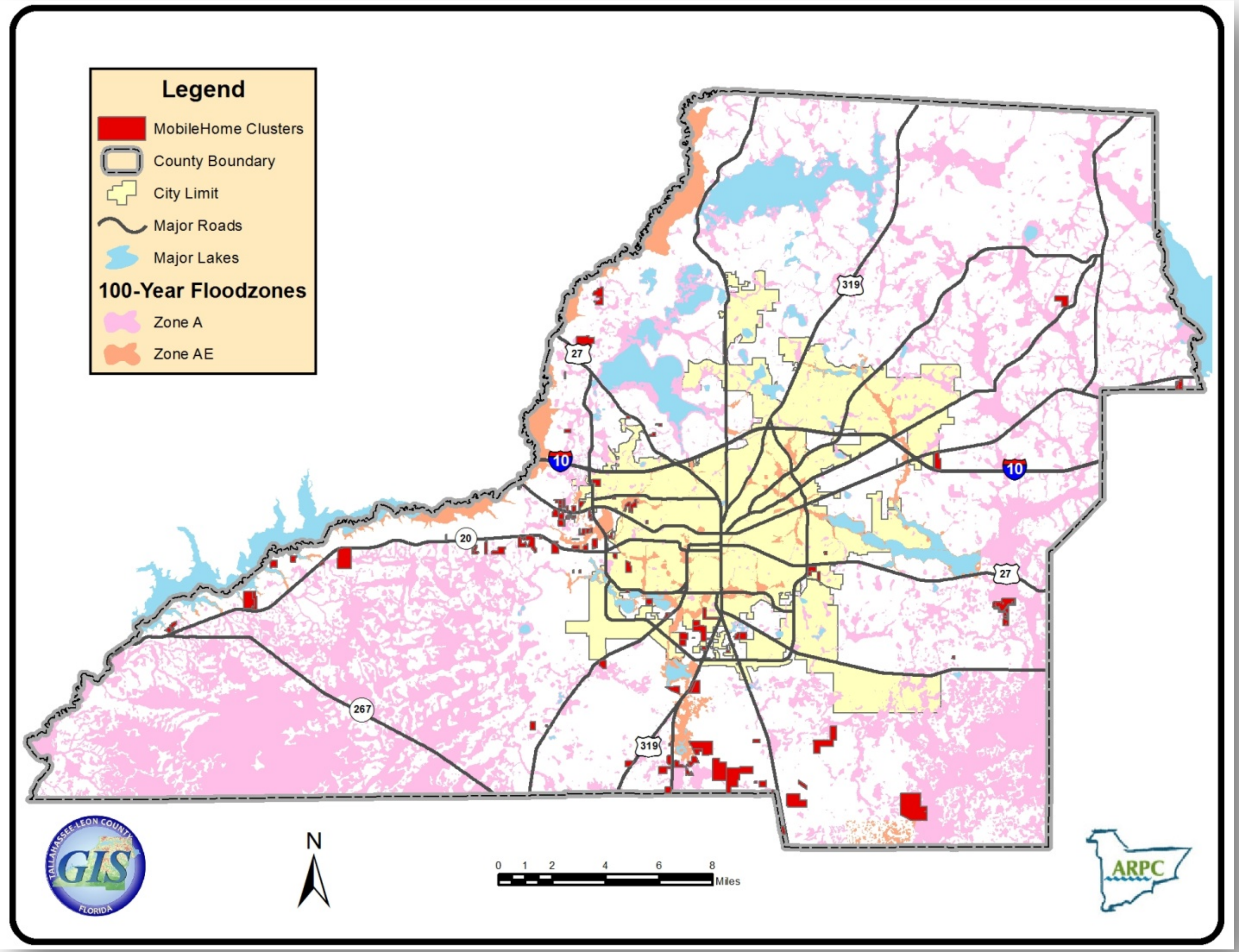
Leon County and the City of Tallahassee have a record of county-wide vulnerability to flooding primarily related to heavy rainfall and tropical events. Areas and features specifically vulnerable to flooding include:

- 8,285 parcels identified as having at least a portion of their property in the 100-year floodplain (Table 2.29)
- Mobile homes and septic tanks in 100-year floodplains (Figures 21 and 22)
- 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 and Belle Vue Middle School
- Flood Problem Areas identified in the Leon County Stormwater Master Plan (Table 2.30)
- 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 Stormwater Utility
- Parking areas adjacent to Leon High School and the FSU Flying High Circus

Risk Assessment

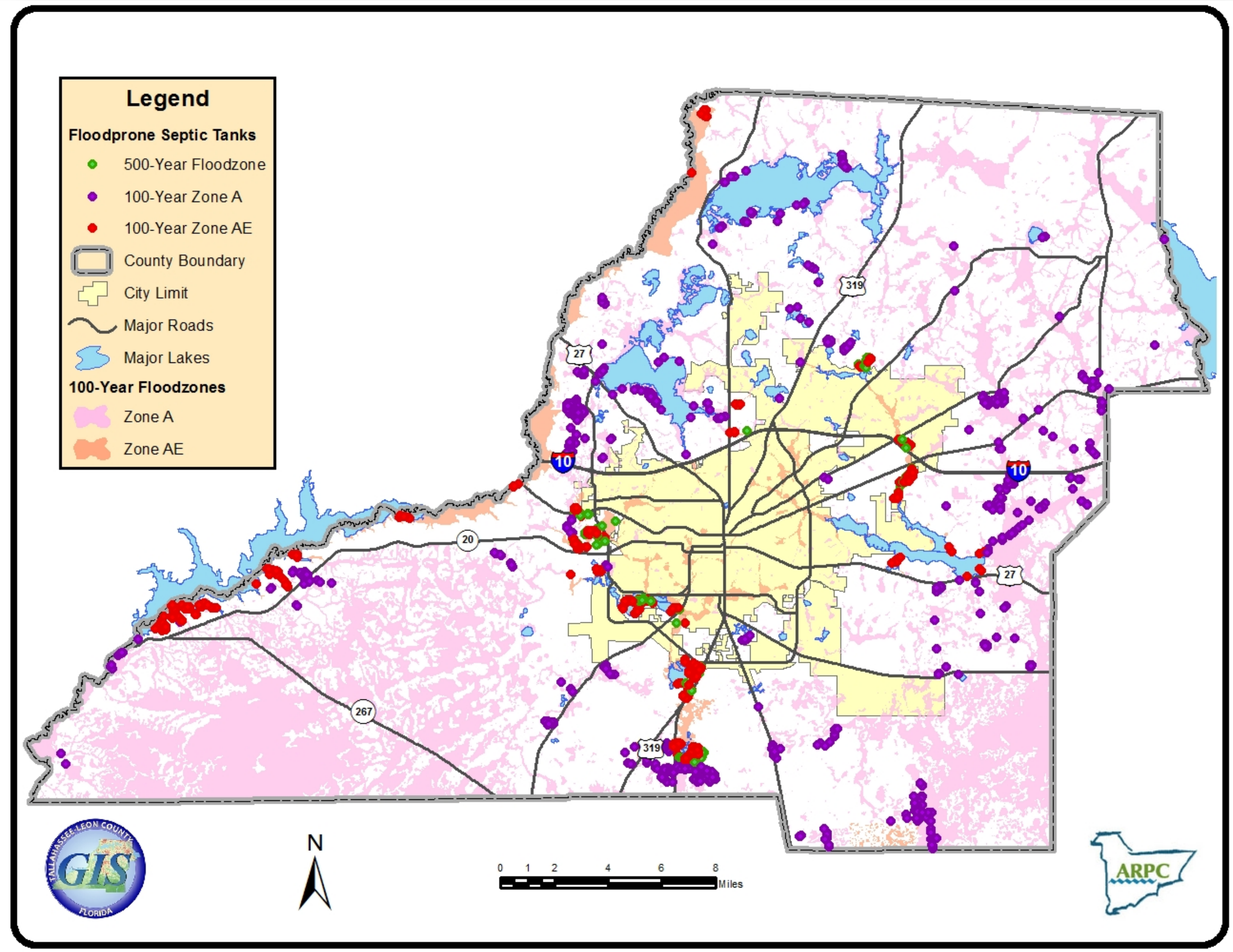
Based on assessment of historical data, the extent and location of floodprone areas, and the Hazus analysis, flooding is classified as a **high risk** in Leon County and the City of Tallahassee.

Figure 21: Mobile Home Clusters in the 100-Year Flood Plain.[80]



[80] Tallahassee-Leon County Geographic Information Systems.

Figure 22: Septic Tanks in the 100-Year Floodplain.[81]



[81] Ibid.

2.3.7 Wildfires

<u>General Description and Location</u>

Florida is a fire state. Our typical “fire season” is 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. It is also a useful land management tool for many areas; prescribed fire consumes excess fuels, germinates many native plants, and helps create and maintain natural wildlife habitat.

Forest and other wild fires 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 cigarettes, 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.

The Florida Division of Forestry (DOF) responds to wildfire events outside the city limits. As of November 1998, the DOF’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 a DOF 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. For example, large areas in the north and northeast are held as plantations and frequently utilize fire as a land management tool. Additionally, 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 Forest Service personnel reduces the risk of wildfire.

<u>Historical Occurrences</u>

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.

Since then, more than 15,000 wildfires have devastated over one million acres and destroyed more than 750 structures in Florida. Leon County and the City of Tallahassee have a county-wide vulnerability to fires, specifically wildfires. However, the majority of wildfires occurs on public lands and is subject to specific management efforts by state and national foresters.

The Florida Forest Service recorded a total number of 77 wildfires in Leon County from January 1, 2010 to April 2, 2015, an average of slightly more than five wildfires per year in Leon County. These fires burned a total area of 617 acres, which is approximately one percent of the land area of the county.

Table 2.35. Historical Occurrences of Wildland Fires in Leon County, 1/1/2010 to 4/2/2015.[82]

Date/Time	Acres	Cause
2/21/2010 15:30	1	Debris Burn--Nonauth--Piles
4/6/2010 19:50	1	Children
6/10/2010 15:43	0.5	Debris Burn--Nonauth--Broadcast/Acreage
7/31/2010 16:35	0.1	Lightning
9/4/2010 4:40	0.1	Incendiary
9/18/2010 15:00	12	Debris Burn--Nonauth--Piles
9/23/2010 5:25	0.3	Debris Burn--Nonauth--Broadcast/Acreage
10/4/2010 9:30	0	Debris Burn--Nonauth--Yard Trash
1/7/2011 17:00	2	Children
2/12/2011 13:45	1.5	Debris Burn--Nonauth--Yard Trash
2/14/2011 9:00	1	Debris Burn--Auth--Piles
2/14/2011 14:00	6.5	Debris Burn--Auth--Yard Trash
2/14/2011 17:00	0.2	Debris Burn--Nonauth--Yard Trash
2/20/2011 14:15	40	Debris Burn--Nonauth--Yard Trash
2/20/2011 15:00	3	Equipment--Recreation
2/22/2011 13:00	1	Debris Burn--Auth--Broadcast/Acreage
2/24/2011 15:05	3	Debris Burn--Auth--Broadcast/Acreage
3/12/2011 15:48	0.5	Unknown
3/16/2011 13:00	0.1	Debris Burn--Nonauth--Piles
3/26/2011 16:30	0.5	Debris Burn--Nonauth--Piles
4/13/2011 17:30	5.2	Children
4/19/2011 13:00	4	Incendiary
5/13/2011 15:25	1	Equipment--Agriculture
5/21/2011 14:50	0.1	Equipment--Transportation
6/3/2011 16:50	25	Equipment--Agriculture
6/8/2011 15:00	5	Lightning
8/30/2011 13:00	1	Debris Burn--Nonauth--Yard Trash
8/31/2011 19:00	0.1	Lightning
9/13/2011 13:35	0.1	Campfire
10/1/2011 3:30	0.5	Equipment--Transportation
11/11/2011 13:45	0	Debris Burn--Auth--Yard Trash
11/22/2011 15:05	1	Equipment--Logging
11/26/2011 20:20	1	Debris Burn--Auth--Yard Trash
12/24/2011 17:15	1	Unknown
12/29/2011 9:30	0.5	Debris Burn--Auth--Broadcast/Acreage
12/30/2011 14:55	0.1	Debris Burn--Nonauth--Yard Trash
1/2/2012 15:30	2	Campfire
1/3/2012 11:45	11	Unknown
2/3/2012 16:00	5	Unknown
2/8/2012 13:00	120	Unknown
2/12/2012 17:15	0.5	Debris Burn--Nonauth--Broadcast/Acreage
3/15/2012 19:30	81	Lightning
3/25/2012 17:00	85.3	Unknown
4/7/2012 15:00	0	Lightning
4/12/2012 13:30	1	Unknown
4/20/2012 15:00	0.2	Unknown
4/24/2012 7:00	4.8	Unknown

[82] 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.

Date/Time	Acres	Cause
5/1/2012 15:00	5	Campfire
5/25/2012 13:00	0.1	Lightning
6/13/2012 12:00	0	Unknown
6/14/2012 15:25	0.1	Miscellaneous --Power Lines
6/17/2012 11:05	0	Incendiary
7/7/2012 22:00	4	Unknown
9/27/2012 19:20	2	Unknown
10/30/2012 18:45	1	Children
11/6/2012 9:00	0.1	Debris Burn--Nonauth--Piles
12/3/2012 16:30	2	Debris Burn--Nonauth--Broadcast/Acreage
12/3/2012 17:50	3.1	Campfire
12/9/2012 12:02	67	Unknown
12/16/2012 14:30	8.5	Campfire
1/16/2013 15:00	6	Children
1/23/2013 15:35	0.1	Campfire
2/1/2013 15:00	1	Unknown
2/3/2013 16:20	20	Debris Burn--Nonauth--Piles
2/16/2013 16:00	40	Unknown
2/18/2013 14:45	0.1	Unknown
2/28/2013 14:30	1	Children
5/24/2013 10:00	5	Debris Burn--Nonauth--Broadcast/Acreage
5/24/2013 16:30	0	Debris Burn--Nonauth--Piles
6/1/2013 22:00	10	Unknown
3/8/2014 10:00	1	Debris Burn--Nonauth--Piles
3/14/2014 16:50	0.7	Unknown
6/5/2014 14:40	0.1	Unknown
6/5/2014 16:00	0.2	Miscellaneous --Power Lines
11/9/2014 19:45	2	Children
2/21/2015 14:15	0.1	Debris Burn--Nonauth--Yard Trash
3/17/2015 17:00	6.1	Campfire
Total	**617.0**	

As indicated in Table 2.35, 45 of the reported non-prescribed wildland fires wildfires (58 percent) over the last five years are less than one acre in size, with a variety of causes. These wildfires have not for the most part burned structures or other property, with the exception of logging equipment, wooded and cut-over areas, fields, and pastures. Approximately 35 percent of these fires are debris burns (yard trash, piles, and prescribed fires), 25 percent are unknown, and the remainders are a mix of campfires, equipment fires, fires set by children or agricultural activities, power lines, incendiary, or lightning. No property damage to structures, including critical facilities, smoke emergencies, or displaced citizens was associated with these wildfires as reported by the Florida Forest Service.

Estimated Impacts, Probability, and Extent

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 have been minimal. However, the potential impact of wildfires in the wildland urban interface (see Figure 25) is greatest. 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 prescriptive fire or the physical removal of burnable fuels, as well as other management tools and practices.

According to the latest Southern Wildfire Risk Assessment (SWRA) provided by the Florida Forest Service, approximately 330,869 acres within Leon County (70.3% of the total area) are at the highest risk of burning.[83] 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 in the vicinity of 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:

> **Conservation Element, Policy 1.2.3:**
>
> 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. [84]

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 DOF as a means to reduce fuel loads, which could contribute to uncontrolled fires. Chapter 590, Florida Statutes, requires burn permits from the DOF or other delegated authorities prior to conducting a prescribed burn anywhere in the state. Burn permits are required for burns on all private and public lands, including private plantations, state parks, and national forest lands. This permit system provides a means of tracking and controlling prescribed burning efforts. Permits are not

[83] Southern Wildfire Risk Assessment Summary Report, DOF (2014).
[84] Tallahassee-Leon County Comprehensive Plan, 2015.

issued 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 DOF for compliance with proper fire procedures.

State and Federal Wildfire Mitigation Programs

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 ReadySetGo 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. Both of these programs are a part of the larger Fire Adapted Communities Approach to reducing wildfire risk throughout the entire community.

Based on the historical record, approximately five wildfires per year approximately eight acres in size will occur in Leon County with an average total area burned of 41 acres. These fires will not result in any fatalities or injuries, or the loss of any structures; neither will they displace people or present a significant smoke or other related hazards. However, due to the large size of those fires deemed unknown in origin (over 57 percent of the area burned), this figure many vary on an annual basis.

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

Vulnerability Summary

The local Tall Timbers Research Station is a non-profit biological research station that has conducted pioneering studies of the role of prescriptive fire on native forest ecosystems in the Southeast. Based on interviews with staff at this station, Leon County has experienced very few problems with fire and the wildland urban interface. This is primarily because of prescribed burning practices in large hunting properties in the north end of the county, and in the Apalachicola National Forest to the south and west, as well as in the several units of State wildlife management areas adjoining the Ochlockonee River.

The native Longleaf pine ecosystem found throughout the county is unique in that if fire is excluded from these areas, less flammable hardwood trees such live oak, magnolia, and water oak become dominate over time. The exception is flatwood areas in the southern part of Leon County, south of the Cody Scarp. These areas are considered vulnerable to wildland fires because these habitats can be very flammable when fire-excluded.

As indicated in Figure 27, the wildland urban interface is where damages from wildfire are most likely to occur. Small wildfires within the urban area are rare and can be easily controlled by local fire departments and Florida Forest Service or other agency personnel as necessary. However, larger fires within this interface area can impact residential areas and other structures, as well as critical facilities and systems. Even the 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 prescriptive 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.

The most vulnerable areas within Leon County are those generally located at the wildland urban interface. These areas include forest and forested wetlands within the city limits. These obscured areas are frequently older residential areas with a mature tree cover that have been developed from the early 1800s to the late 1900s. Residential areas such as Southwood, which was developed in the early 2000s on old, open pastures, are less vulnerable to wildfire.

Vulnerability to wildfires was estimated from the use of the Hazus model and 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.

Hazus Analysis

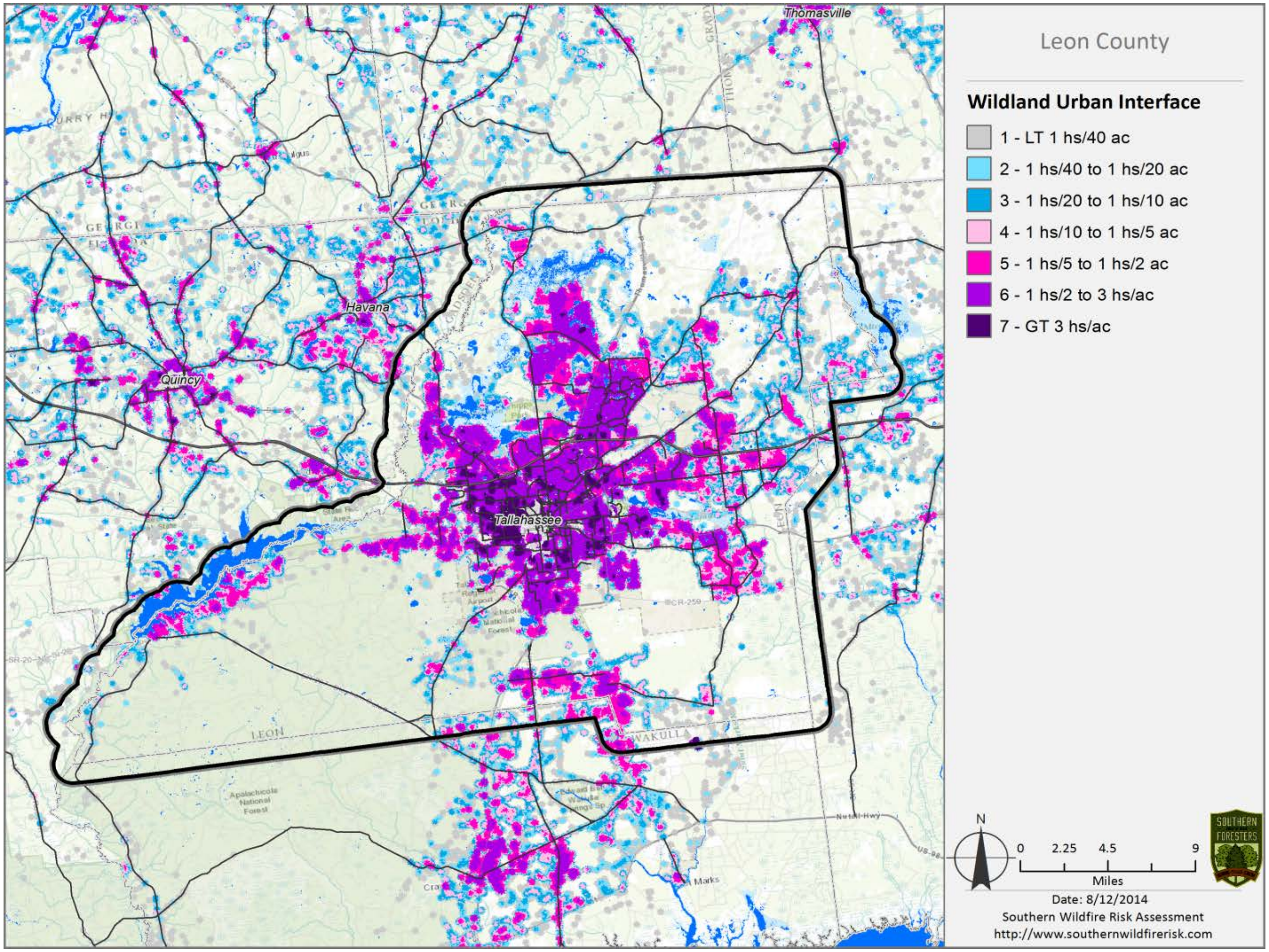
Using the same categories of general building stock provided in the HAZUS-MH 2.0 model, the 2010 Leon County Property Appraiser parcel level data was used to produce the value estimates of those properties at risk for wildfire. The two following figures indicate the wildfire risk for both the City and the County using a Wildfire Susceptibility Index (WFSI). The WFSI represents the key index from the SWRA that supports the current fire planning needs of southern fire management agencies. The WFSI integrates the probability of an acre igniting and the expected final fire size based on the rate of spread in four weather percentile categories into a single measure of wildland fire susceptibility. WFSI is comprised of three main data elements:

1. Fire Occurrence
2. Fire Behavior
3. Fire Suppression Effectiveness

The WFSI is a value between 0 and 1 that represents the likelihood that a given acre will burn. The "hotter" the color, the higher the index, which expresses the likelihood of an area burning based on existing vegetation (e.g., type of trees, age of stands, understory, etc.) and other factors.

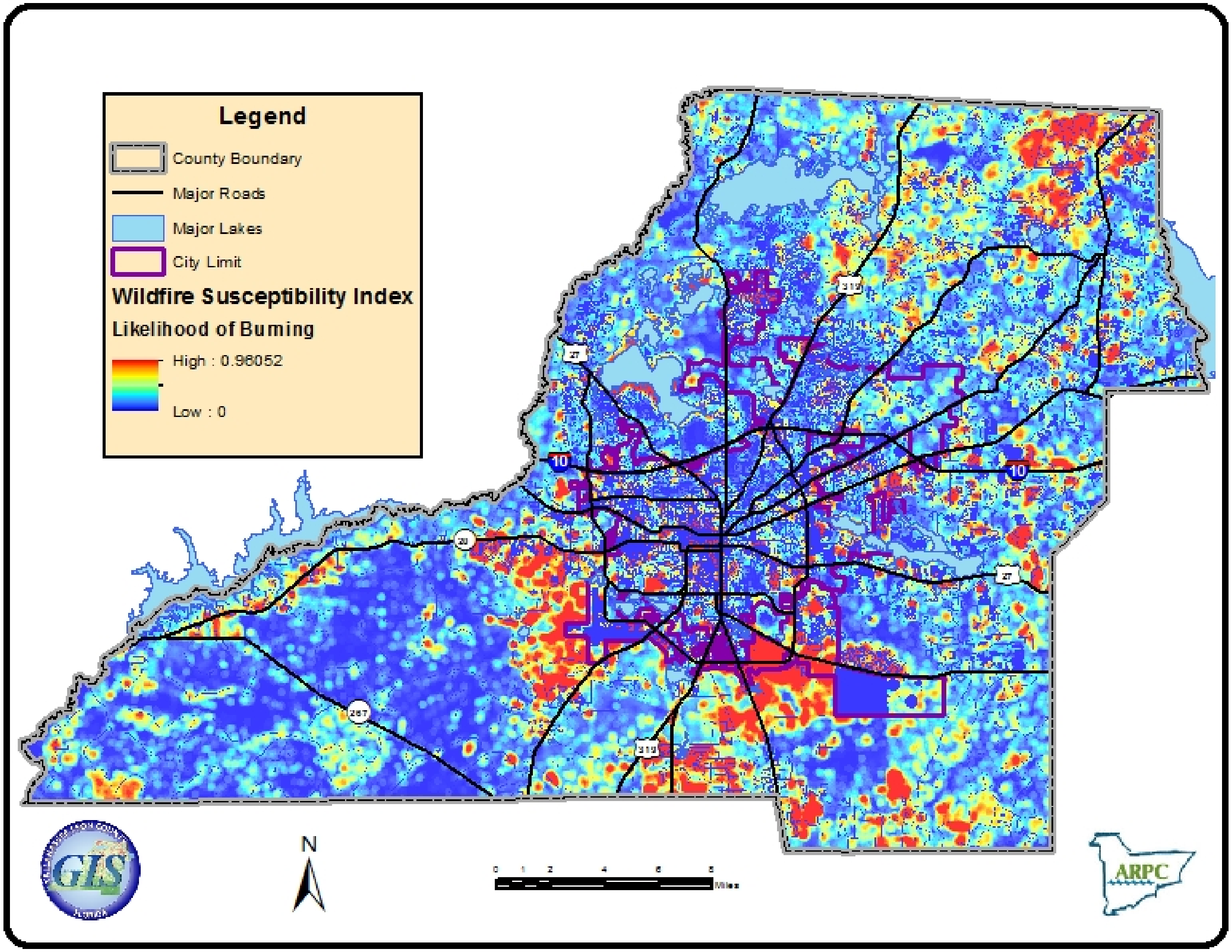
The following figures from the Wildfire Risk Assessment Summary Report indicate the extent in 2014 of the wildland urban interface in Leon County and the City of Tallahassee, as well as the relative risk of wildfire.

Figure 23: Wildland Urban Interface of Leon County, Florida.[85]



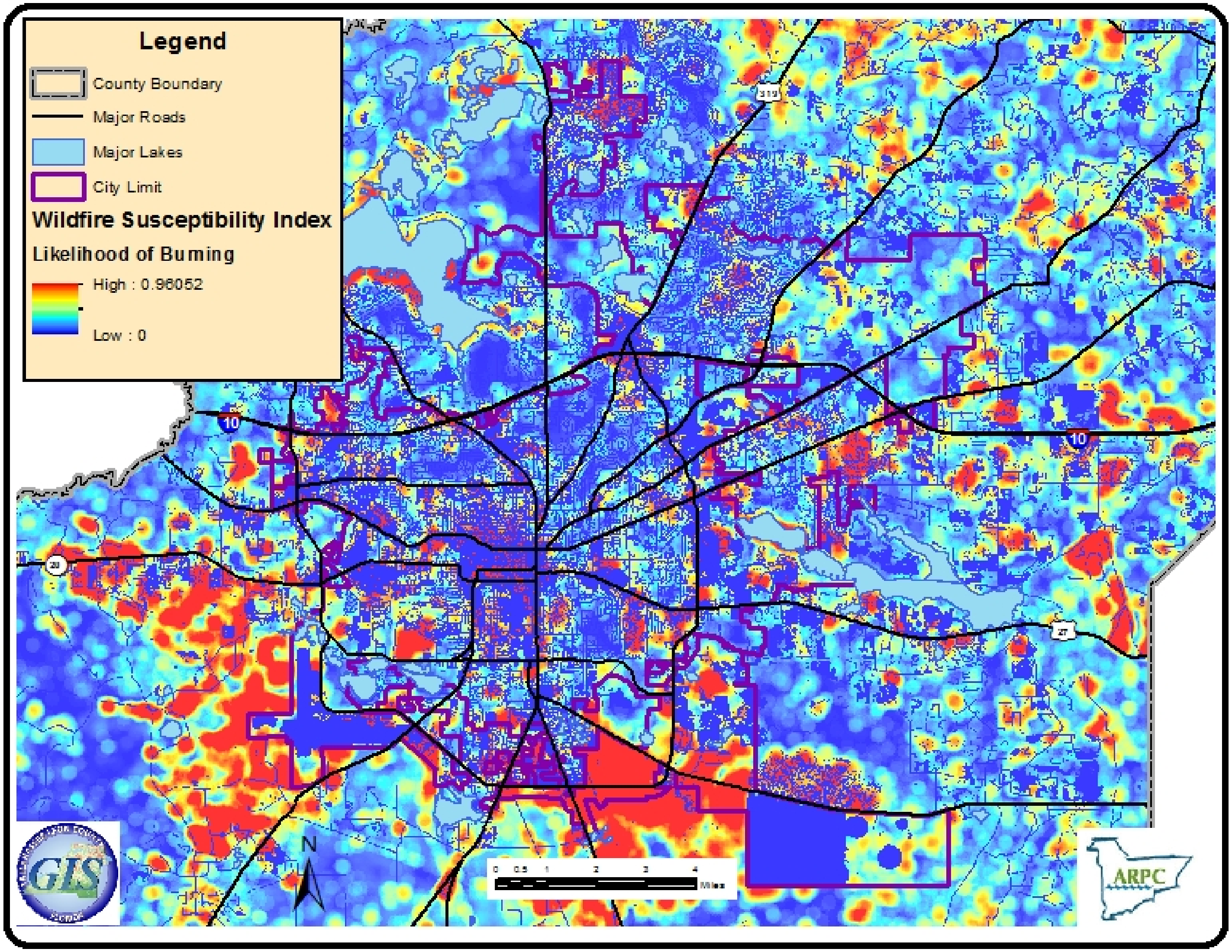
[85]Ibid.

Figure 24: Wildfire Risk in Leon County, Florida.[86]



[86] Florida Division of Forestry and Hazus-MH 2.0.

Figure 25: Wildfire Risk in the City of Tallahassee, Florida.[87]



[87] Florida Division of Forestry and Hazus-MH 2.0.

While residents may experience a periodic blanketing of smoke, the regular use of prescribed burns by Forest Service personnel reduces the risk of wildfire.

Using the same categories of general building stock provided in the HAZUS-MH 2.0 model, the 2010 Leon County Property Appraiser parcel level data was used to produce the value estimates of those properties at risk for wildfire. The two tables below display a breakdown of total value by property type for the City and the County. It is important to note that these are total property values, not damage values based on the impact of a wildfire.

Table 2.36: Fire Loss Estimates in the City of Tallahassee, Florida.[88]

Property Type	Number of Properties	Value (in dollars)
Residential	4,015	$890,279,779
Commercial	678	$781,059,979
Government	195	$1,565,484,628
Industrial	55	$37,168,980
Education	42	$1,900,844,161
Religion	43	$62,035,540
Agriculture	9	$12,422,559
Vacant	754	$86,696,502

Table 2.37: Fire Loss Estimates in Leon County, Florida.[89]

Property Type	Number of Properties	Value (in dollars)
Residential	3,467	$478,138,684
Commercial	87	$95,815,349
Government	92	$141,385,882
Industrial	45	$16,333,050
Education	4	$47,292,350
Religion	23	$17,307,814
Agriculture	215	$242,855,609
Vacant	1,043	$86,538,194

The majority of wildfires occurs as prescribed burning on public land and is subject to specific management efforts by state and national foresters. For non-prescribed wildland fires, the Division of Forestry recorded a total of 180 during the period from 1999-2009, or an average of about 18 per year, that burned approximately 1,858 acres. The Florida Forest Service (previously the Division of Forestry) recorded a total number of 77 wildfires in Leon County from January 1, 2010 to April 2, 2015, an average of slightly more than five wildfires per year in Leon County. These fires burned a total area of 617 acres, which is approximately one percent of the land area of the county. The majority of these are small-acreage (less than 1.0 acres) burnings of debris Southern Leon County. These data indicate that human action is one of the leading causes of wildfires within Leon County.

[88] Leon County Property Appraiser, 2010.
[89] Ibid.

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.

Risk Assessment

Based on assessment of the historical data, the Hazus analysis, and the Wildfire Risk Assessment Summary Report, wildland fires are classified as a **low risk** to Leon County residents. This risk estimation is also based on the active use of prescriptive fire to help manage public and many private lands, which significantly reduces the degree of risk of wildfires in these areas and nearby residential areas.

Regardless, as the population of Leon County continues to grow, the number of residents living in or near wildland areas will also continue to increase. Subsequently, the threat of wildfire will increase as the urban area of Tallahassee extends into previously forested areas, or into or adjacent to forested areas not prescriptively burned on a regular basis. The number of human-caused fires is also predicted to increase as the population living in wildland urban interface areas continues to grow, and as natural areas within the urban area age out absent prescriptive fire or other vegetation and leaf litter management.

2.3.8 Sinkholes

General Description and Location

Sinkholes form in karst terrain principally from the collapse of surface sediments into underground voids and cavities in the limestone bedrock. Slightly acidic ground water slowly dissolves cavities and caves in the limestone over a period of many years. When a cavity enlarges to the point that its ceiling can no longer support the weight of overlying sediments, these sediments collapse into the cavity. In a less catastrophic type of sinkhole, a bowl-shaped depression forms at the surface, usually over a considerable period of time, as surface sediments ravel downward into small cavities in the bedrock. Well drilling data suggests that much of the underlying bedrock in Florida contains cavities of differing size and depth. However, relatively few ever collapse and directly affect roads or dwellings.

Karst terrain is a type of topography that is formed by dissolution of bedrock in areas underlain by limestone, dolostone or, as in some western states, gypsum. Such terrain has underground drainage systems that are reflected on the surface as sinkholes, springs, disappearing streams or even caves. The term karst, therefore, refers to the terrain and the term sinkhole is one of the types of drainage features reflected by that type of terrain. 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. Commonly, a reported depression is not verified by a licensed professional geologist to be a true sinkhole, and the cause of subsidence is not known. Such an event is called a subsidence incident. The Florida Geological Survey maintains and provides a downloadable database of reported subsidence incidents statewide. While this data may include some true sinkholes, the majority of the incidents have not been field-checked and the cause of subsidence is not verified. [90]

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.

Since 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 supportive of sinkhole development. 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."[91]

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[90] http://www.dep.state.fl.us/geology/feedback/faq.htm.
[91] http://www.dep.state.fl.us/geology/geologictopics/sinkholedevelopment.htm.

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.[92]

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.

Since 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

Data gathered by the Florida Center for Instructional Technology (FCIT) from the Florida Geological Survey (FGS) and the Florida Department of Environmental Protection (FDEP) indicated 90 reported sinkhole events in Leon County as of 2008. Of these, 85 are less than 10’ wide, four are 31-80’ wide, and one is 81-200’ wide.[93]

A spatial database of subsidence incident reports maintained by the Florida Department of Environmental Protection - Florida Geological Survey indicated 128 occurrences of sinkholes in Leon County between 1967 and 2014.[94] These data indicate that 22 of these events have occurred between January 2010 and October 2014. These sinkholes have ranged in width from six inches to 75’ wide, and from less than one foot deep to 40’ deep. The following figure depicts the location of karst subsidence reports (sinkhole occurrences) within Leon County.

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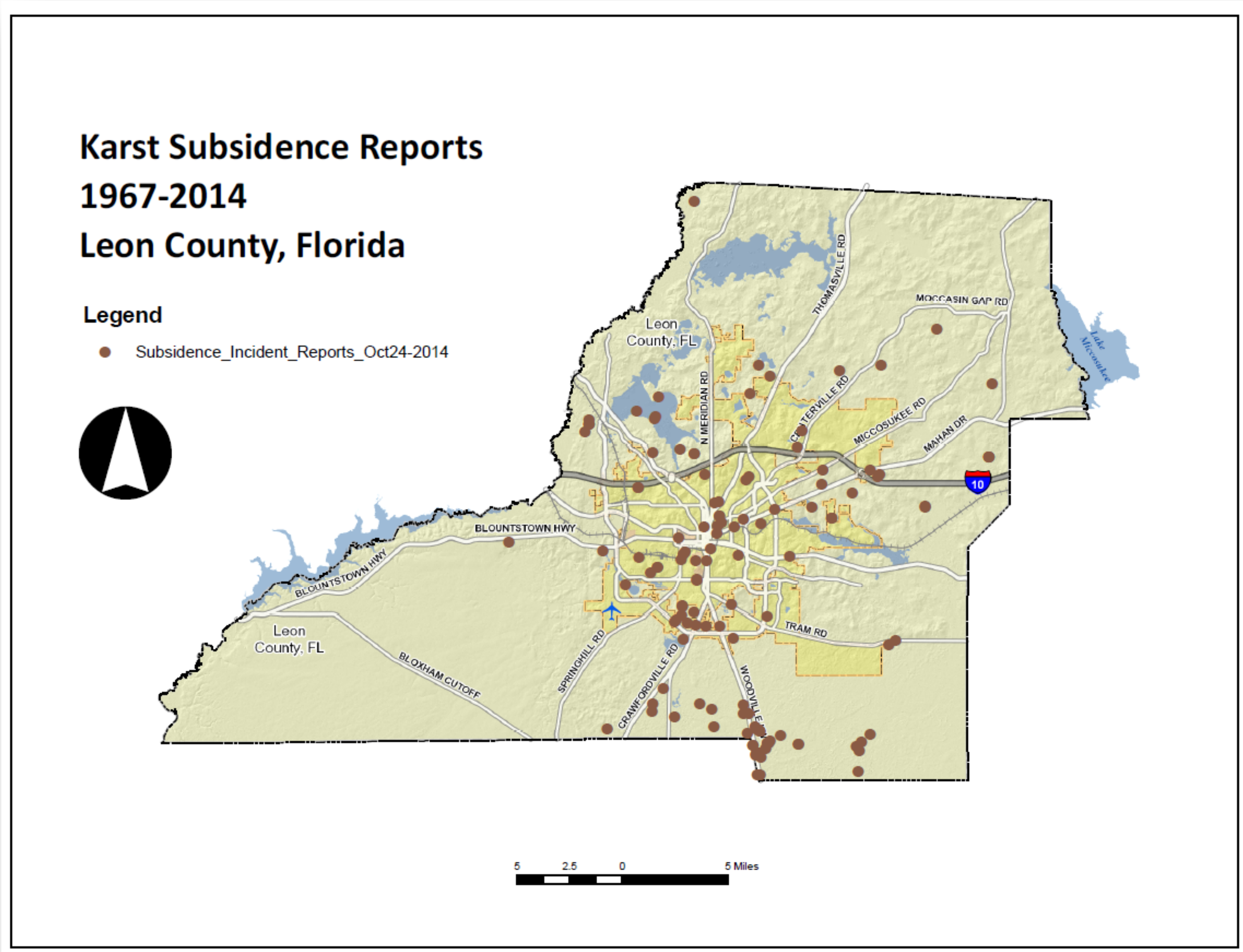
[92] United States Geological Survey, http://ga.water.usgs.gov/edu/earthgwsinkholes.html.

[93] University of South Florida, Florida Center for Instructional Technology, http://fcit.usf.edu/florida/maps/pages/11100/f11139/f11139.htm.

[94] Florida Geological Survey, 2014. http://www.dep.state.fl.us/geology/gisdatamaps/SIRs_database.htm.

Figure 26: Karst Subsidence Reports in Leon County, Florida, 1967 – 2014.[95]



[95] Tallahassee-Leon County Planning Department, 2014, using data from http://www.dep.state.fl.us/geology/gisdatamaps/SIRs_database.htm.

Estimated Impacts, Probability, and Extent

There is currently no agency with responsibility and authority for sinkhole inspections in Florida. Often the Florida Geological Survey (FGS) receives calls from homeowners 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 this 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.

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 have historically not been the size and extent of sinkholes in Central Florida, where ground water levels are much more variable due to geologic structures that are different than that underlying Leon County, and where drawdown of ground water 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.

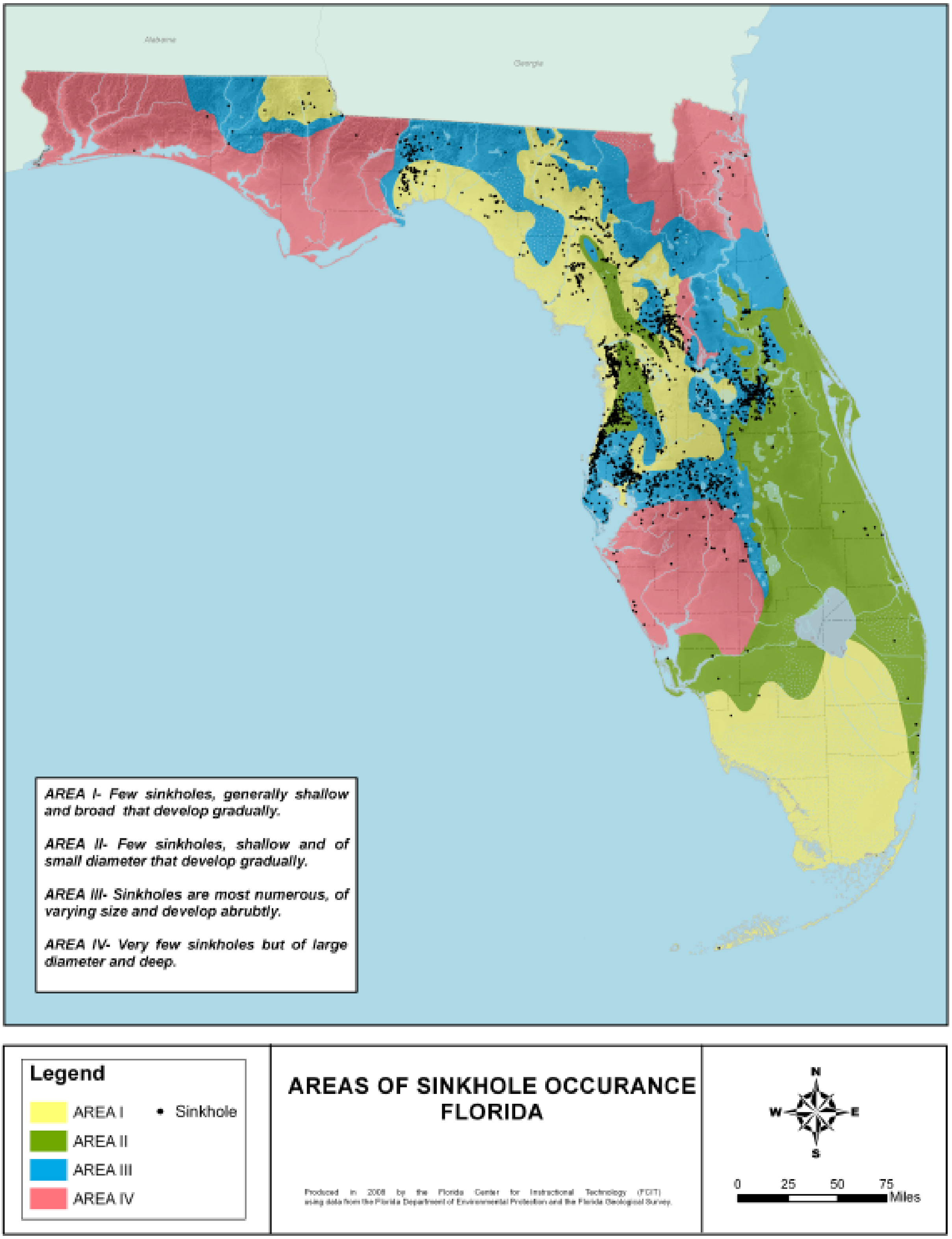
The database of subsidence incident reports in Leon County from 1967-2014 indicates that the majority of these sinkholes are small and relatively shallow, and many of those have been filled and stabilized. However, some of these events (11 out of 128) have created some degree of property damage. Although 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. However, since sinkholes 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, all citizens, structures, and critical facilities and systems within these areas may be potentially affected.

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.[96]



[96] 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. New sinkholes would have an average width of 8.4’ and an average depth of 7’. 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.

Overall, the probability based on the historical record of a sinkhole occurring within Leon County and the City of Tallahassee is **highly likely** as defined under Section 2.2.1 Risk.

<u>Vulnerability Summary</u>

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, since 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.

<u>Risk Assessment</u>

Based on 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. 3.9 Storm Surge/Tsunami

General Description and Location

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.[97]

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, since 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.

Historical Occurrences

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.[98] 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.

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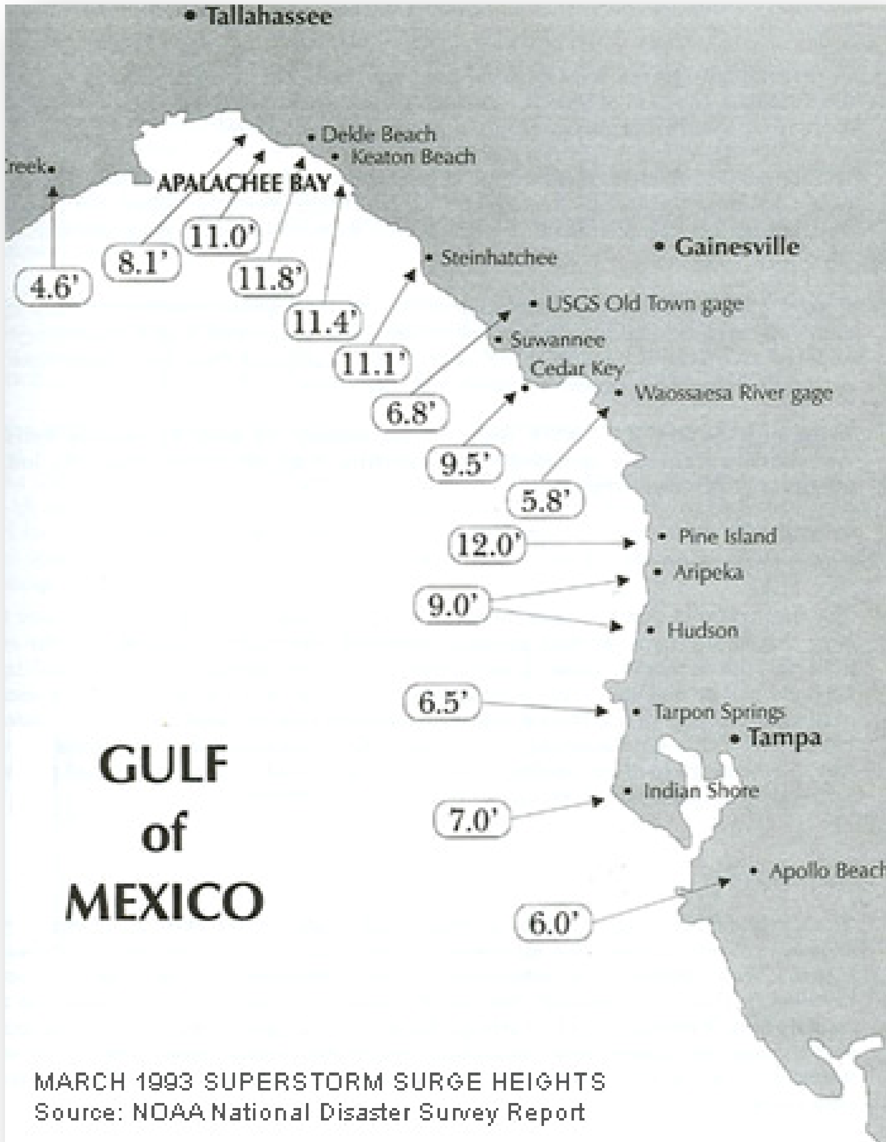
[97] http://en.wikipedia.org/wiki/Tsunami.
[98] Storm of the Century, Wikipedia, The Free Online Encyclopedia, 2009.
<http://en.wikipedia.org/wiki/Storm_of_the_Century_(1993)>

Figure 28: NOAA Estimate of Storm Surges along Florida's Gulf Coast, 13 March 1993.[99]



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

Storm surges and tsunamis are somewhat similar in the areas they affect. These include river and stream valleys and adjacent low-lying lands along the southern and southeastern borders of the County. High water, particularly moving water commonly associated with tsunamis, can damage

[99] Ibid.

structures and other property, and sweep away people, livestock, and other living beings and materials.

However, one critical difference is the time in which they can affect these areas. A storm surge associated with a hurricane can take up to a day or so to rise, whereas a tsunami can rise quickly. Citizens potentially affected by a storm surge, the range of which can be predicted as part of a hurricane or tropical storm, usually have 12-24 hours to leave for higher ground, and evacuations can be ordered as well. A tsunami on the other hand is relatively sudden, and there is usually little to no warning. The force of moving water moving across a normally dry landscape can devastate most structures and drown anyone caught in this sudden flood of water. As a tsunami recedes, there is an associated elevated risk of disease created by stagnant and contaminated water, as well as hazards associated with debris.

A storm surge from a Category 3, 4, or 5 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 in Figure 32. 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. A 500-year tsunami would be approximately 10' in depth in Leon County for those areas indicated in Figure 31.

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 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.

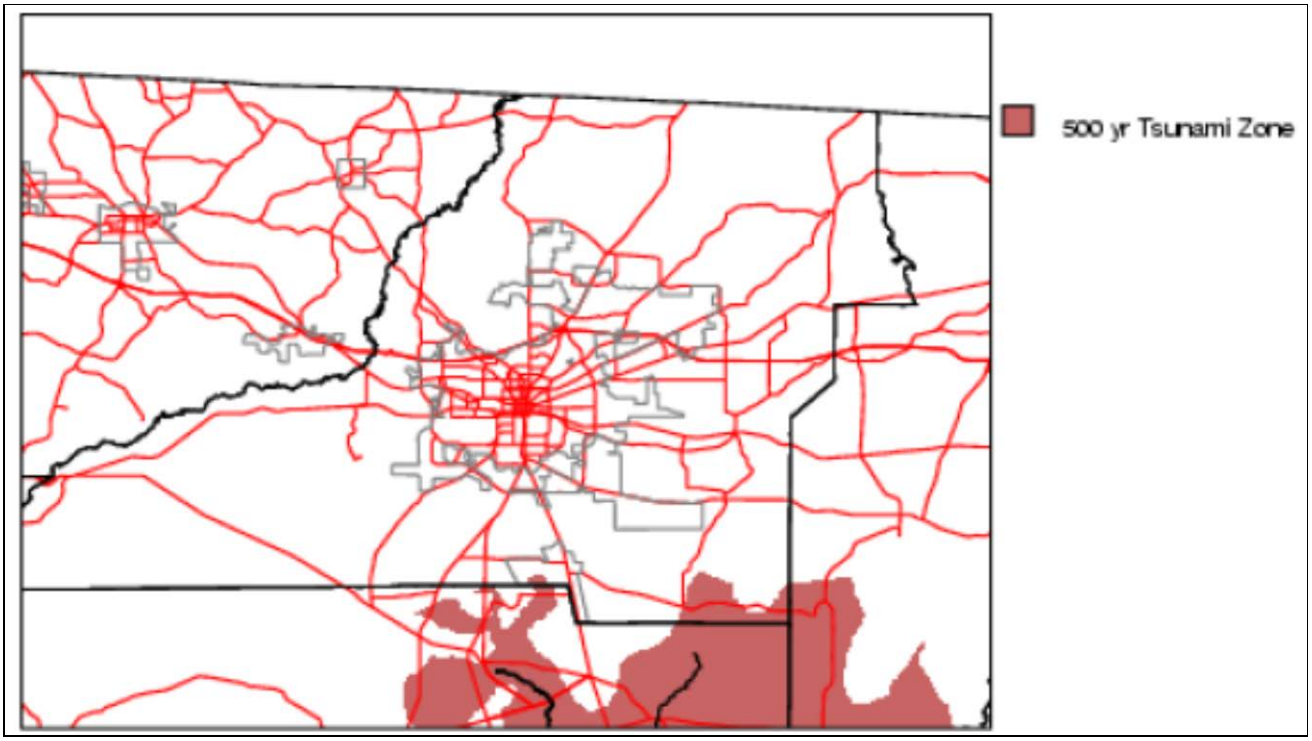
Based on this and the historical record, the probability of a tsunami affecting Leon County and the City of Tallahassee is **unlikely** as defined under Section 2.2.1 Risk. However, the probability based on the historical record of a storm surge event, which is associated with tropical cyclones affecting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

Vulnerability Summary

The only available data indicating the potential reach of a tsunami is a map generated by a MEMPHIS model run that was prepared for the 2010 edition of the LMS by the Florida Division of Emergency Management. Figure 31 indicates a "500-year Tsunami Zone" that illustrates the hypothetical impacts from a model tsunami based on the associated sea level surge and topography. It is similar to the hurricane surge area map included below.

The southern portion of Leon County is vulnerable to storm surges and associated flooding. Figure 32 (also Figure 5 above) indicates 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.

Figure 29: Leon County Tsunami Vulnerability MEMPHIS Map, 2005.



A 500-year tsunami as indicated in Figure 29 would affect approximately 30 residential structures east of Old Plank Road in the extreme SE portion of the county , a portion of Natural Bridge Road, and one small state park (Natural Bridge Battlefield Historic State Park). Approximately 40 residential structures would be also affected south of Sunflower Road west of Woodville Highway.

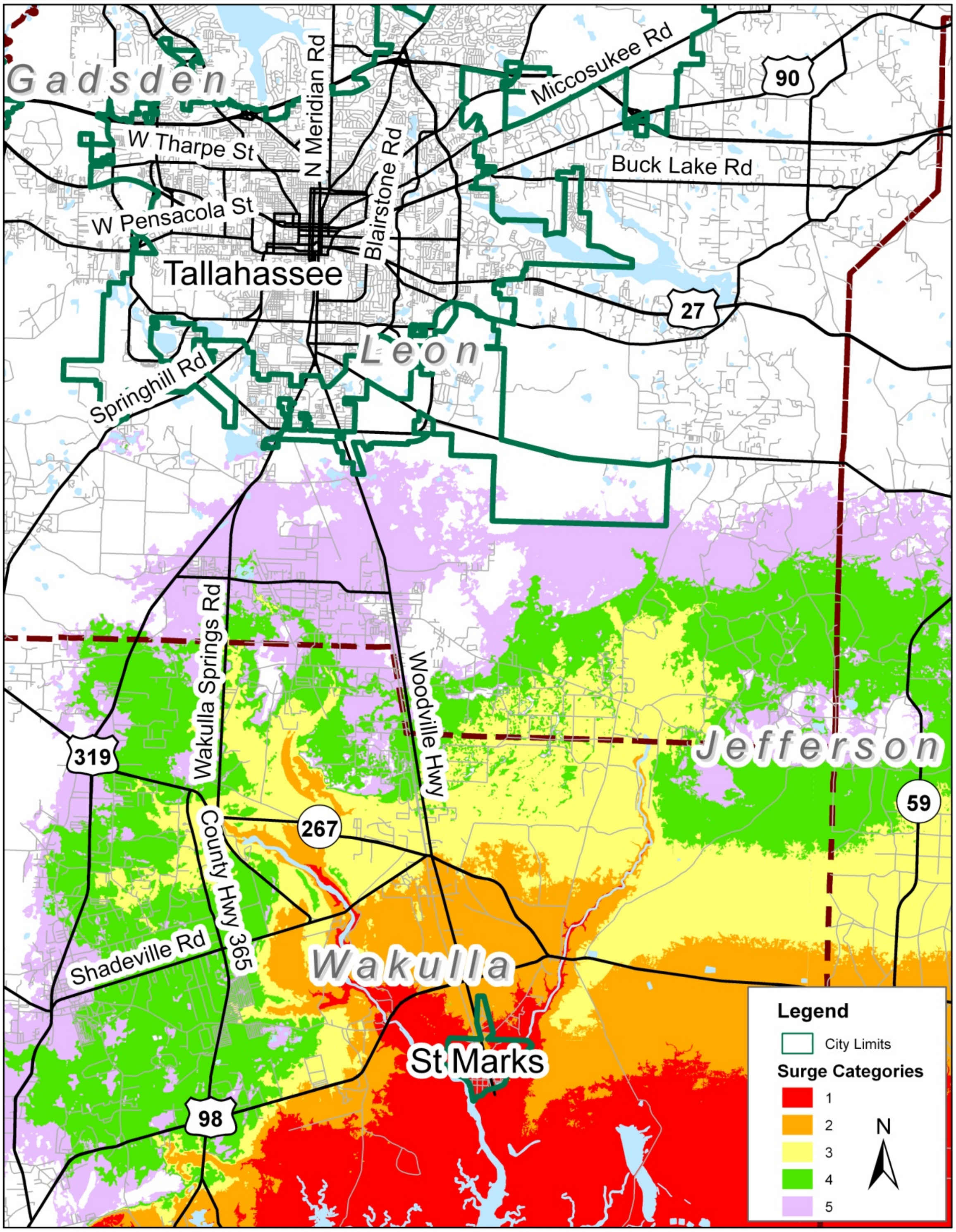
The worst-case event of a storm surge would be generated by a Category 5 hurricane. Flooding associated with this storm surge, as indicated in Figure 32, would likely affect the following developed features in Leon County:

- 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.

Risk Assessment

Based on these data, storm surge and tsunamis are classified as a **low risk** to Leon County residents. Figure 32 indicates that the vast majority of residents in Leon County, the City of Tallahassee, and the unincorporated areas are not vulnerable to tsunami or storm surge events. There may be some residents who live in the extreme southern areas of the county in low-lying areas adjacent to river or stream tributaries that could be affected by storm surges or a tsunami.

Figure 30: Estimated Hurricane Storm Surge within Franklin and Leon counties.[100]



[100] Apalachee Regional Planning Council, 2009.

2.3.10 Dam Failure

General Description and Location

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 is 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.

Corn Hydroelectric Generating Station

The City of Tallahassee operates the C.H. Corn Hydroelectric Power Plant 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 City leases 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. 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 for hydroelectric operation, and refurbished the facility. It is currently rated for 11 megawatts (MW) of electrical generation capacity. The Corn facility consists of the following components:

- Powerhouse: Consists of three generating units with a total rating of 11 MW. The generating units are 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 is insufficient to operate the generating units and during periods of high flow when the flows exceed 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 maintains an emergency action plan (EAP) that is designed to address the failure of the dam. The City also utilizes the EAP as a part of the normal high water event response. The EAP provides for the communication routines in the event of a failure of the dam. In addition, The City actively works 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.

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."[101] 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.

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

Figure 31: Dam Locations, Leon County, Florida, 2014.

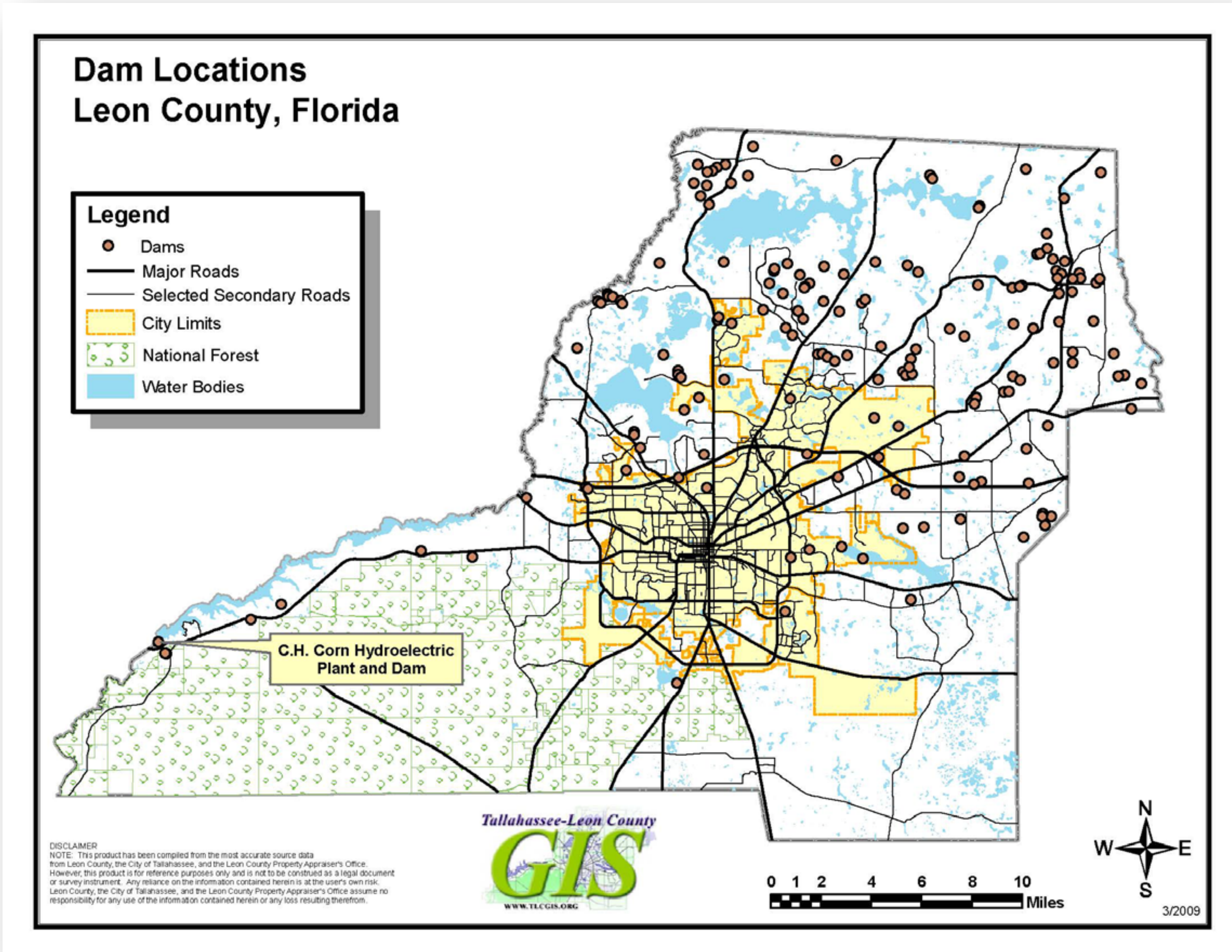


Table 2.38: Leon County Dams as of 2014.[102]

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

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.[103]

[102] National Dam Inventory (2009) and Tallahassee – Leon County Geographic Information Systems (2014).
[103] Association of State Dam Safety Officials, http://www.damsafety.org/news/?p=412f29c8-3fd8-4529-b5c9-8d47364c1f3e.

Figure 34: 1957 Break in Jackson Bluff Dam.[104]

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

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

[104] State Archives of Florida, Florida Memory, http://floridamemory.com/items/show/2198.

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 Ochlocknee 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 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:

BLXF1 Flood Categories (in feet)[105]

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 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** as defined under Section 2.2.1 Risk.

105 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.

Vulnerability Summary

Due to downstream residents, the Power Plant is classified as a high hazard facility by the Federal Energy Regulatory Commission (FERC). 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 also performs routine monitoring of the earthen dam to ensure that there are no indications of any structural integrity issues. 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

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.

2.11 Exotic Pest Infestations

General Description and Location

As a result of international travel, trade, population growth, climate change, and other factors, infestations of exotic plants and animals, including insects, have increased in the last century in Florida. Invasive exotic plants and animals can alter native plant communities by displacing native species, changing 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. There are many examples of this in Florida, including its fresh and coastal water resources. Florida is one of the states most affected by invasive and other 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.

In response to concerns about exotic plants, the Florida Exotic Pest Plant Council was formed, and publishes an annual List of Invasive Plant Species (see Appendix K). 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 purpose of their annual list is to focus attention on:

- 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 invasive insect of particular concern in Leon County is the southern pine beetle (SPB). 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. 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.[106] The table below describes stages and symptoms associated with a southern pine beetle infestation.

Table 2.39: Stages of Southern Pine Beetle Attack.[107]

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

The Southern Pine Beetle occurs in Leon County. Other invasive plants and animals in Leon County at present (see Appendices I and J) 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*)
- Channeled Apple Snail (Pomacea canaliculaa group)

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 Apple Snail In Florida poses a potentially serious threat to the eco-logical health of 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.

[106]University of Florida, Entomology and Nematology Department, http://entnemdept.ufl.edu/creatures/trees/southern_pine_beetle.htm.
[107] Forest Encyclopedia Network (2009), http://www.forestencyclopedia.net/p/p2901.

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.

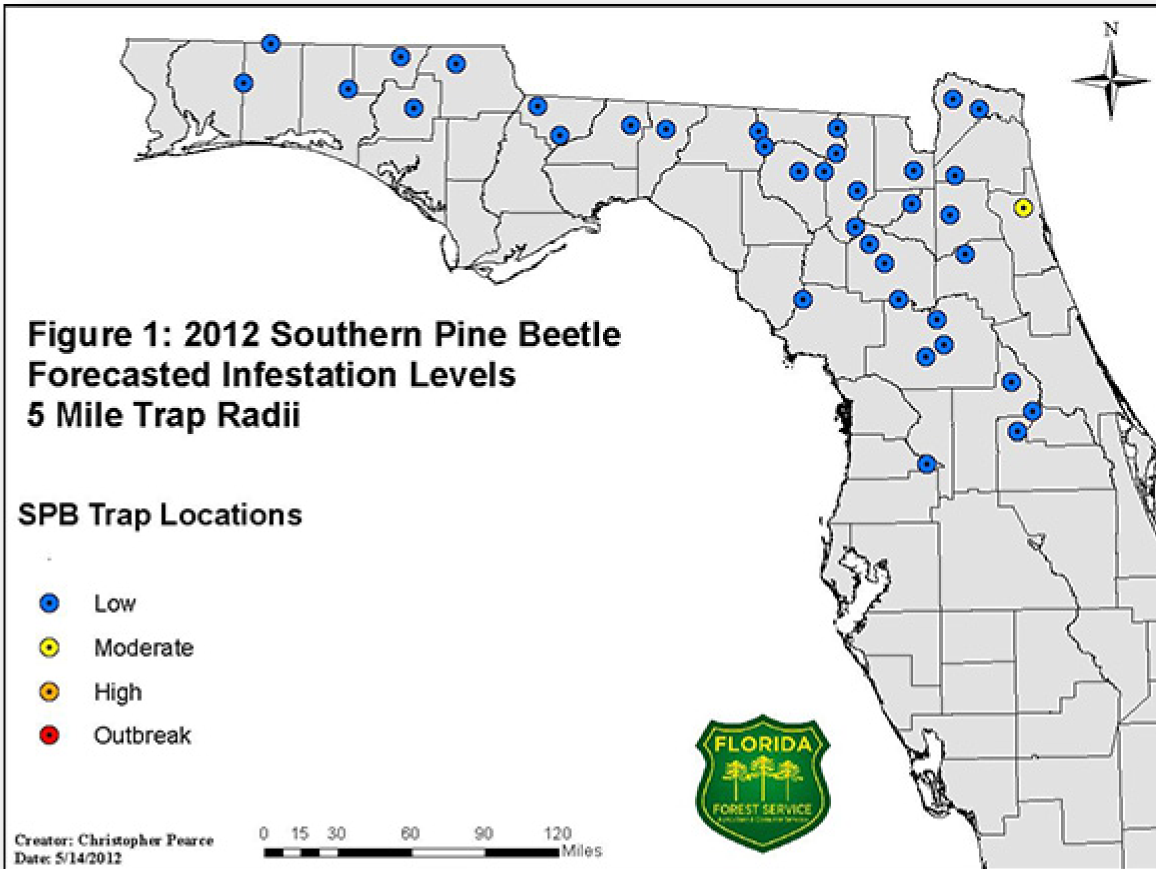
Table 2.40: Historical Occurrences of Southern Pine Beetle Infestations in Florida, 1995 – 2011.[108]

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.

108 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 33: 2012 Southern Pine Beetle Forecasted Infestation Levels.[109]



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 Lake Jackson, a State Aquatic Preserve.

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

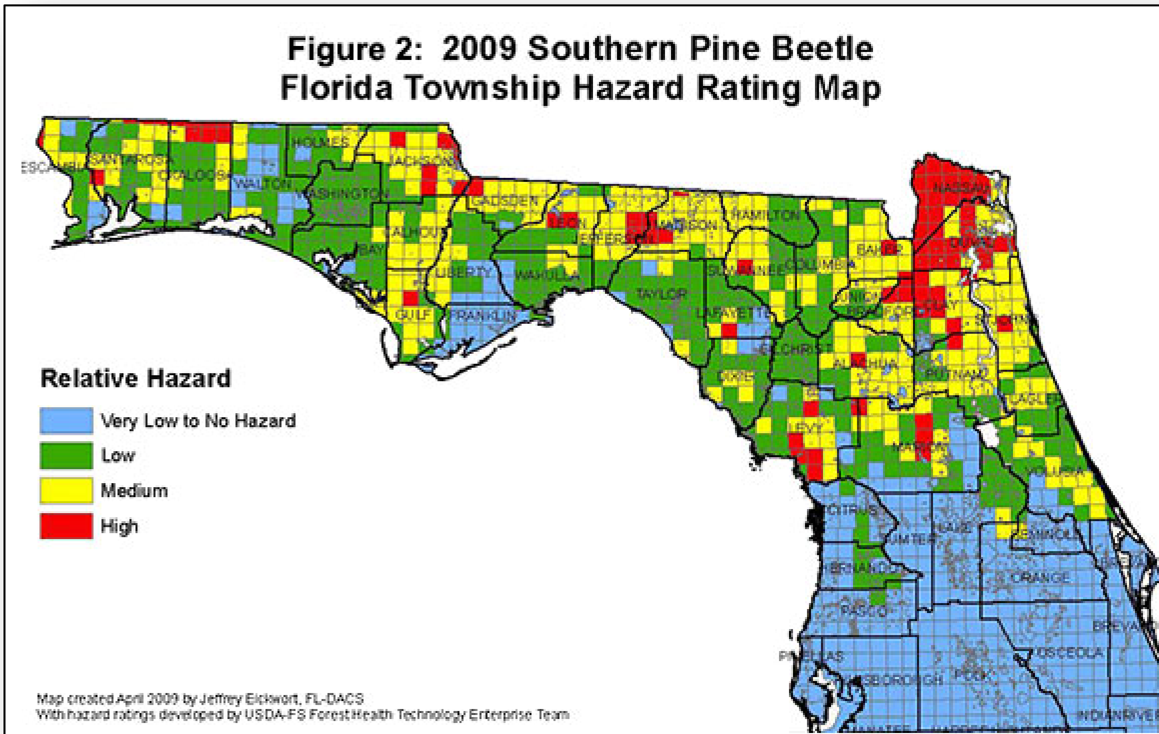
SPB outbreaks are periodic events that occur roughly on 6-12 year cycles and in general last two to three years. Between outbreaks, there can be several years with very few or no infestations, characteristic of the past six years in Florida.

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

[109] 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/2012-Southern-Pine-Beetle-Forecast.

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.

Figure 34: Southern Pine Beetle Florida Township Hazard Rating Map 2009.[110]



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.

[110] Florida Department of Agriculture and Consumer Services (2015),

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 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** as defined under Section 2.2.1 Risk.

<u>Vulnerability Summary</u>

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, it is likely 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 birds (in the case of seeds), conveyances such as boats, trucks, or other vehicles, or by humans (such as exotic landscape plants).

<u>Risk Assessment</u>

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.

2.3.12 Diseases and Pandemics

General Description and Location

A pandemic is a global disease outbreak. The internationally accepted definition of a pandemic as it appears in the Dictionary of Epidemiology is: “An epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people.”

This definition can apply to other infections subject to global spread, e.g. cholera and HIV. There is no element of severity in it: while some pandemics are severe in the disease they cause in some individuals or at a population level, not all 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.

Severity has never been part of the WHO definition of a pandemic. 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.

Table 2.41: Pandemic Phases.[111]

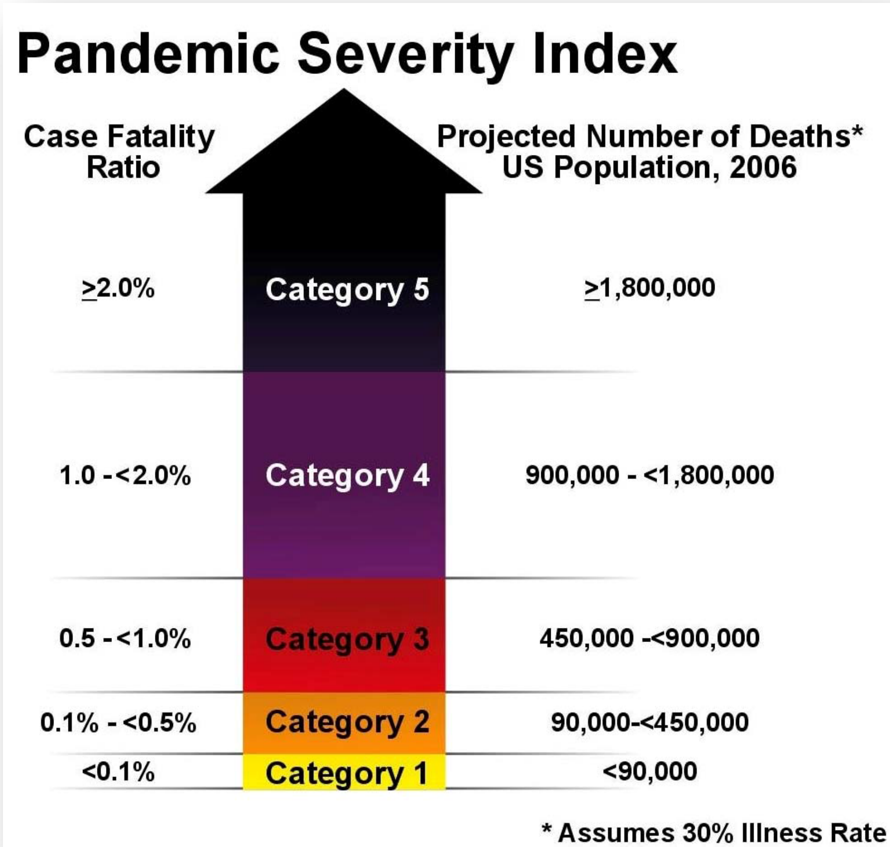
Phases	Description
One	No animal influenza virus circulating among animals has been reported to cause infection in humans.
Two	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
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. In an effort to create a rational planning tool for communities to measure pandemics, the Centers for Disease Control and Prevention (CDC) 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.

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

Figure 35: Pandemic Severity Index, 2007.[112]



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.

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

Table 2.42: Community Strategies by Pandemic Influenza Severity.[113]

	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
	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.

[113] 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.

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 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.

Nearly 650 cases of human cases of H5N1 have been reported 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 March 11, 2009.

Table 2.43.[114]

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

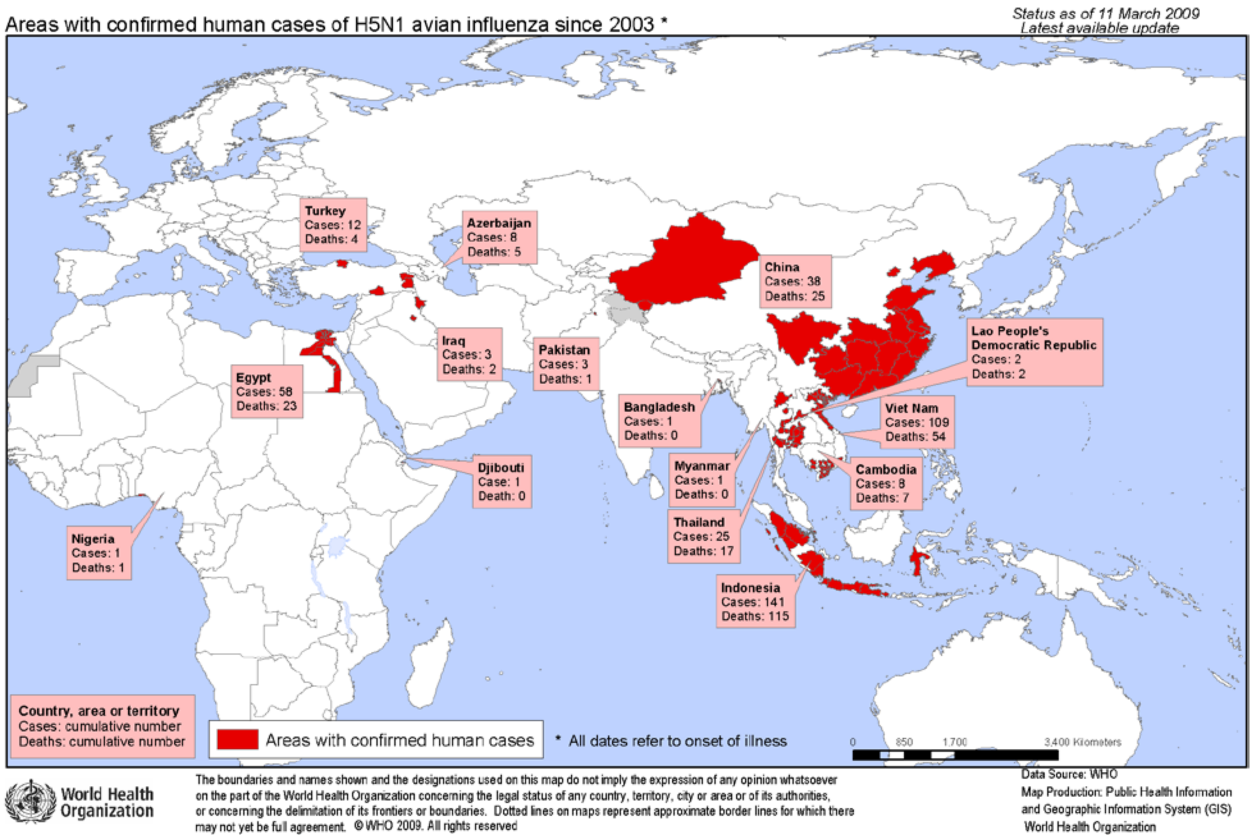
Total number of cases includes number of deaths
WHO reports only laboratory cases
All dates refer to onset of illness

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

World Health Organization

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

Figure 36: Areas with Confirmed Human Cases of Avian Influenza (H5N1), 2003 – 2009.[115]



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:

- swine triple reassortant (tr) H1N1 influenza virus
- trH3N2 virus
- trH1N2 virus[116]

Swine flu viruses do not normally infect humans. However, sporadic human infections with swine influenza viruses have occurred. When this happens, these viruses are called "variant viruses." They also can be denoted by adding the letter "v" to the end of the virus subtype designation. Human infections with H1N1v, H3N2v and H1N2v viruses have been detected in 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.[117] Several of these fatalities have occurred in Florida.

[115] World Health Organization, Epidemic and Pandemic Alert and Response. http://www.who.int/csr/disease/avian_influenza/en/.
[116] U.S. Centers for Disease Control and Prevention < http://www.cdc.gov/flu/swineflu/>.
[117] http://en.wikipedia.org/wiki/2009_flu_pandemic.

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.[118]

Ebola[119] [120]

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.

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

[118] http://www.thefamuanonline.com/news/view.php/774999/Health-department-confirms-H1N1-cases-in.
[119] http://en.wikipedia.org/wiki/Ebola_virus_disease.
[120] http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/index.html.

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.

Estimated Impacts, Probability, and Extent

Though there have been no recent occurrences of major pandemics in Leon County, the potential impact of a pandemic on the local population was estimated using a Center for Disease Control computer model for the 2010 LMS. This model is still 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. FluSurge 2.0 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 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.

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 unincorporated area only, and the incorporated area.

Table 2.44: 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 2.45: 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 2.46: 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** as defined under Section 2.2.1 Risk.

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.

Risk Assessment

An influenza pandemic is considered at this time to be a **low** risk for Leon County residents. If an influenza pandemic were to come into play locally, there are several significant medical facilities that would be able to provide health services, as well as the Leon County Health Department, and the health clinics associated with Florida State University and Florida Agricultural and Mechanical University.

The other pandemic that is currently of concern to many citizens is Ebola, but that is also 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.

2.3.13 Technological and Societal Hazards

As part of the 2015 LMS update, technological and societal hazards identified in the previously adopted plan were evaluated. Those that were deemed relevant by the Steering Committee include:

1. Hazardous Materials Storage and Transportation
2. Terrorism
3. Aviation Incidents
4. Energy Failures/Disruptions

Although the main purpose of the LMS is to address community vulnerability to natural hazards, procedures and plans for addressing local vulnerability to selected societal and technological hazards are developed, maintained, and updated by other local agencies and departments. For example, the City of Tallahassee Utilities maintains plans and procedures for dealing with power and gas loss during hazard events, both natural and man-made. The Leon County Comprehensive Emergency Management Plan addresses the period immediately following any significant emergency, and lists mitigation actions and local plans for addressing local vulnerability to these and other hazards.

Given the extent of procedures in other local planning documents for addressing societal and technological hazards, those hazard profiles have been eliminated from the 2015 LMS update. However, updated hazard profiles for the above hazards are included here.

2.3.13.1 Hazardous Materials Storage and Transportation

General Description and Location

Industrial substances and other materials vary in how 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.

There are many potentially hazardous industrial substances used in manufacturing and other industrial, commercial, and other activities. These materials[121] may present a threat to public health from their use, storage, transport, or improper disposal.

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 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 materials and wastes regulated by the EPA include Extremely Hazardous Substances, which are often stored at fixed facilities, and hazardous wastes, which are regulated by type and quantity.

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. The 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. The Plan 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:

[121] The terms “materials” and substances are essentially similar for the purposes of this planning document.

- 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.

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.

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.

In response to these concerns, and the many historical practices and sites in many areas of the U.S., the Resource Conservation and Recovery Act (RCRA) is a US law that provides, in broad terms, definitions and general guidelines for managing hazardous waste at the federal, state, and local levels. It includes a Congressional mandate directing EPA to develop a comprehensive set of regulations to implement the law.

A hazardous waste determination must be made of any waste material generated. If the material is hazardous, then it must be recycled, treated, stored, or disposed at a proper 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 "proper" HW management facility using a licensed transporter.

Hazardous waste generators are classified into three categories:

1. *Conditionally Exempt Small Quantity Generators* (CESQGs) - generate less than 100 kilograms of HW per month and no more than 1 kilogram of acute HW (such as some pesticides, toxins or arsenic and cyanide compounds) per month
2. *Small Quantity Generators* (SQGs) - generate 100 - 1000 kilograms of HW per month, and
3. *Large Quantity Generators* (LQGs) - generate 1000 kilograms or more of HW per month or more than 1 kilogram of acute HW (such as some pesticides, toxins or arsenic and cyanide compounds) per month.

All of 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 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.

The Florida Department of Environmental Protection (DEP) has a variety of 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.

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.

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.

Historical Occurrences

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.[122] This information and other related data used for the Hazards Analyses that are part of this Plan, is organized with a CAMEOfm[123] 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.

Hazardous Wastes

The types and amounts of waste produced by Small Quantity Generators of hazardous waste in Leon County during the period between January 1, 2009 and December 31, 2013 are included in Technical Appendix G. This appendix also includes similar data for Large Quantity Generators for the same time period.

As of 2009, Leon County had eleven 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 2001 and 2007, LQGs in Leon County produced approximately 1,237 tons of waste. The two types of waste by amount during this period were concentrated non-halogenated solvents and contaminated debris.

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 the Resource Conservation and Recovery Act (RCRA). The following table indicates the total hazardous wastes generated in Leon County for 2013.

[122] 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.
[123] 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.

Table 2.47: Hazardous Wastes Generated in Leon County in 2013.[124]

County	City	EPA ID	Generator	Tons in 2013
LEON	TALLAHASSEE	FLR000145102	COSTCO WHOLESALE #1026	0.196
LEON	TALLAHASSEE	FL0000124784	FL DEP, BUREAU OF EMERGENCY RESPONS	4.207
LEON	TALLAHASSEE	FLD000608125	FLORIDA STATE UNIVERSITY	22.045
LEON	TALLAHASSEE	FLD982133159	SAFETY-KLEEN SYSTEMS, INC	152.319
LEON	TALLAHASSEE	FLR000126144	TARGET STORE T0844	1.296
LEON	TALLAHASSEE	FLR000121434	TARGET STORE T1973	0.636
LEON	TALLAHASSEE	FL0000207449	VEOLIA ES TECHNICAL SOLUTIONS, L.L.	100.958

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 regional airport presents another opportunity for a transportation-related disaster involving hazardous material. The following table presents transportation related spill incidents by source and type of material from 2005 – 2009 in Leon County.

Table 2.48: Transportation-related Hazardous Material Spills 2005-2009.[125]

	Number of Incidents by Type					
Hazardous Material	**Pipeline**[126]	**Vehicle Incident**	**Airplane**	**Train**	**Unspecified**	**Total**
Petroleum[127]	0	47	2	2	1	52
Natural Gas	8	0	0	0	0	8
Ethylene Glycol	0	2	0	0	0	2
Sodium Hypochlorite	0	1	0	0	0	1
Silicone Sealant	0	1	0	0	0	1
Tar	0	1	0	0	0	1
Nitrogen Dioxide	0	1	0	0	0	1
Paint	0	1	0	0	0	1
Total	**8**	**54**	**2**	**2**	**1**	**67**

Of the 67 transportation related spills during this period, nearly 81 percent were vehicle incidents. Eight incidents involved pipeline transport, which included only natural gas. Two incidents involving trains were reported, as well as two incidents at the airport. Only one transportation incident type was unknown. Petroleum products, such as diesel fuel, gasoline and oil accounted for nearly 78 percent of all spills. Chemical spills represented a small percentage of total spills, with only five EHS incidents

[124] Florida Department of Environmental Protection, 2014.
[125] Apalachee Regional Planning Council, 2009.
[126] Includes gasoline, diesel, oil, kerosene, and hydraulic fluid.
[127] Only current through March 1999.

reported involving minor amounts ethylene glycol, sodium hypochlorite, silicone sealant, and nitrogen dioxide.

Analysis of the Transportation of Hazardous Materials by Rail

A hazardous materials density study was performed in 2007 by CSX Transportation to identify the hazardous materials most frequently transported through the District. CSX rail traverses the region through Gadsden, Jackson, Jefferson, and Leon Counties. The study excludes intermodal shipments (trailer or container on flat cars). Intermodal hazardous materials shipments are non-bulk and less than 55 gallon/package formats.

The following table displays the average amounts of hazardous materials transported by rail through the District II region in 2007 in descending order. As CSX can accurately track the amounts of hazardous materials cargo by computer, the results are displayed in descending order by average carload. For general estimating purposes, a carload is approximately 20,000 gallons of product.

Table 2.49: 2007 CSX Hazardous Materials Commodity Summary.[128]

Average Carloads 2007	Hazardous Material Commodity	General Hazards Category from 2008 ERG	ERG Guide #
3,935.5	Sulfur, molten	Flammable Solids	133
2,583.5	Environmentally hazardous substances, liquid	Substances (Low to Moderate Hazard)	171
2,133.25	Sodium hydroxide, solution	Substances - Toxic and/or Corrosive (Non-Combustible)	154
1,155.5	Liquefied petroleum gases	Gases - Flammable (Including Refrigerated Liquids)	115
1,067.5	Carbon dioxide, refrigerated liquid	Gases - Inert (Including Refrigerated Liquids)	120
775.5	Ammonium nitrate, liquid	Oxidizers	140
751.75	Ammonium nitrate	Oxidizers	140
562	Phosphoric acid, liquid	Substances - Toxic and/or Corrosive (Non-Combustible)	154
508	Ammonia, anhydrous*	Gases - Corrosive	125
468.75	Elevated temperature liquid	Flammable Liquids (Non-Polar/Water- Immiscible)	128
458.75	Phenol, molten*	Substances - Toxic and/or Corrosive (Combustible)	153
310.75	Styrene monomer, stabilized	Flammable Liquids (Non-Polar/Water- Immiscible)	128
276	Environmentally hazardous substances, solid	Substances (Low to Moderate Hazard)	171
260.75	Hydrogen peroxide**	Oxidizers	140
240	Other regulated substances, liquid	Substances (Low to Moderate Hazard)	171
230.75	Maleic anhydride	Substances - Toxic and/or Corrosive (Combustible/Water-Sensitive)	156
171	Nitric acid*	Substances - Toxic and/or Corrosive (Non-Combustible/Water-Sensitive)	157
167	Hydrochloric acid*	Substances - Toxic and/or Corrosive (Non-Combustible/Water-Sensitive)	157
161	Sulfuric acid*	Substances - Water-Reactive - Corrosive	137
143.5	Potassium hydroxide, solution	Substances - Toxic and/or Corrosive (Non-Combustible)	154
143	Acetic acid, glacial	Flammable Liquids - Corrosive	132
138	Methyl chloride	Gases - Flammable (Including Refrigerated Liquids)	115
133.25	Methyl acrylate, stabilized	Flammable Liquids (Polar/Water- Miscible/Noxious)	129
127.5	Toxic liquid, inorganic	Substances – Toxic (Non-Combustible)	151
125.75	Acrylic acid, stabilized	Flammable Liquids - Corrosive	132

***** - Extremely Hazardous Substance (EHS)

****** - EHS when concentration is > 52%

Molten sulfur, environmentally hazardous substances, sodium hydroxide solution, liquefied petroleum gases and refrigerated liquid carbon dioxide were the five most frequently shipped hazardous materials commodities in 2007 via rail by CSX Transportation.

The following table is a comparison of the top five ranked general hazards between Table 1 (Highway Placard Survey) and Table 2 (CSX Density Study). This table allows for a comparison of the most commonly transported hazardous materials by rail and highway and includes the corresponding 2008 ERG Guide Number.

[128] Ibid.

Table 2.50: Top 5 Highway & Rail Comparison Summary.[129]

Rank	**General Hazards Category (Highway Placard Survey)**	**ERG Guide #**	**General Hazards Category (CSX Density Study)**	**ERG Guide #**
1.	Flammable Liquids (Non- Polar/Water-Immiscible)	128	Flammable Solids	133
2.	Gases - Flammable (Including Refrigerated Liquids)[130]	115	Substances (Low to Moderate Hazard)	171
3.	Flammable Liquids (Polar/Water-Miscible)	127	Substances - Toxic and/or Corrosive (Non-Combustible)	154
4.	Gases - Inert (Including Refrigerated Liquids)	120	Oxidizers	140
5.	Substances - Toxic and/or Corrosive (Non-Combustible)	154	Gases - Flammable (Including Refrigerated Liquids)	115

Spills of Hazardous Materials

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 analysis, data were provided by the Apalachee Regional Planning Council for Leon County from 2005 through May of 2009. A total of 162 incidents were reported for this time period resulting in the known discharge of roughly 33,354 pounds of hazardous materials resulting in 53 injuries and the evacuation of 107 people (see following table). There were no incidents resulting in fatalities between 2005 and May 2009. Injuries were likely the result of vehicular accidents rather than exposure to hazardous materials.

[129] Ibid.

[130] The matching shaded areas denote shared general hazard categories for both the Highway Placard Survey and the CSX Density Study.

Table 2.51: Leon County Hazardous Materials Spill Summary (2005 - 2009).[131]

Material	# Incidents	Amt. (lbs)	Evacuees	Injuries	Deaths
Petroleum-based[132]	99	> 2800	6	0	0
Natural Gas	31	Unknown	3	0	0
Unknown Chemical	1	Unknown	0	0	0
Propane	7	Unknown	0	0	0
Paint	1	Unknown	0	0	0
Methanol/ Nitric Acid	1	.01-03/ .01-03	0	3	0
Chlorine	1	10	0	0	0
Sodium Hypochlorite	4	Unknown	19	13	0
Polychlorinated Biphenyls (PCBs)	1	975	0	0	0
Sodium Hydroxide	1	Unknown	0	0	0
Ethylene Glycol	2	46	0	14	0
Lithium Aluminum Hydride	1	Unknown	60	1	0
Silicone Sealant	1	Unknown	0	0	0
Tar	1	Unknown	0	0	0
Benzene	1	Unknown	0	0	0
Trimethyl	1	Unknown	0	0	0
Phosphoric Acid	2	Unknown	9	12	0
Mineral Oil	1	293	0	0	0
Nitrogen Dioxide	1	Unknown	0	0	0
Oxygen	1	Unknown	0	0	0
Mercury	2	0.04	0	0	0
Ammonia	1	Unknown	10	10	0
Total	**162**	**33,354 (known lbs.)**	**107**	**53**	**0**

The following table provides an updated summary of hazardous material spills for the last three years.

[131] Apalachee Regional Planning Council, 2009.
[132] Includes propane, gasoline, diesel, oil, kerosene, mercaptans and hydraulic fluid.

Table 2.52: Hazardous Material Spills 2011-2014.[133]

State Warning Point (SWP) #	Release Date	SWP Date	Facility Reported /Address	Chemical Reported
2011-4236	7/7/2011 1:51:00 PM	7/7/2011 1:51:00 PM	Leon Co. EM-Orange Rd and Capital Circle	Diesel Fuel or Gasoline
2011-4623	7/27/2011 12:40:00 PM	7/27/2011 12:48:00 PM	Leon County SO/Westminster Oaks 4449 Meandering Way City: Tallahassee	Natural Gas
2011-5159	8/23/2011 2:05:00 PM	8/23/2011 2:05:00 PM	Leon Co. WP/Banyan Bay Apartments,1800 Miccosukee Commons Drive Bldg. 1600, Tallahassee	Natural Gas
2011-5721	9/16/2011 9:44:00 AM	9/16/2011 9:44:00 AM	Leon County Sheriff's Office/2814 Boatner St., Tallahassee	Natural Gas
2011-5798	9/20/2011 11:29:00 AM	9/20/2011 11:34:00 AM	Leon County Warning Point /North Monroe Street ,Silver Slipper Lane, Tallahassee	Hydraulic OIL
2011-5833	9/21/2011 12:13:00 PM	9/21/2011 12:13:00 PM	Leon County Sheriff/ Lonesome Dove St. Street & Williams Rd. ,Tallahassee	Hydraulic OIL
2011-6043	9/30/2011 7:08:00 PM	9/30/2011 7:16:00 PM	Leon County Warning Point/US Highway 20 Street & Big Richard Road, Tallahassee	ETHYLENE GLYCOL
2011-6123	10/5/2011 5:32:00 PM	10/5/2011 5:31:00 PM	Leon County Sheriff's Department/Crawfordville HWY & Whitaker, Tallahassee	Gasoline
2011-6164	10/8/2011 8:31:00 PM	10/8/2011 8:31:00 PM	Leon County SO/2020 West Pensacola St. Tallahassee	Gasoline
2011-6190	10/9/2011 10:36:00 AM	10/9/2011 10:36:00 AM	Leon County/On I-10 between mile markers 194 and 205 in Gadsden and Leon	Diesel Fuel
2011-6284	10/11/2011 3:53:00 PM	10/11/2011 3:53:00 PM	Leon Co. WP /Meridian Road & Orchard Pond Road, Tallahassee	Natural Gas
2011-7553	12/18/2011 7:02:00 AM	12/18/2011 5:50:00 AM	Leon County Warning Point/Orchard Pond & Old Bainbridge, Tallahassee	Gasoline
2012-408	1/19/2012 8:14:00 AM	1/19/2012 8:30:00 AM	Leon Co SO/Woodville Highway Street 2: Gaile Ave City: Tallahassee	ETHYLENE GLYCOL
2012-632	1/29/2012 12:48:00 PM	1/29/2012 12:48:00 PM	Leon Co. SO WP/2037 Thomasville Road, Tallahassee	Gasoline
2012-953	2/12/2012 10:15:00 PM	2/13/2012 5:30:00 AM	Leon County Warning Point/ Tallahassee Regional Airport, 3300 Capital Circle, Tallahassee	Kerosene - JP5
2012-1162	2/21/2012 10:15:00 AM	2/21/2012 10:30:00 AM	Leon County SO/Orange Ave. between Rankin Rd. and Capital Circle, Lat: 30.41478, Long: -84.34479	Diesel Fuel
2012-1361	3/1/2012 10:41:00 AM	3/1/2012 10:41:00 AM	Leon County Sheriff's Office /USA Gas near the Tallahassee Mall, 2373 Allen Road, Tallahassee	Gasoline
2012-1705	3/14/2012 4:15:00 PM	3/14/2012 4:15:00 PM	Leon Co SO/Carlton Drive, Merritt Drive, Tallahassee	Natural Gas
2012-1968	3/27/2012 5:52:00 AM	3/27/2012 6:30:00 AM	Leon County/Citgo Gas Station,3305 Capital Cir NE # 101, Tallahassee	Gasoline
2012-1982	3/27/2012 2:25:00 PM	3/27/2012 2:53:00 PM	Leon County SO/3086 Walden Road, Tallahassee	Diesel Fuel
2012-2660	4/29/2012 4:51:00 PM	4/29/2012 4:51:00 PM	Leon Co SO/North Monroe Street ,Talpeco Road, Tallahassee, Lat: 30.49284, Long: -84.32439	Gasoline
2012-3056	5/15/2012 5:08:00 PM	5/15/2012 5:19:00 PM	Leon County SO/Room C-129, Psychology Building at Florida State University Campus, 1107 West Call Street, Tallahassee, Lat: 30.44559, Long: -84.30333	Phosphate
2012-3112	5/17/2012 2:51:00 PM	5/17/2012 2:51:00 PM	Leon County SO/Pensacola Street, Varsity, Tallahassee, Lat: 30.43877, Long: -84.30071	Hydraulic OIL

[133] Division of Emergency Management, 2014.

State Warning Point (SWP) #	Release Date	SWP Date	Facility Reported /Address	Chemical Reported
2012-4173	6/22/2012 2:15:00 PM	6/22/2012 2:15:00 PM	Leon County SO /Capitol Circle NE & Raymond Diehl Road, Tallahassee	Gasoline or Diesel Fuel
2012-4815	7/5/2012 4:39:00 PM	7/5/2012 4:39:00 PM	Leon Polk/5208 Patricia Drive, Orlando	Mineral OIL
2012-5474	7/31/2012 12:07:00 PM	7/31/2012 12:07:00 PM	Leon County SO /Capital Circle NE at Centerville Road	Hydrochloric Acid
2012-5503	8/1/2012 3:00:00 PM	8/1/2012 3:26:00 PM	Leon Co SO/Springhill Road, Capital Circle SW, Tallahassee	Demon Max & Bifenthrin
2012-5715	8/10/2012 5:16:00 PM	8/10/2012 5:16:00 PM	Leon County WP/Interstate 10 West, Miccosukee Road, Tallahassee	Diesel Fuel
2012-5755	8/13/2012 6:44:00 PM	8/13/2012 6:44:00 PM	Leon Co SO/Levy Pool, 625 West Tharpe Street, Tallahassee	Sodium Hypochlorite
2012-6079	8/25/2012 8:49:00 PM	8/25/2012 8:49:00 PM	Leon Co SO/Oak Ridge Road, Blackjack Road, Tallahassee	Gasoline
2012-6673	9/19/2012 10:39:00 AM	9/19/2012 10:39:00 AM	Leon County Sheriff Office/5371 Pembridge Pl, Tallahassee	Propane
2012-7127	10/12/2012 1:40:00 PM	10/12/2012 1:50:00 PM	Leon SO/N. Meridian Road St., S. Fairbanks Ferry Rd., Tallahassee	Diesel Fuel
2012-7579	11/6/2012 10:43:00 PM	11/6/2012 10:43:00 PM	Leon Co. SO/Barrington Park Apts.,2801 Chancellorsville Dr., Tallahassee	Propane
2012-7598	11/8/2012 10:04:00 AM	11/8/2012 10:04:00 AM	Leon County SO/8520 Hannary Circle, 32312	Natural Gas
2012-7690	11/13/2012 9:25:00 PM	11/13/2012 9:25:00 PM	Leon County Sheriff/Old Bainbridge Rd. & Tharpe St., Tallahassee	Natural Gas
2012-8050	12/6/2012 9:47:00 AM	12/6/2012 9:47:00 AM	Leon County SO/ I-10, MM 205	Diesel Fuel
2012-8189	12/12/2012 6:57:00 AM	12/12/2012 7:19:00 AM	Leon County Warning Point/North Monroe St & Wiggington Rd., Tallahassee	Diesel Fuel
2012-8527	12/26/2012 4:41:00 AM	12/26/2012 5:10:00 AM	Leon County SO/2144 Amanda Mae Court, Tallahassee	Natural Gas
2013-264	1/16/2013 11:55:00 AM	1/16/2013 12:15:00 PM	Leon County Sheriff's Office/2029 North Meridian Road, Tallahassee	Natural Gas
2013-1633	3/21/2013 11:13:00 AM	3/21/2013 11:13:00 AM	Leon County Sheriff's Office/1538 Crystal Ball Drive, Tallahassee	Propane
2013-1237	3/1/2013 11:55:00 AM	3/1/2013 1:30:00 PM	Veolia EF Technical Solutions, 342 Marpan Lane, Tallahassee	Hydraulic OIL
2013-1477	3/13/2013 10:00:00 AM	3/13/2013 10:40:00 AM	City of Tallahassee, HOPKINS GENERATING STATION, 1125 Geddie Rd., Tallahassee	Sulfuric Acid
2013-2495	4/26/2013 12:46:00 PM	4/26/2013 12:57:00 PM	Leon County SO/At the end of Road To The Lake, Chaires/Lat: 30.43468, Long: -84.13671	Diesel Fuel/OIL
2013-3055	5/22/2013 3:51:00 PM	5/22/2013 3:51:00 PM	Leon County Sherriff's Dept./Capital Circle SE, Tallahassee	Hydraulic OIL/OIL
2013-4535	7/9/2013 6:36:00 PM	7/9/2013 6:36:00 PM	Leon County SO/Blountstown Highway & Geddie Rd, Tallahassee	Diesel Fuel/Gasoline
2013-4788	7/18/2013 4:08:00 AM	7/18/2013 4:23:00 AM	Leon County Warning Point/Bellevue Way & Lipona Rd, Tallahassee	Hydraulic OIL
2013-5205	8/2/2013 12:54:00 PM	8/2/2013 12:54:00 PM	Leon County Sheriff's Office/S. Woodward Ave, Tallahassee	Natural Gas
2013-5241	8/4/2013 5:56:00 AM	8/4/2013 5:56:00 AM	Leon Co. SO/Sonic Drive-In, Lat: 30.46052, Long: -84.36165, Tallahassee	Propane

State Warning Point (SWP) #	Release Date	SWP Date	Facility Reported /Address	Chemical Reported
2013-7449	11/15/2013 1:05:00 PM	11/15/2013 1:05:00 PM	Leon FR/Capital Circle NW at North Monroe Street	Diesel Fuel
2014-948	2/4/2014 6:32:00 PM	2/4/2014 6:32:00 PM	Leon County CDA/445 Appleyard Dr., Tallahassee	Unknown Chemicals/Lithium
2014-2180	3/28/2014 3:40:00 PM	3/28/2014 3:40:00 PM	Leon County CDA/6706 Thomasville Rd., Tallahassee	Gasoline
2014-3357	5/8/2014 9:09:00 PM	5/8/2014 9:09:00 PM	Leon CDA /3247 Bodmin Moore Drive, Tallahassee	Gasoline
2014-4441	6/21/2014 11:29:00 AM	6/21/2014 11:29:00 AM	Leon County Warning Point/ West Tharpe Street& Ocala Rd., Tallahassee	Hydraulic OIL
2014-5107	7/19/2014 5:10:00 PM	7/19/2014 5:10:00 PM	Leon CDA/Lat: 30.46364, Long: -84.28241	Gasoline
2014-6487	9/17/2014 7:01:00 PM	9/17/2014 7:29:00 PM	Leon CDA/ I-10 EB Rest Area between MM 194 & 196,near Tallahassee	Diesel Fuel
2014-6517	9/19/2014 6:40:00 AM	9/19/2014 7:09:00 AM	Leon County Warning Point (CDA)/Tennessee St. & Dewey St., Tallahassee	Hydraulic OIL
2014-7055	10/9/2014 6:34:00 AM	10/9/2014 6:57:00 AM	Leon County Warning Point/1100 Mahan Dr., Tallahassee	Gasoline

Hazardous Materials Commodity Flow Study[134]

In March of 1996, the District II Local Emergency Planning Committee (LEPC) conducted a study of the transportation of hazardous materials through the Apalachee Region. The Hazardous Materials Commodity Flow Study included historical accident data, a highway placard survey on major transportation routes and an analysis of rail transport data in order to determine which hazardous materials first responders are likely to encounter in the event of accident.

In 1999, the Apalachee Regional Planning Council updated this study. Detailed information specific to Leon County was not included in the reported results. In 2009, the ARPC again updated the Flow Study for the nine-county area under its jurisdiction. Although the original Hazardous Materials Emergency Preparedness (HMEP) scope of work for the project called only for a highway placard survey, the District II LEPC included an analysis of CSX Transportation rail data.

For the highway placard survey, data was collected and analyzed from over 160 trucks carrying hazardous materials on Interstate 10 and US-90 (East-West routes), and US-19, US-319 and US-231 (North-South routes). During the data collection, it became very evident that Interstate 10 is the major road corridor of hazardous materials transport within the District II region. Although hazardous materials are transported on almost all major roads within the District, the bulk of the hazardous materials were observed on Interstate 10.

The placard survey represents approximately 75% accuracy of the hazardous materials moving on highways throughout the District II region. Beyond general recording error and survey limitations, there are two reasons for this lack of accuracy. Firstly, trucks are only required to display placards if the

[134] The information in this section comes from the 2009 Hazardous Materials Commodity Flow Study conducted by the Apalachee Regional Planning Council.

hazardous materials meet or exceed the established transport thresholds. A truck carrying hazardous materials cargo may not necessarily display a placard when the cargo is below the federal threshold.

Secondly, trucks are only required to display the placard for the most dangerous hazardous material on board. In these instances, the survey does not reflect the entire hazardous materials inventory for the truck. Although there may be a variety of hazardous materials loaded together, they are regulated for compatibility under CFR 49, § 177.848 and they generally meet all the packaging criteria in § 172.101

Thirdly, the placard does not always reveal specific information about the corresponding hazardous material. For example, one placard (1993) indicates any of the following: combustible liquid, cleaning liquid compound, tree/weed killing compound, diesel fuel, flammable liquid not otherwise specified, fuel oil, etc. Unfortunately, there is no way to confirm the actual hazardous material cargo other than reviewing the shipping papers. To compensate for this uncertainty, the survey results were aggregated by the U.S. Department of Transportation's 2008 Emergency Response Guidebook (ERG) general hazards categories.

The following table provides a summary of the percentages of hazardous materials surveyed in descending order as categorized by the 2008 ERG.

Table 2.53: 2009 Highway Placard Survey Summary.[135]

% of Total	General Hazards Category from 2008 ERG	Potential Hazardous Material Commodity	ERG Guide #
35.63%	Flammable Liquids (Non-Polar/Water-Immiscible)	Gasoline, Gasohol and Motor spirit	128
13.13%	Gases - Flammable (Including Refrigerated Liquids)	Propane, Hydrogen, LPG, etc.	115
10.00%	Flammable Liquids (Polar/Water- Miscible)	Resin solution, Tetrahydrofuran, etc.	127
5.00%	Gases - Inert (Including Refrigerated Liquids)	Argon, Helium, Nitrogen, Carbon dioxide, etc.	120
5.00%	Substances - Toxic and/or Corrosive (Non-Combustible)	Caustic potash, Caustic soda, Potassium hydroxide, Sodium hydroxide, Corrosive liquid, etc.	154
3.75%	Substances - Toxic and/or Corrosive (Combustible)	Alkylamines, Amines, Polyalkylamines, etc.	153
3.13%	Substances - Toxic and/or Corrosive (Non-Combustible/Water-Sensitive)	Hydrochloric acid*, Hypochlorite solution, etc.	157
2.50%	Gases - Flammable - Corrosive	N/A	118
2.50%	Flammable Liquids (Non-Polar/Water-Immiscible/Noxious	Dichloropropane, Propylene dichloride, Asphalt, Mercaptan mixture, etc.	130
2.50%	Substances (Low to Moderate Hazard)	Environmentally hazardous substances, Hazardous waste, etc.	171
1.88%	Flammable Liquids (Polar/Water-Miscible/Noxious)	Acetaldehayde, Isopropanol, Aldehydes, etc.	129
1.88%	Flammable Liquids - Toxic	N-propyl nitrate, Environmentally hazardous substances, hazardous waste, etc.	131
1.88%	Flammable Liquids - Corrosive	Triethylamine, Acrylic acid, etc.	132
1.88%	Oxidizers	Hydrogen peroxide**, Nitrates, etc.	140
1.25%	Gases - Flammable (Unstable)	Acetylene, Vinyl bromide, etc.	116
1.25%	Gases - Oxidizing (Including Refrigerated Liquids)	Oxygen	122
1.25%	Substances - Water-Reactive - Corrosive	Phosphorous trichloride*	137
1.25%	Substances - Water-Reactive (Emitting Flammable Gases)	Aluminum dross, Organo-metallic substances	138
1.25%	Infectious Substances	Medical waste, Toxic and infectious substances	158
0.63%	Mixed Load/Unidentified Cargo	N/A	111
0.63%	Gases - Corrosive	Anhydrous ammonia*	125
0.63%	Substances - Toxic and/or Corrosive (Combustible/Water-Sensitive)	Maleic acid	156

***** Extremely Hazardous Substance (EHS)

****** EHS when concentration is > 52%

[135] Hazardous Materials Commodity Flow Study, 2009

As can be seen in the table above, the majority (36%) of the hazardous materials being transported throughout the region are Flammable Liquids (Non-Polar/Water-Immiscible). This category includes petroleum products such as gasoline, gasohol and motor spirits. The second most abundant category is flammable gases, including refrigerated liquids. This category also includes petroleum products, such as propane, LPG, and hydrogen.

Estimated Impacts, Probability, and Extent

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 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 May 2009, only 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** as defined under Section 2.2.1 Risk.

Vulnerability Summary

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.[136]

Due to the specificity of each hazardous material release, it was not possible to determine a comprehensive vulnerable zone or population exposure for Leon County.

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.

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.

[136] Statewide Regional Evacuation Studies Program, Volume 1-2 Apalachee, Apalachee Regional Planning Council, 2012.

2.3.13.2 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.[137]

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.

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 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.

Estimated Impacts, Probability, and Extent

There are a number of 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.

[137] Section 2 (15), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

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.

2.3.13.3 Aviation Incidents

General Description and Location

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. [138]

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 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

[138] http://en.wikipedia.org/wiki/Aviation_accidents_and_incidents..

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.[139]

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, since the vast majority of recorded incidents have resulted in 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**.

[139] http://en.wikipedia.org/wiki/Aviation_safety..

2.3.13.4 Energy Failures/Disruptions

General Description and Location

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.

Historical Occurrences

Data for energy failures and disruptions are not easily available. Nevertheless, the majority of energy failures and disruptions 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 TEC 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. The most severe event 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.[140] 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.

[140] http://en.wikipedia.org/wiki/Hurricane_Kate_%281985%29.

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. 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.

Estimated Impacts, Probability, and Extent

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. The probability and extent of electrical outages are correlated to storm hazards, since storms often result in partial or larger outages.

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** as defined under Section 2.2.1 Risk.

Vulnerability Summary

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.

Risk Assessment

Based on the above data and analysis, the risk for energy failures or disruptions is considered **medium**.

2.5 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 a destructive storm. The following table summarizes the types and number of high priority critical facilities within Leon County. There are a total of 772 critical facilities identified within Leon County, 97 of which are hazardous material sites.

Table 2.54. Leon County Critical Facilities by Type and Jurisdiction, 2015.[141]

Critical Facility Type	Total Number of Sites	City of Tallahassee	Unincorporated Leon County
Communications Towers	155	86	69
Child Care Facilities	159	130	29
Hazardous Materials Sites	97	57	40
Health Care Facilities	70	59	11
Schools (K-12)	59	48	11
Public Water Supply (Wells & Tanks)	55	24	31
Emergency Shelter	60	50	10
Fire Stations	21	10	11
Hurricane Shelter	14	9	5
Sewage Treatment Facility	6	2	4
Solid Waste Facilities	6	0	6
Law Enforcement	8	8	0
Educational Facilities (Collegiate/Adult Ed	5	5	0
Corrections	4	4	0
Hospital	2	2	0
Electrical Generation / Power Plant	42	22	20
Government Center	2	2	0
Emergency Operations Center	4	4	0
Military	3	3	0
Total Number of Critical Facilities	**772**	**525**	**247**

In previous updates to the Tallahassee-Leon County LMS, the locations of existing critical facilities were mapped. After discussion with local emergency management officials, the LMS Committee directed to withhold publishing the location of Leon County high priority critical facilities in the current LMS update. Since the events of September 11, 2001, Leon County, like many local governments, has been required by federal law to restrict public access to various categories of data, including the location of hazardous material facilities and high priority critical facilities. This is intended to reduce Leon County's vulnerability to domestic and international terrorist attacks and protect the community.

[141] Tallahassee – Leon County GIS.

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 priority critical facilities in Leon County located within hazard areas considered vulnerable to storm surge from hurricanes,

Table 2.55: Leon County Critical Facilities Located in Storm Surge Hazard Areas, 2015.[142]

	Storm Surge Zones		
Facility Type	**Category 3**	**Category 4**	**Category 5**
Child Care Facility	4	5	6
Communications Tower	1	2	3
Fire Stations	0	1	1
Hazardous Materials Sites	0	0	1
Public Water Supply (Wells)	0	1	2
Solid Waste Facility	1	1	1
Total	6	10	14

The following table describes the type and number of Leon County Critical Facilities located within the FEMA 100-year flood zone.

Table 2.56: Leon County Critical Facilities Located within FEMA 100-year Flood Zone, 2015.[143]

Facility Type	**Number of Facilities**
Child Care Facility	4
Communications Tower	10
Hazardous Materials Sites	3
Healthcare Facility	0
Public Water Supply (Wells)	1
Schools (K-12)	1
Total	19

[142] Ibid..
[143] Ibid.

2.6 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 a Category 3, 4 or 5 storm could 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. Falling trees are hazardous to people, structures, vehicles, and other possessions and infrastructure, including electrical lines, internet and video cable, and land line telephones.

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.

Medium risk hazards include thunderstorms, tornados, flooding, lightning, droughts, hazardous materials storage and transportation, and energy failures and disruptions.

Low risk events include wildfires, sinkholes, terrorism, dam failure, storm surge/tsunamis, exotic pest infestations, diseases and pandemics, and aviation incidents.

Chapter 3 – Mitigation Strategy

This section discusses the overall mitigation strategy, including Hazard Mitigation Goals and Objectives and the Hazard Mitigation Initiatives intended to address the hazards previously outlined.

3.1 Hazard Mitigation Goals and Objectives

To assist them in analyzing regional, county and municipal policies, ordinances and programs that affect mitigation the LMS Committee 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.

The LMS Committee re-evaluated the adopted Hazard Mitigation Goals and Objectives at a meeting on May 29, 2014 to reflect the latest local government and other stakeholder priorities. These goals and objectives include:

1. **Goal: Protect human health, safety and welfare**

   Objectives:
   - 1.1 Limit public expenditures in areas identified as subject to repetitive damage from disasters.
   - 1.2 Ensure the protection of critical facilities such as prohibitions on constructing critical facilities in hazard areas.
   - 1.3 Reduce or eliminate development in hazard prone areas such as floodplains.
   - 1.4 Regulate non-conforming land uses particularly in areas subject to damage from disasters.
   - 1.5 Encourage the removal of septic tanks and technically hazardous sites such as chemical storage facilities from hazard areas.
   - 1.6 Consider the impact of hazard mitigation when conducting development review and approval.
   - 1.7 Implement additional development restrictions in hazard areas.
   - 1.8 Consider the use of land acquisition programs for properties subject to development that are located in hazard areas.
   - 1.9 Coordinate efforts to develop and maintain current maps of regional hazards.

2. **Goal: Protect economic activities within the community.**

   Objectives:
   - 2.1 Encourage economic diversification to protect the community from hazards that may affect a single economic source.
   - 2.2 Encourage programs to address repetitively damaged and vulnerable commercial structures.
   - 2.3 Coordinate with the local business community in the development of existing and proposed mitigation initiatives.

3. Goal: Enhance regional mitigation efforts.

Objectives:

3.1 Coordinate with other government agencies to develop regional mitigation efforts.
3.2 Encourage hazard mitigation training with agencies throughout the region.
3.3 Coordinate with other government agencies to develop regional hazard mapping procedures and processes.

4. Goal: Promote adequate and safe housing.

Objectives:

4.1 Encourage programs to address repetitively damaged and vulnerable residential structures.
4.2 Encourage the development of land development building codes and inspection procedures that meet or exceed the hazard mitigation-related portions of the Florida Building Code.

5. Goal: Protect community resources, including, but not limited to, infrastructure, and environmental, recreational, and historic resources.

Objectives:

5.1 Provide for the removal and/or relocation of damaged and vulnerable infrastructure.
5.2 Regulate land use, floodplains, non-point source stormwater run-off, and the design and location of sanitary sewer and septic tanks in hazard-prone areas, pursuant to rule 9J5.012(3)(c)3, F.A.C.
5.3 Encourage the removal of septic tanks from hazard areas.

6. Goal: Promote the community's ability to respond to a disaster in a timely manner.

Objectives:

6.1 Participate in the National Flood Insurance Program (NFIP) and Community Rating System (CRS).
6.2 Develop procedures to request limited revision of Flood Insurance Rate Map studies from the NFIP.
6.3 Develop procedures to address activities that can earn credit toward reduction of NFIP insurance premiums through CRS.
6.4 Encourage public awareness of hazards and hazard prone areas in the community.
6.5 Preserve the ability to evacuate hazard areas.
6.6 Maintain policies and procedures for pre- and post-storm development.

3.2 Prioritization Procedures for Hazard Mitigation Actions

As part of developing the original LMS, the LMS Committee recognized the need to rank and prioritize the mitigation initiatives. The purpose of the 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. 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.

LMS Committee members prioritized the individual initiatives based on stakeholder priorities. Based on the final scores, the Committee grouped the initiatives into high, medium or low categories. This initial ranking resulted in 11 high, 8 medium and 5 low priority initiatives.

3.4 Current Prioritized Hazard Mitigation Initiatives

<u>Changes and Prioritization</u>

For the 2015 update to the LMS, the Prioritized List of Hazard Mitigation Initiatives and ranking were re-evaluated by the LMS Committee. The status and priority of mitigation initiatives were discussed in a meeting of the LMS Committee on December 10, 2014. LMS Committee staff presented a status report for each mitigation initiative. The status updates were 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.

After discussion and evaluation of the mitigation initiatives, based on the community's history of hazards, mitigation efforts, new development, priorities, and other data identified by the Update Committee, the LMS Committee kept the priority list intact, added one new initiative at the bottom of the list, and removed one completed initiative from the list. This completed initiative was the building of a single, community-wide emergency operations center. 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 Joint 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.

Other changes to the list of mitigation initiatives included providing status updates based on the annual progress report; updating the hazards addressed by the initiative; updating the organizations, including departments and divisions referenced; and updating references to potential funding sources.

For the 2017 update, the LMS Committee reviewed the current list of initiatives, and decided to change 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. Other changes include modifying the LMS Steering Committee bylaws to reflect various organizational changes.

As of 2017, the current Prioritized Mitigation Initiatives list currently includes 20 initiatives. Table 3.3 provides a description of each initiative, the hazard(s) that the mitigation initiative is intended to address, the agency responsible for leading efforts towards implementation, and potential funding sources.

Cost/Benefit Analysis

In the previous edition of the LMS, a basic cost/benefit analysis was conducted for the proposed mitigation alternatives. Because the list of prioritized mitigation initiatives was relatively unchanged, this economic evaluation of mitigation initiatives was incorporated into Table 3.3 within the current LMS update.

The mitigation programs and policies identified by the LMS Committee are generally 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. Nevertheless, in order to assess the benefits of mitigation actions versus the cost of implementing these initiatives, an economic evaluation of each mitigation initiative was performed by determining the estimated costs, benefits, and available funding sources for each initiative.

This 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. LMS Committee staff met on numerous occasions to discuss aspects of each initiative and estimate costs for implementing these initiatives. Estimated cost rankings for each mitigation initiative were then incorporated into Table 3.3. Potential non-local funding sources are incorporated into the description of each mitigation initiative in Table 3.3.

The hazard mitigation capital projects include stormwater ponds, culverts, flood warning devices, storm retrofits, and emergency response equipment purchases. For most of these efforts, the local governments will require outside funding assistance. Many of the identified projects will involve both studies and implementation of the study results. Because the previous list of mitigation alternatives was not significantly changed, an updated analysis was not conducted for the 2015 update of the LMS.

Depending on the grant program requirements, identified capital projects to mitigate hazards will provide a cost/benefit analysis as part of the grant application.

Ranking of Proposed Hazard Mitigation Grant Program Applications

The LMS Committee, at a public meeting on April 18, 2017, voted to prioritize seven proposed HMGP projects using a simple ordinal ranking system that was accepted by the Committee. This is a spreadsheet-based ranking system that is included in this document as Technical Appendix M. The methodology is to ask the Committee to make either/or selections for summaries of each proposed grant proposal. The results are scored and ranked in the spreadsheet, and the results voted upon by the Committee.

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2017

Initiative	Summary/Status as of April 2017	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. Because of the hurricane, 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 is also a need to move key vulnerable electric grid components underground to protect them from storms. 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, 2017

Initiative	Summary/Status as of April 2017	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 in an effort 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.	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, 2017

Initiative	Summary/Status as of April 2017	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 so as to avoid the frequent necessity for duplicate, and sometimes conflicting, modeling for NFIP purposes.	FEMA is very reluctant to fund and manage software review activities at a level necessary to facilitate needed coordination and cooperation with multi-objective local stormwater management programs. Tallahassee and Leon County have advanced stormwater regulations and require sophisticated digital modeling. FEMA is very slow to review (let alone consider approval of) 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 limited suite of FEMA-approved software for NFIP purposes. Not only is this a waste of taxpayer dollars, but frequently it results in conflicting flood stage data. 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 the purpose of 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.	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, 2017

Initiative	Summary/Status as of April 2017	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 in an effort 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.	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, 2017

Initiative	Summary/Status as of April 2017	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. The entire system is trimmed on an 18 month cycle. Recently adopted policy (Dec 2014 commission approval) allows neighborhoods with high rates of outages due to vegetation to request additional clearance up to 10 feet from existing power lines. Final policy still not defined.	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, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(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 and Leon County are included in Appendix D.	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.	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
(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	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, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	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 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					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	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* There are also smaller networks that monitor critical infrastructure and weather events. 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. 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. *Tallahassee Community College* Tallahassee Community College (TCC) utilizes an Emergency Notification System called TCC Alert. System components					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	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 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					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
	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 protect critical facilities, can often require significant startup and/or maintenance funding commitments.					

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(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.	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, 2017

Initiative	Summary/Status as of April 2017	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 (DEMhas 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 result are also used in the Tallahassee – Leon County Post-Disaster Redevelopment Plan (PDRP). An updated Hazus model and data will be utilized for the 2017 update of the PDRP. Additionally, HAZUS can estimate shelter needs based on population and socioeconomic information, as well as other impacts and mitigation needs.	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, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(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 (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.	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 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.	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, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(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 3.1 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) in order 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.	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)

Table 3.3. Prioritized Mitigation Initiatives with Potential Funding Sources, 2017

Initiative	Summary/Status as of April 2017	Hazards	2015 Estimated Costs& Timeframe	Responsible Agencies	Jurisdiction	Potential Funding Sources
(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. 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. Three shelters were employed during Hurricane Hermine on September 2, 2016. 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.	All	Low/ Continuing	City of Tallahassee and Leon County Emergency Management	City of Tallahassee& Leon County	Local
(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)

Chapter 4 – Plan Maintenance

4.1 Monitoring, Maintenance and Updating

The Steering Committee recognizes that in order 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 3.3, to ensure it is current 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. This report will contain a report on the current 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. It is assumed that Leon County, as it enters the Community Rating System program, will prepare a similar annual report. These reports will be presented to the Steering Committee by City and County staff and the LMS Coordinator for review and consideration at each annual meeting. The Steering Committee will evaluate these annual reports to monitor the progress in meeting the established goals and objectives, as well as monitoring the implementation of the mitigation initiatives.

LMS Committee meetings, annual review of the plan, continued public involvement and the annual Status Report provided by the City of Tallahassee Stormwater Management Division will all be integral in compiling a comprehensive update to the Local Mitigation Strategy in 2020. It is expected that the update process will take approximately one year to complete and will require LMS Committee members, local officials, and community members to actively participate in the update process by reevaluating the LMS and providing new information as appropriate.

The update of the LMS will begin approximately 18 to 24 months prior to the expiration date of the current LMS. This process will be initiated by the LMS coordinator under supervision of the Steering Committee.

4.2 Coordination with other Planning Mechanisms

The following section details past and future efforts to coordinate the LMS with other local planning mechanisms.

<u>Tallahassee-Leon County Comprehensive Plan</u>

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.

<u>Leon County Comprehensive Emergency Management Plan</u>

The LMS Committee and staff will continue to work with staff from the Leon County Sheriff’s Office 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 where appropriate relevant hazards, proposed mitigation alternatives, and other related information.

<u>Tallahassee – Leon County Post-Disaster Redevelopment Plan</u>

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 in the PDRP was incorporated into this LMS update.

<u>City of Tallahassee Stormwater Management Plan</u>

The Tallahassee-Leon County Local Mitigation Strategy will continue to contribute to the maintenance requirements for the Community Rating System (CRS). 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.

<u>Land Development Code</u>

As discussed in Section 3.2, floodplain management regulations have been incorporated into both the City of Tallahassee’s and Leon County’s land development regulations, based on flood mitigation initiatives in the LMS and the FEMA requirements. Mitigation initiatives included in the LMS will continue to be considered during amendments to existing ordinances and regulations and in the drafting of new ordinances and regulations for inclusion in the Code.

Local Government Capital Improvement Projects

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 2015 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.

A draft copy of the 2015 LMS update was added to the website prior to the public meeting on March 12, 2015 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 2015. After the updated LMS was approved and adopted by both the City and County Commissions, the adopted version was added to the webpage.

To encourage public participation and increase community knowledge regarding the current LMS update and related planning processes, a copy of the 2017 Update to the 2015 LMS will also be maintained on the Planning Department's webpage (www.talgov.com/planning/mitstrat/mitstra.cfm).

Lastly, in an effort 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 current 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.

Technical Appendices

A. Resolutions Adopting the Tallahassee-Leon County LMS
B. Amended LMS Steering Committee Bylaws (2009)
C. LMS Committee Meeting Minutes (2010 – 2015)
D. Local Government Inventory of Flooded Structures and Planned Drainage Improvement Projects
E. 2014 Annual CRS Report
F. Leon County Small Quantity Generator Data (2009-2013)
G. Southern Wildfire Risk Assessment Summary Report for Leon County (2014)
H. Public Meeting Notice
I. Common Invasive Plants of Leon County
J. Channeled Apple Snail
K. Thunderstorm Events (January 1, 2010 – December 31, 2014)
L. Lightning Events (January 1, 2010 – December 31, 2014)
M. Ranking System for Proposed Hazard Mitigation Grant Program Applications

APPENDIX A:

Resolutions Adopting the Tallahassee-Leon County LMS

RESOLUTION NO. R15-19

RESOLUTION ADOPTING 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

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 12th day of May, 2015, that:

1. The Board of County Commissioners adopts the 2015 update of the Local Mitigation Strategy, attached hereto and incorporated herein as if fully set forth below.

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. Promote adequate and safe housing;
    5. Protect community resources, including but not limited to, infrastructure, and environmental, recreation and historical resources; and
    6. 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.

PASSED AND ADOPTED by the Board of County Commissioners of Leon County, Florida, this 12th day of May, 2015.

LEON COUNTY, FLORIDA

By: ______________________
Mary Ann Lindley, Chairman
Board of County Commissioners

Attested By:

Bob Inzer, Clerk of the Circuit Court and Comptroller
Leon County, Florida

By: John Stott, Deputy Clerk

Approved as to Form:

Office of the County Attorney
Leon County, Florida

By: ______________________
Herbert W.A. Thiele, Esq.
County Attorney

RESOLUTION NO. 15-R-24

RESOLUTION ADOPTING 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 actions:

1. Identifying hazards to which the City is vulnerable;
2. Determining where the county is vulnerable to these hazards;
3. Assessing facilities and structures that are 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 adopted by the City Commission in September 2000; and

WHEREAS, Federal and State rules require that each local government participating in a Local Mitigation Strategy must adopt and maintain the document individually.

NOW, THEREFORE, be it resolved by the City Commission of the City of Tallahassee that

1. The City Commission adopts the 2015 update of the Tallahassee-Leon County Local Mitigation Strategy, originally dated 15 December, 1999.

2. The City Commission supports the following local hazard mitigation goals of the strategy:

    a. Protect human health, safety and welfare;
    b. Protect economic activities within the City;
    c. Enhance regional mitigation efforts;
    d. Promote adequate and safe housing;
    e. Protect community resources, including but not limited to, infrastructure, and environmental, recreation and historical resources; and
    f. 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 strategies, and does not require the Commission to affirmatively act unless and until the City Commission identifies and commits the resources necessary to act.

4. The City Commission directs the interlocal Local Mitigation Strategy Steering Committee to undertake the following actions:

    a. Conduct a annual evaluation of the Local Mitigation Strategy to ensure that it incorporates the most current information available;
    b. Address any changes in vulnerability of the City's population and resources to the full range of hazards the community is exposed to;
    c. Examine opportunities to coordinate the Local Mitigation Strategy with other area-wide emergency planning efforts and with appropriate objectives and policies of the local Comprehensive Plan.
    d. Evaluate the costs and benefits of any proposed mitigation actions; and
    e. Return to the Commission with any recommendations or proposed changes to the current list of priority initiatives or projects that may reduce the risks associated with natural and other hazards.

5. 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.

This resolution shall take effect immediately upon adoption.

ADOPTED by the City Commission of the City of Tallahassee this 22nd day of April, 2015.

CITY OF TALLAHASSEE

By: _______________
Andrew D. Gillum
Mayor

ATTEST:

By: _______________
James O. Cooke, IV
City Treasurer-Clerk

APPROVED AS TO FORM:

By: _______________
Lewis E. Shelley
City Attorney

RECEIVED
CITY TREASURER-CLERK
2015 APR 28 PM 1:52

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;
i. Capital Area Chapter, American Red Cross;
j. Leon County Emergency Medical Services; and
k. 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
Meeting Minutes
2010-2014

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION
STEERING COMMITTEE

Minutes

Monday, March 15, 2010
9:00 a.m.

Planning Department Conference Room,
3rd Floor Renaissance Center

Members Present
Patrick Dooley (COT-EU)
Ryan Guffey (LC GEM)
David Henry (COT SW)
Steve Hodges (TLCPD)
Jonathan Kilpatrick (COT UU)
Gabe Menendez (COT PW)
Tony Park (LC Public Works)
Robby Powers (COT-EM)
Richard Smith (LCEM/SO)

Others
Kris Barrios (NWFWMD)
Brad Trotman (CONA)

The meeting began at 9:10 a.m. with a quorum and introductions.

The Local Mitigation Strategy (LMS) Steering Committee met to review and consider the endorsement of a proposed Northwest Florida Water Management District (NWFWMD) Grant Application for the federal Severe Weather & Floods Post-Disaster Hazard Mitigation Grant Program (FEMA-1831-DR-FL). The NWFWMD proposed submitting a hazard mitigation grant program application under this program to expand and provide real-time telemetry for the rainfall and stream level gaging network in the region. The overall project cost was estimated at $463,800 and the District would provide the 25% local match of $115,950.

Richard Smith moved that the Steering Committee find this proposed project consistent with the goals and objectives within the Tallahassee – Leon County LMS and with the State's mitigation goals and objectives, and to endorse this project for HMGP funding from this disaster declaration. Robbie Powers seconded the motion, and the Committee voted unanimously for the motion.

Following this action, Richard motioned staff to write a requested letter of support for this proposed grant application to be signed by the Committee Chair. Robbie seconded the motion, and the Committee voted unanimously for the motion.

The Committee adjourned at 9:33 a.m.

Approved:

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Chairman

Attest:

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Stephen M. Hodges, Committee Staff

Minutes approved on:______________________________

TALLAHASSEE-LEON COUNTY
LOCAL HAZARD MITIGATION
STEERING COMMITTEE

Minutes

Monday, March 15, 2010
9:00 a.m.

Planning Department Conference Room,
3rd Floor Renaissance Center

<u>Members Present</u>
Patrick Dooley (COT-EU)
Ryan Guffey (LC GEM)
David Henry (COT SW)
Steve Hodges (TLCPD)
Jonathan Kilpatrick (COT UU)
Gabe Menendez (COT PW)
Tony Park (LC Public Works)
Robby Powers (COT-EM)
Richard Smith (LCEM/SO)

<u>Others</u>
Kris Barrios (NWFWMD)
Brad Trotman (CONA)

The meeting began at 9:10 a.m. with a quorum and introductions.

The Local Mitigation Strategy (LMS) Steering Committee met to review and consider the endorsement of a proposed Northwest Florida Water Management District (NWFWMD) Grant Application for the federal Severe Weather & Floods Post-Disaster Hazard Mitigation Grant Program (FEMA-1831-DR-FL). The NWFWMD proposed submitting a hazard mitigation grant program application under this program to expand and provide real-time telemetry for the rainfall and stream level gaging network in the region. The overall project cost was estimated at $463,800 and the District would provide the 25% local match of $115,950.

Richard Smith moved that the Steering Committee find this proposed project consistent with the goals and objectives within the Tallahassee – Leon County LMS and with the State's mitigation goals and objectives, and to endorse this project for HMGP funding from this disaster declaration. Robbie Powers seconded the motion, and the Committee voted unanimously for the motion.

Following this action, Richard motioned staff to write a requested letter of support for this proposed grant application to be signed by the Committee Chair. Robbie seconded the motion, and the Committee voted unanimously for the motion.

The Committee adjourned at 9:33 a.m.

Approved:

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Chairman

Attest:

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Stephen M. Hodges, Committee Staff

Minutes approved on:______________________________

TALLAHASSEE-LEON COUNTY LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Thursday, December 13, 2012

Leon County Development Support and Environmental Management Conference Room
2nd Floor Renaissance Center

Attendees
Patrick Dooley (COT EU)
Mark Fuller (COT SW)
David Henry (COT UU)
Laura Herbert (DEM)
Steve Hodges (TLCPD)
John Kraynak (LC DSEM)
Bill McCusker (DEM)
Gabriel Menendez (COT PW)
Tony Park (LC PW)
Kevin Peters (LCSO)
Robby Powers (COT)
Susan Poplin (TLCPD)

The meeting began at 8:45 a.m. with a quorum and introductions. The meeting was chaired by Tony Park, LMS Committee Chair.

The December 14, 2011 minutes were moved by Kevin Peters, seconded by Gabriel Menendez, and approved unanimously.

Kevin motioned maintaining the present officers for 2013, including Tony as Chair and Gabe as Vice-Chair. John Kraynak seconded the motion, and it was and approved unanimously.

The Committee discussed FSU's role in the Local Mitigation Committee and the Local Mitigation Strategy (LMS) planning process. FSU's representative, Dave Bujak, had sought via email clarification of FSU's role and had also suggested that the University, if necessary, would consider creating their own LMS. State Division of Emergency Management (DEM) staff present at the meeting suggested that FSU was a bona fide member of the local LMS Committee, and that it would not be necessary for the University to create their own LMS. DEM staff present at this meeting were requested by the Committee to send an email to this effect to FSU clarifying their role, including their ability to participate fully in pre- and post-disaster grant funding opportunities.

Planning staff discussed the Disaster Declaration for T.S. Debby and suggested there may be an opportunity for local government and other Committee members and organizations to submit a grant application for any Tier III funds left over. DEM staff clarified the grant funding process. David Henry offered a City project (Devlin Drive flooded property acquisition) for consideration by the Committee for an endorsement under this Declaration. Tony Park proposed endorsing this project. Robby Powers made this motion; John seconded the motion, and it was and approved unanimously.

Susan Poplin presented a summary of the recently adopted Tallahassee – Leon County Post-Disaster Redevelopment Plan. Following several questions and a discussion, no actions were taken by the Committee.

The Committee reviewed the City's 2012 Annual Community Rating System (CRS) Report. This Report reviews the existing initiatives in the LMS, as well as updating a list of City stormwater projects. As part of this review, an updated list of Leon County stormwater projects programmed into its Capital Improvements budget was presented by Tony Parks. Gabe motioned acceptance of the CRS Report and the updated County list. John seconded the motion, and it passed unanimously.

John Kraynak provided a status update to the Committee of Leon County's CRS application. No actions were taken by the Committee.

The Committee adjourned at approximately 10:30 a.m.

Approved:	Attest:
______________________________	______________________________
Chairman	Stephen M. Hodges, Committee Staff

Minutes approved on:______________________________

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY
COMMITTEE

Meeting Minutes
Thursday, April 11, 2013

Leon County Development Support and Environmental Management Conference Room
2nd Floor Renaissance Center

Attendees
Patrick Dooley (COT EU)
Dave Bujak (FSU EM)
Debbie Floyd (CONA)
Dr. Henry Fuelberg (FSU)
Allan Gale (COT EU)
Ryan Guffey (LC DSEM)
Steve Hodges (TLCPD)
Gabriel Menendez (COT PW)
Tony Park (LC PW)
Kevin Peters (LCSO)
Robby Powers (COT EM)
Tom Quillen (LC EMS)
Harry Reed (CRTPA)
Dean Richards (LC PW)
Scott Weisman (TLCGIS)

The meeting began at 9:02 a.m. with a quorum and introductions. The meeting was chaired by Tony Park, LMS Committee Chair.

The December 13, 2012 minutes were moved by Robbie Powers, seconded by Gabriel Menendez, and approved unanimously.

The Committee heard a presentation on a proposed North Florida Lightning Network given by Dr. Henry Fuelberg of Florida State University. Dr. Fuelberg's presentation included a request for the Committee to endorse this project. Following the presentation and a followup discussion, Gabe Menendez motioned a letter of support for this proposed project and to endorse its application within Leon County, and to consider it for inclusion into the list of initiatives/projects in the City of Tallahassee/Leon County Local Mitigation Strategy as part of its next update. Ryan Guffey seconded the motion, and it was approved unanimously by the Committee.

There were no other actions taken by the Committee, and the Committee adjourned at approximately 10:33 a.m.

Approved: Attest:

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Chairman Stephen M. Hodges, Committee Staff

Minutes approved on: ______________

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 10, 2013

Leon County Development Support and Environmental Management Conference Room
2nd Floor Renaissance Center

Attendees

Evan Blythe (FSU)	Gabriel Menendez (COT PW)
Dave Bujak (FSU)	Bill McCusker (DEM)
Patrick Dooley (COT EU)	Jennifer Nagy (LCSO)
Philip Doyle (TMH)	Tony Park (LC PW)
Mark Fuller (COT SW)	Susan Poplin (TLCPD)
Ryan Guffey (DSEM)	Todd Schroeder (FFS)
Steve Hodges (TLCPD)	Scott Weisman (TLCGIS)

The meeting began at 1:32 p.m. with a quorum and introductions. The meeting was chaired by Tony Park, LMS Committee Chair. Agenda modifications were requested by Dave Bujak to discuss a project previously discussed and endorsed by the Committee at an earlier meeting in 2013, and an additional proposed project.

The April 11, 2013 minutes were moved by Ryan Guffey, seconded by Tony Park, and approved unanimously.

Steve Hodges moved maintaining the present officers for 2014, including Tony as Chair and Gabe as Vice-Chair. Ryan seconded the motion, and it was and approved unanimously.

Staff from the Florida Division of Emergency Management made a presentation on mitigation grant funding opportunities. The Committee had a number of questions and a followup discussion. No actions were taken by the Committee concerning this item.

Planning staff discussed the upcoming update of the 2010 Local Mitigation Strategy plan, including a schedule of tasks, deadlines, and the need for Committee input into this update. No actions were taken by the Committee concerning this item.

Dave presented an update on a project previously endorsed by the Committee developed by FSU to monitor lightning in real time and providing these data to government agencies and the public via the internet. He discussed the federal funding strategy taken by FSU to initiate this project, and the difficulties encountered. No actions were taken by the Committee concerning this item.

Dave then presented a proposed project to create a flood monitoring network for the FSU campus that would alert staff, faculty, and students of flooding conditions. The proposal would require approximately $50,000 to purchase equipment. Dave requested inclusion of this project on the LMS list of initiatives and projects. Following a discussion, Steve motioned the requested inclusion of this project, and a letter of endorsement to be provided to FSU supporting this project. Gabriel Menendez seconded the motion, and it was and approved unanimously.

The Committee adjourned at approximately 2.37 a.m.

Approved: Attest:

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Chairman Stephen M. Hodges, Committee Staff

Minutes approved on:____________________________

TALLAHASSEE-LEON COUNTY
LOCAL MITIGATION STRATEGY COMMITTEE

Meeting Minutes
Tuesday, December 11, 2014

Leon County Development Support and Environmental Management Conference Room
2nd Floor Renaissance Center

Attendees
David Block (FDEM)
Patrick Dooley (TEU)
Philip Doyle (TMH)
Mark Fuller (TUU)
Jerome Gaines (TFD)
Ryan Guffey (DSEM)
Steve Hodges (TLCPD)
Don Lanham (LC)
GW Lupton (TCC)
Anna Padilla (LCPW)
Tony Park (LCPW)
Kevin Peters (LCSO)
Robby Powers (CEM)
Steve Shafer (TPW)
Todd Schroeder (FFS)
Michael Wallick (FDEM)
Scott Weisman (TLCGIS)

The meeting began at 8:35 p.m. with a quorum and introductions. The meeting was chaired by Tony Park, LMS Committee Chair.

The December 13, 2013 minutes were moved by Steve Shafer, seconded by Kevin Peters, and approved unanimously.

Robby Powers moved Gabe Menendez as Chair for 2015. Ryan Guffey seconded the motion, and it was approved unanimously. Robby then motioned Scott Weisman as Vice-chair. Jerome Gaines seconded the motion, and it was approved unanimously.

Planning staff presented draft materials from the updated 2015 Local Mitigation Strategy plan, including the remainder of the work plan for the update, a draft outline, and a draft list of proposed mitigation initiatives and their relative prioritization. Following discussion, the Committee approved by acclamation the work plan and materials presented.

The Committee adjourned at approximately 10:30 a.m.

Approved:

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Chairman

Attest:

____
Stephen M. Hodges, Committee Staff

Minutes approved on:______________________________

APPENDIX D:

Local Government Flooded Structures Inventory
and Planned Drainage Improvement Projects

On November 27, 2001 the Board of County Commissioners amended the LMS to incorporate by reference the "October 2001 Leon County Flooded Structures Inventory," which includes all of the records provided by County and City stormwater departments and the Red Cross following the major storm events of 2000 and 2001 (i.e., Tropical Storms Helene, Allison and Barry). This list has been updated for this edition of the LMS.

Table 1: Leon County Flooded Structures Inventory

Street	# of parcels
Absa Court	4
Alan A Dale Trail	15
Almanac Road	1
Apalachee Parkway	1
Audubon Drive	1
Avalon Court	4
Avalon Drive	17
Bayberry Drive	3
Ben Boulevard	2
Ben Brush Trail	3
Benjamin Chaires Road	6
Boatwright Road	1
Briarcreek Road E	1
Bright Court	7
Bright Drive	5
Buck Lake Road	1
Casey Drive	1
Celia Court	11
Celia Road	17
Centennial Oak Circle	1
Chaires Cross Road	15
Circle J Drive	2
Coffee lane	1
Colbert Road	6
Collins Hole Road	2
Comet Drive	1
Conifer Street	3
Cottonwood Lane	14
Crooked Road	34
Crystal Road	15
Cypress Circle	3

Street	# of parcels
Darien Road	8
Deer Lane Drive	1
Donerail Trail	1
Druid Lane	18
Edenfield Road	1
Elena Drive	1
Fairbanks Ferry Road	2
Faulk Drive	10
Flicker Road	19
Forget me Not Trail	5
Forward Pass Trail	3
Franklin Oaks Lane	2
Freedom Road	8
Friendly Pines Court	9
Gabby Lane	3
Gallant Fox Trail	2
Glover Road	1
Hassell Road	18
Hawkbill Court	1
Houston Road	4
Jessica Street	7
Jet Pilot Trail	2
Joe Cotton Trail	1
John Hancock Drive	5
Kauai King Trail	1
La Rochelle Drive	10
Lainey Lane	4
Lakeview Drive	4
Lakeview Road	1
Lawndale	1

Street	# of parcels
Lesley Street	8
Log Landing Road	4
Long View Drive	6
Lonnie Road	1
Lucky Debonair Trail	1
Markim Road	3
Mill Pond Loop	3
Monaco Drive	11
Mustang Drive	8
Nocatee Road	5
Oak Ridge Road	41
Old Shell Point Road	15
Omaha Trail	1
Orleans Drive	10
Parkhill Road	1
Perker Lane	1
Pimilico Drive	1
Ranchero Road	9
Regiment Loop	4
Rivers Williams Circle	6
Riviera Drive	2
Rumbling Vine Lane	1
Sipsey Way	4
Sistowbell Lane	1
Skate Drive	5
Sonora Lane	2
Sora Road	4
Spiral Garden Way	5
Stallion Avenue	1
Stan Circle	15
Stonler Road	10

Street	# of parcels
Strawhill Lane	4
Sunflower Road	25
Sweet Jasmine Lane	1
T Bird Road	6
Tan Mouse Road	1
Tomberlin Road	8
Touraine Drive	9

Street	# of parcels
Towhee Road	5
Vaughans Lane	1
Wakulla Springs Road	12
Warbler Street	8
Waterfront Drive	3
Whirlaway Trail	2
Wild Cherry Drive	15

Street	# of parcels
Wildberry Lane	8
Windmill Lane	3
Winters Run	1
Woodhill Drive	5
Woodpecker Lane	4

As of February 2015, the Leon County Flooded Structures Inventory includes a total of 661 properties with documented flooding histories

Table 2: City of Tallahassee Flooded Structures Inventory

Road Name	Road Type	Parcel Count
9TH	AVE	2
ABBIEGAIL	DR	14
ABRAHAM	ST	1
ADAMS	ST	2
AIRPORT	DR	5
ALBAN	AVE	1
ALDER	DR	1
ALLEN	RD	1
ALLIEGOOD	AVE	4
APALACHEE	PKWY	1
ARBOR STATION	LN	1
ARIZONA	ST	1
ARKANSAS	ST	3
ATAPHA NENE		1
ATKAMIRE	DR	13
ATLANTIS	PL	2
AUSLEY	RD	3
BALDWIN	DR	4
BANTRY BAY	DR	2
BARBARA	ST	1
BARCELONA	CT	1
BARN	WAY	1
BARRIE	AVE	10
BAUM	LN	1
BAY	DR	2
BAY SHORE	CIR	2
BEARD	ST	1
BEECHNUT	LN	1
BELLINGTON	CT	1
BELMONT	RD	1
BLAIR STONE	CT	1
BONNIE	DR	2
BOTANY	DR	3
BRANDEMERE	DR	1
BREVARD	ST	1
BROWARD	ST	1
BUCK LAKE	CIR	1
BUCKINGHAM	CT	6
BUCKWOOD	DR	4

Road Name	Road Type	Parcel Count
BUENA VISTA	DR	1
BUNCHE	AVE	1
BYINGTON	CIR	2
CACTUS	PL	1
CALHOUN	ST	1
CALIFORNIA	ST	1
CALL	ST	4
CAMPUS	CIR	15
CAPITAL	CIR	3
CAROLINA	ST	9
CARRAWAY	ST	1
CASA LINDA	CT	4
CASTLEWOOD	DR	9
CATAWBA	ST	1
CELIA	CT	1
CELTIC	CT	2
CENTERVILLE	CT	2
CHAPEL	DR	1
CHARLES	CT	2
CHESTNUT	DR	3
CHESTWOOD	AVE	1
CHINOOK	ST	5
CHOCKSACKA NENE		1
CHOWKEEBIN	CT	2
CHULI NENE		2
CLAY	ST	2
COBLE	DR	2
COCHRAN	DR	2
COLONIAL	DR	1
COLORADO	ST	2
CONNIE	DR	3
CONRADI	ST	6
CONTINENTAL	AVE	1
COPELAND	ST	5
COPPER CREEK	CT	1
COUNTRY CLUB	DR	1
CRATE	DR	2
CREEK	RD	1
CRESTVIEW	AVE	1

Appendix D
Local Government Flooded Structures Inventory and Planned Drainage Improvement Projects

Road Name	Road Type	Parcel Count
CRISTOBAL	CT	1
CYPRESS COVE	CT	8
CYPRESS LAKE	ST	2
DAWN LAUREN	LN	3
DAWSEY	ST	1
DAYLILY	LN	6
DEER HAVEN	LN	1
DENT	ST	3
DESOTO	ST	2
DIXIE	DR	2
DOOMAR	DR	6
DOONESBURY	CT	1
DORIC	DR	1
DOVER	ST	1
DUNKELD	CT	1
DUNN	ST	3
DUPONT	DR	4
DUTCHESS	CT	3
DUVAL	ST	1
EASTWOOD	DR	2
ELFINWING	LN	1
EMORY	CT	10
EPPES	DR	4
ESSEX	DR	8
EVELYN	CT	2
EXECUTIVE CENTER	CIR	1
FERNANDO	DR	1
FISHER	LN	5
FOREST	DR	3
FORSYTHE	CT	1
FORT KNOX	BLVD	3
FOSTER	CT	2
FRANKLIN	BLVD	1
FULTON	RD	1
GARDENBROOK	LN	1
GAWAIN	CT	1
GEORGIA	ST	18
GIBBS	DR	2
GINGER	DR	1
GLENVIEW	DR	1

Road Name	Road Type	Parcel Count
GLORIA	DR	1
GOLF TERRACE	DR	1
GOODWOOD	CT	1
GREENON	LN	1
GREENWICH	CT	1
GREER	CT	2
GWEN	ST	5
HALIFAX	CT	1
HARPER	ST	1
HARTSFIELD	CT	11
HARWOOD	ST	3
HASTIE	RD	2
HAWTHORNE	ST	2
HAYDEN	RD	1
HAYWARD	DR	3
HEECHEE NENE		1
HEMLOCK	ST	1
HIGH	CT	2
HILLSBOROUGH	ST	1
HOFFMAN	DR	1
HOLTON	ST	2
HOOD	CT	2
INDIAN HEAD	DR	1
JACKSON	ST	2
JACKSON BLUFF	RD	2
JAYDELL	CIR	1
JEFFERSON	CT	4
JIM LEE	RD	1
JONATHANS LANDING	RD	2
KAREN	LN	1
KEILY	RUN	1
KELLY	ST	1
KENDALL	DR	1
KENNEDY	DR	10
KISSIMMEE	ST	3
LAFAYETTE	CIR	1
LAGUNA	DR	9
LAKE BRADFORD	RD	12
LAKE HENRIETTA	ST	2
LAKESHORE	DR	3

Appendix D
Local Government Flooded Structures Inventory and Planned Drainage Improvement Projects

Road Name	Road Type	Parcel Count
LANCASTER	DR	1
LASSWADE	DR	2
LAURA LEE	AVE	1
LEEWOOD	DR	1
LIBERTY	ST	2
LINDA ANN	DR	1
LINDA ANN	DR	5
LIVE OAK	DR	1
LONNBLADH	RD	1
LUCY	ST	1
LUPINE	LN	1
LYNDON	DR	3
LYNNDALE	ST	8
MABRY	ST	1
MACLAY	BLVD	1
MAGNOLIA	CIR	6
MAHAN	DR	2
MAPLE	DR	1
MARGARET	CT	2
MARSTON	PL	1
MARTIN	ST	1
MARYELLEN	DR	1
MCARTHUR	ST	3
MCCAIN	CT	3
MCCASKILL	AVE	1
MCCLENDON	DR	1
MCKEITHEN	CT	1
MEETING STREET	DR	11
MELANIE	DR	27
MERIDIAN	PL	9
MERLIN	CT	1
MERRY OAKS	CT	2
MICCOSUKEE	LOOP	4
MICHAEL		1
MIDDLEBROOKS	CIR	1
MILLARD	ST	5
MISSION	RD	5
MITCHELL	AVE	1
MOCK	DR	1
MONACO	DR	8

Road Name	Road Type	Parcel Count
MONROE	ST	4
MURIEL	CT	1
MYERS PARK	DR	1
NEKOMA	CT	1
NICKLAUS	CT	1
NORMA	ST	1
NORTH POINT	BLVD	1
NORTH RIDE		4
NOTRE DAME	ST	1
NUTMEG	CT	2
OAK PARK	CT	2
OAKDALE	ST	1
OAKLAND	AVE	1
OBRIEN	DR	3
OCALA	RD	1
OKALOOSA	ST	6
OLD BAINBRIDGE	PL	2
OLD FORT	DR	1
OLD ST AUGUSTINE	RD	1
OLDFIELD	DR	1
OLIVE	AVE	2
ORANGE	AVE	1
ORLANDO	DR	1
OSCEOLA	ST	1
OSTAPAKIN NENE		1
OSTIN NENE		2
OX BOTTOM	HL	1
OXFORD	RD	1
PADDRICK	DR	1
PARK	AVE	2
PARK VIEW	CT	1
PATSY ANN	CT	1
PAUL RUSSELL	CIR	11
PEACHTREE	DR	1
PECAN	CT	2
PENSACOLA	ST	7
PICKETT	CT	5
PINE	ST	3
PINE FOREST	DR	2
PIPING ROCK		1

Road Name	Road Type	Parcel Count
POTTS	RD	1
PROCK	DR	1
RAIN VALLEY	CIR	1
RANDOLPH	CIR	1
RAVEN	ST	1
RAYMOND DIEHL	RD	1
REDBUD	AVE	2
REDWOOD	DR	1
REFUGE	RD	1
REXWOOD	DR	3
RICHVIEW	RD	1
RIDGE	RD	4
RIDGEWAY	ST	1
RIGGINS	RD	1
RIVER CHASE		4
ROCKBROOK	CT	1
ROLLINS	ST	2
ROSEMARY	TER	2
RYAN	PL	1
SAIL	CT	6
SALMON	DR	2
SAN MATEO	CT	1
SANDRINGHAM	DR	1
SAULS	ST	4
SEMINOLE	DR	1
SEQUOIA	DR	4
SHADOWLAWN	DR	1
SHAMROCK	DR	1
SHANNON LAKES		2
SHARER	CT	4
SHARON	RD	1
SHERWOOD	DR	1
SHORT	ST	1
SILVER SLIPPER	LN	1
SOUTHWOOD	DR	5
SOUTHWOOD PLANTATION	RD	2
SPENCE	AVE	1
SPOONWOOD	DR	1
SPOTTSWOOD	DR	1
SPRINGFIELD	DR	1

Road Name	Road Type	Parcel Count
STADIUM	DR	1
STILLWOOD	CT	1
STONE	RD	1
STONEHOUSE	CT	1
STRATFORDSHIRE	CT	1
STUCKEY	AVE	1
SUMERLIN	DR	2
SUNNYSIDE	DR	1
SUTOR	CT	3
TALLOW POINT	RD	1
TARTARY	DR	8
TENNESSEE	ST	8
TEXAS	ST	4
THARPE	ST	3
THOMASVILLE	RD	2
TINA	DR	9
TORREYA	DR	1
TORY SOUND	LN	2
TRALEE	RD	1
TREEO	LN	8
TRESCOTT	DR	2
TUCKER	ST	1
TUPELO	TER	3
VAN BUREN	LOOP	1
VASSAR	CT	1
VEGA	DR	1
VICTORY GARDEN	DR	2
VILLAGE GREEN	WAY	1
VILLAS	CT	3
VIOLET	ST	5
VIRGINIA	ST	15
WALTER SCOTT	ST	1
WARD	ST	3
WAVERLY	RD	5
WEKEWA NENE		4
WESTWOOD	DR	1
WHEATLEY	RD	1
WHETHERBINE	WAY	7
WHIRLAWAY	TRL	3
WHISPER	CT	2

Road Name	Road Type	Parcel Count
WILLAMETTE	RD	1
WILLOW	AVE	1
WOODGATE	WAY	2

Road Name	Road Type	Parcel Count
WOODRICH	DR	1
YAUPON	DR	1
YULEE	ST	1

As of February 2015, the City of Tallahassee Flooded Structures Inventory includes a total of 618 properties with documented flooding histories.

Table 3: Leon County Existing 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

[1] Leon County Public Works, 2015.

Liberty Ridge Wild Cherry/etc. (east of Wakulla Springs)	12,690,000	Planning
Louvenia Court	1,000,000	Planning
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

The City of Tallahassee has identified the following 24 drainage improvement projects in its current Capital Improvement Program (FY2014-2019). The estimated cost of these projects totals $97,632,311.

Table 4: City of Tallahassee Existing Stormwater Management Capital Improvement Projects.[2]

Project	Cost ($)	Prior Year	Current Status
Concord Road SMF	980,000	Permitting	Under Construction
Downtown Stormwater Master Plan	500,000	Analysis	Analysis
E. Georgia at Meridian Flood Mitigation	2,475,000	Construction	Completed
Eastgate Flood Relief Project	3,850,000	Phase I & II Design & Land Acquisition	Phase I Under Construction. Phase II Design & Land Acquisition
Emory Ct and Dupont Dr Area Flood Relief (4)	10,100,000	Phase I complete	Phase II Analysis
Frenchtown Stormwater Master Plan (2)	11,645,400	(see note 2 below)	(see note 2 below)
Inglewood Stormwater Improvements	1,050,000	Design	Design
Karen Lane Drainage Improvements	600,000	Completed	Completed
Killarney Way at Shamrock Drainage Improvements.	1,765,000	Completed	Completed
Lafayette Park Stormwater Outfall (4)	1,300,000	Phase I complete, Phase II Under Construction	Phase II Completed
Lake Ella Stormwater Outfall	150,000	New	Study
Lower Central Drainage Ditch	11,450,050	Design	Design
Medium Stormwater System Imprv. (3)	18,000,000	New	(see note 3 below)
Meginnis Arm LOMR	200,000	New	Study
Northeast Ditch at Lonnbladh Rd.	1,500,000	Completed	Completed
Northeast Ditch Tributary 2 Flood Study	120,000	On Hold	On Hold
Park Ave. Tributary No. 1 Improvements	3,125,000	Bid for Construction	Under Construction
Rainfall and Stream Gauging	1,651,861	Data gathering	Data gathering
Royal Oaks Creek	3,000,000	Analysis	Analysis
Small Projects Initiative (see below)	9,670,000	See Table 2 below	See Table 2 below
Stormwater Infrastructure Inventory and Mapping	3,360,000	Data gathering	Data gathering
Upper Lake Lafayette Nutrient Reduction Facility	7,000,000	Construction	Construction
Upper West Ditch Stormwater Facility	3,540,000	Analysis	Analysis
Wilson Ridge Flood Relief Project	600,000	Completed	Completed
Total	**$97,632,311**		

[2] City of Tallahassee Underground Utilities, 2014.

Notes:

1. Projects listed as "On Hold" have been recommended and approved in the Capital Budget and are awaiting implementation.
2. The Frenchtown Stormwater Project has been segmented into multiple phases. Nine phases have been constructed while other phases are 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).
4. These projects have been segmented into two phases.

Table 5: City of Tallahassee Drainage Improvement Projects - Small Projects Initiative – Current & Planned Projects[3]

Project	Prior Year Activity	Status
Sandhurst Drive	Under Construction	Completed
Stonehouse Road	On hold	Completed
3068 O'Brien Drive	Design	Completed
3933 Runnymede	Under Construction	Completed
4052 Roscrea Drive	Design	Completed
676 Riggins Road	Integrated*	Integrated*
3015 Shamrock North	Design	Under Construction
1046 Copper Creek Lane	Under Construction	Completed
3224 Baldwin Drive	Under Construction	Completed
3244 Shannon Lakes	Design	Design
1341 Hutchinson Avenue	Design	Design
903 Beard Street	Study	Design
1133 Richardson Road	Study	Under Construction
3509 Kilkenny East	Study	Design
2410 Limerick Drive	Study	Design
Limerick Drive Outfall	Study	Design
1423 Devils Dip	Study	Design
1829 Ivan drive	Study	Design
3033 Shamrock South	Future	Future
Bradford Road Stormwater Outfall	Study	Design
Gwen Street	*Not Reported*	Study
Chamberlin Drive	*Not Reported*	Design
Sauls Street – Short Street	*Not Reported*	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.

[3] Ibid.

APPENDIX E:

LMS Final 2014 Report

City of Tallahassee
Your Own Utilities

ENERGY SMART PLUS
SAVE ENERGY SAVE WATER SAVE MONEY

Underground Utilities | 300 South Adams Street, B-26 | Tallahassee, FL 32301 | 850.891.4YOU (4968)

MEMORANDUM

TO:	Michelle Bono Assistant to the City Manager
FROM:	John Buss, Director Water Resources Engineering Division
DATE:	September 4, 2014
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, Hazard Mitigation Procedures and Initiatives. This report was prepared by the Water Resources Engineering Division to meet requirements of the Community Rating System (CRS) annual recertification. The CRS program awards credit points to communities that perform floodplain management activities above the minimum requirements of FEMA's National Flood Insurance Program. Because of City participation in the CRS program, Tallahassee floodplain property owners receive up to a 20% discount on their flood insurance premiums. As part of the annual recertification process, the attached report must be submitted to our City Commission, released to the media and made available to the public.

We have contacted Alison Faris regarding the media release, and she has agreed to assist us with this effort. The media release will describe the content of the report, inform the reader that copies of the report may be obtained online and also give contact information so that interested parties may obtain copies of the report upon request. The report contains a review of each action item in the Local Mitigation Strategy, Hazard Mitigation Procedures and Initiatives including statements discussing how much has been accomplished to date as well as discussion of why any objectives have not been reached. In addition, some recommendations for new projects are included in the capital improvement section of the report.

To meet the recertification requirements, please forward this memorandum with the report to the City Commission. No action is required by the Commission. This is for information purposes only.

Attachments

JB/mf

City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2014 Progress Report

Note: The twenty four underlined items are from the City of Tallahassee/Leon County Local Mitigation Strategy 2010 Update, Table 3.3.

1. Increase intergovernmental coordination in the area of Stormwater management.

   Status: Intergovernmental Stormwater management coordination is 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 in an effort 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.

2. Improve the disaster resistance of existing site built housing stock.

   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."

3. Advocate that FEMA provide greater flexibility to local communities that elect to establish more accurate flood elevations.

   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 are attending the Apalachee Bay Saint Mark River Watershed Discovery Meeting for the purpose of updating the FEMA flood maps for the Saint Marks Basin.

4. Improve floodplain boundary identification and implementation of the FEMA map amendment process.

   Status: The City and County are currently working with the Northwest Florida Water Management District in an effort 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.

5. Explore methods to eliminate additional development in the 25-year floodplain.

   Status: The City of Tallahassee, Growth Management Department continues to consider new ordinance language to accomplish this goal.

6. Create a public education campaign and community program that promotes awareness of vulnerability to hazards in our community and encourage disaster preparation.

   Status: The Capital Area Chapter of the American Red Cross has developed the Disaster Resistant Neighborhood 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 and County should adopt this program and advertise to all residents to provide technical assistance where needed. The City and county host annual and semiannual disaster fairs, which focus on community vulnerability to various disasters and possible mitigation techniques. The fair is a standalone 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. Volunteer Leon also offers disaster preparedness information during their community outreach programs. Florida State University actively uses social media and other programs, such as its published Emergency Preparedness Guide, to foster a "culture of preparedness and safety" on its campus.

7. Develop and disseminate a public awareness safety strategy.

   Status: The City of Tallahassee, Leon County, Florida State University and Capital Area Chapter of the American Red Cross performs this initiative on a regular basis. Information is passed out both in forms of press releases/news articles, radio preparedness messaging, TV ads, community outreach and social media.

8. Promote disaster resistant neighborhoods.

   Status: The community continues to partner with the local Red Cross and local media outlets to provide public service announcements and outreach programs supplying information to citizens related to disaster resistant neighborhood strategies. The Red Cross is working to revamp the Disaster Resistant Neighborhood program in cooperation with the city/county partners and CONA.

9. Host an annual or semi-annual disaster fair.

   Status: The Capital Area Chapter of the American Red Cross regularly facilitates hurricane exercises for businesses and neighborhoods to increase community preparedness. Further information related to the Red Cross hurricane exercises can be found online at http://www.redcross.org/fl/tallahassee . The Red Cross has facilitated, partnered and hosted community exercises and provided relevant preparedness messaging during those exercises.

10. Continue current efforts to remove dead, dying or diseased trees or branches next to roadways and power lines.

    Status: The City of Tallahassee Electric Department and City of Tallahassee Streets and Drainage Division in cooperation with the Leon County Public Works Department, continues to remove those trees and limbs that pose a hazard to overhead power lines and roadways.

11. City of Tallahassee and Leon County flood-related capital improvement projects.

    Status: See attached list of City of Tallahassee, Stormwater Capital Projects drainage improvement projects.

12. Acquire parcels in the 100-year floodplain.

    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 Department of Community Affairs.

13. Develop an emergency notification system for all hazards.

Status: Emergency notification is 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 flooding. 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. For the City of Tallahassee, the Department of Communications sends these notifications.

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 use a different kind of technology, than text messages, to ensure they are delivered immediately and are not subjected to potential congestion (or delays) on wireless networks. 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.

Leon County utilizes the internet website http://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.

Florida State University maintains a nationally-renowned emergency notification and warning system targeted toward its campus community that includes up to 35 methods of message delivery. FSU recently completed installation of its "EZ Button" technology which allows for the instantaneous activation of pre-scripted emergency messages at the press of a single button. The FSU ALERT EZ system streamlines warning and notification to 3-5 minutes or less in the most extreme situations.

14. <u>Evaluate requirements and feasibility for the County's participation in the NFIP Community Rating System.</u>

    Status: Leon County has applied to participate in the Community Rating System and had a Technical Assistance Visit on July 10, 2014. They are working on their 30-day letter.

15. <u>Explore the feasibility of adding a full build-out component to the Leon County Master Stormwater Management Plan.</u>

    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.

16. <u>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.</u>

    Status: 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. 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.

17. <u>Continue and expand program to deploy flood-warning devices at critical facilities and/or locations.</u>

    Status: There are several flood-warning devices in place and functioning within the community, which include the warning system at the Lake Talquin Dam as well as the Capital Area Flood Warning Network and City of Tallahassee 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.

Florida State University has identified locations on its campus that are prone to flooding, with a history of personal injury and property damage. FSU has plans to install flood detection equipment in several key locations on its campus and integrate it into its FSU ALERT emergency notification and warning system. The FSU Flood Detection and Warning system is pending funding opportunities.

18. Establish audible warning systems at the Lake Talquin Dam.

Status: The C. H. Corn, Hydroelectric Power Plant at the Lake Talquin Dam continues to operate warning siren and paging system that is used to warn boaters downstream of the dam to move further downstream prior to increasing flow through the dam. Electric is providing phone and email notifications to Crooked Road residents now.

19. Establish a regional lightning detection and warning system.

Status: Representatives from Florida State University have proposed a regional lightning mapping array (LMA). The proposed lightning mapping array 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. DHS Science and Technology does not take unsolicited proposals and incorrectly say that "lightning is not a hazard." FSU is exploring other possibilities for support.

20. Place an audible warning system at the wastewater treatment plant and potable water sites.

Status: The City of Tallahassee Water Quality Administration has initiated a remote detection system to determine the run status and condition of the potable well facilities. This system achieves the goal of an audible alarm system for our potable water system. The Lake Bradford Road wastewater treatment plant has audible alarms on chlorine gas releases.

In addition, a separate monitoring system has audible alarms for all equipment in the Thomas P. Smith wastewater treatment plant on Springhill Road.

21. Develop automated telephone warning/notice system tied to chemical releases at fixed facilities.

    Status: Funding needs to be identified, to support such a system.

22. Secure funding source for identified shuttering and hardening needs for Tallahassee Memorial Hospital (TMH) and Capital Regional Medical Center (CRMC).

    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. Tallahassee community hospital is now Capital Regional Medical Center, and they have hardened windows installed.

23. Consider addressing the economic impact of different disaster scenarios, as information becomes available.

    Status: The City of Tallahassee and the Capital Area Chapter of the American Red Cross both continue to have programs in place to assess the impacts of disaster immediately following an event. Damage Assessment Teams are also deployed following a disaster on a countywide basis to document disaster-related damages. In addition, the Tallahassee – Leon County Geographic Information Systems department now has FEMA's HAZUS-MH 2.0 software. This software incorporates a nationally applicable standardized methodology that contains models for estimating potential losses from floods and hurricanes. It can be used to model and generate estimated potential losses for hurricane winds and flooding.

24. Continue to improve and expand regional response capabilities for responding to hazardous materials and terrorism events.

    Status: 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. Tallahassee Fire Department has the only hazardous materials response unit in the region (between Alachua and Escambia Counties, and to a lesser extent, Bay County). Currently the Fire Department will respond to hazardous material incidents outside of the County. In the extent of multiple incidents, the Fire Department's ability to response would be severely taxed. The Development of a regional hazardous material response capability would necessitate the expansion of personnel, equipment, and training, as well as the development of local agreements.

25. Identify equipment needs for responding to a weapon of mass destruction threat, a hazardous materials release or similar disaster.

    Status: Our community emergency management officials have identified the equipment needed and have purchased many of the items through the homeland security funding. There is a committee that outlines items to be purchased, and funding is coordinated through the Regional Domestic Security Task Force. However, available funding for this initiative is decreasing.

26. Compile a more comprehensive hazardous materials database.

    Status: According to Local Mitigation Strategy Steering Committee information, the Solid Waste Departments are responsible for maintaining the hazardous materials database. However, there is no record of a recent update to this information on file. Leon County Division of Emergency Management and the Local Emergency Planning Committee is responsible for identifying and mapping all facilities storing EPA section 302 chemicals. Annually, they publish a document identifying these locations as part of the community right to know act.

27. Develop regional hazardous materials response capability; identify needed assets, training and local agreements.

    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 7 of these in Florida, and they will support each other as needed. There has been no change in the status of this initiative since the previous publication of this report.

28. Maintain training programs for emergency responders, and continue to identify new training programs as needed.

Status: 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 dispatch, initial responders, field responders, and incident commanders. Included as part of this is a continuous training program, involving classroom training, table top exercises and field exercise. The effort should also address the development and implement public awareness training programs. Through continued cooperation between City and County emergency managers, incident command training sessions will continue to be provided to City, County and other community representatives with emergency response roles.

29. Continue to identify needs for improving the disaster resistance of critical facilities.

Status: 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 limited to, the installation of storm shutters, or gas generators. 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 Forces, is provided funding to address K-12, Universities, Court houses and communications towers, funding is still needed to protect utilities.

30. Identify populations at risk under different scenarios.

Status: 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) in order 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.

31. Encourage the establishment of community-based emergency shelters.

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.

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.

32. Build a single, community-wide emergency operations center.

Status: Construction of the Public Safety Complex was completed in July 2013. The 100,000 square foot facility will house the Consolidated Dispatch Agency, Leon County Emergency Medical Services, Tallahassee Fire Department Administration, City of Tallahassee Regional Traffic Management Center, and a joint City/County Emergency Operations Center.

33. Deploy a low-power public radio station.

Status: Currently, no funding has been obtained to purchase the system. Therefore, Emergency Managers would make use of NOAA Alerts and Public Radio for required radio broadcasts of public announcements in the event of an emergency.

34. Identify major land-based transportation corridors and establish safe zones around those corridors based on the exposure pathway for different chemicals.

Status: 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 GIS capability on the hazardous response vehicle). The Apalachee Regional Planning Council has developed a 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.

City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2014 Progress Report - Attachment

Table 1: City of Tallahassee Drainage Improvement Projects

The City has identified the following 24 drainage improvement projects in its current Capital Improvement Program (FY2014-2019). The estimated cost of these projects totals $97,632,311.

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City of Tallahassee/Leon County Local Mitigation Strategy
Hazard Mitigation Procedures Initiatives
2014 Progress Report - Attachment

Notes:

1. Projects listed as "On Hold" have been recommended and approved in the Capital Budget and are awaiting implementation.
2. The Frenchtown Stormwater Project has been segmented into multiple phases. Nine phases have been constructed while other phases are 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).
4. These projects have been segmented into two phases.

Table 2: City of Tallahassee Drainage Improvement Projects - Small Projects Initiative – Current & Planned Projects

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Gwen Street	*Not Reported*	Study
Chamberlin Drive	*Not Reported*	Design
Sauls Street – Short Street	*Not Reported*	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:

Leon County Small Quantity Generator
Waste Types
January 1, 2009 – December 31, 2013

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	AD	8	4052
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	AN	1	500
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	AO	6	13511
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	EE	5	528122
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	ER	19	66285
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	EU	64	146842
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	HH	4	209650
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	HO	1	200
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	HQ	1	2002
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	HR	36	81101
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	OE	2	17714
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	OP	1	2002
AMEO	ANTIFREEZE (HW EXCEPT WHEN RECYCLED)	OR	7	19365
AMNO	ANTIFREEZE (NOT HW)	AD	1	1001
AMNO	ANTIFREEZE (NOT HW)	AO	1	3002
AMNO	ANTIFREEZE (NOT HW)	EU	8	66853
AMNO	ANTIFREEZE (NOT HW)	HR	3	4503
AMTO	ANTIFREEZE-NO TESTING DONE	EU	7	30432
AMTO	ANTIFREEZE-NO TESTING DONE	OR	1	2752
BDEB	LEAD-ACID BATTERIES	AD	17	15548
BDEB	LEAD-ACID BATTERIES	AN	3	960
BDEB	LEAD-ACID BATTERIES	EE	6	2088
BDEB	LEAD-ACID BATTERIES	ER	286	21011076
BDEB	LEAD-ACID BATTERIES	HO	2	924
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	AD	1	12
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	AN	1	8
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	DP	3	200
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	ER	1	500
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	EW	1	200
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	HH	22	5704
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	HR	2	108
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	OE	5	317
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	SL	1	2
CWCM	ACIDIC OR ALKALINE WASTES - PH12.5	SO	2	108
CWCN	SPENT PLATING WASTES-FROM METAL-PLATING, ETC.	HH	1	917
EENU	EMPTY PESTICIDE CONTAINERS D,U LIST	OE	3	156
EENU	EMPTY PESTICIDE CONTAINERS D,U LIST	SL	8	492

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
EMRD	PESTICIDE WASTE MIXTURES/WATERS	HH	1	540
EMRD	PESTICIDE WASTE MIXTURES/WATERS	HO	1	24
EMRD	PESTICIDE WASTE MIXTURES/WATERS	OR	1	348
EPRD	TOXIC WASTES D,U LIST	HH	2	132
ETRC	TOXIC SPILL CLEANUP D,U LIST	AD	1	12
ETRC	TOXIC SPILL CLEANUP D,U LIST	HH	1	240
ETRC	TOXIC SPILL CLEANUP D,U LIST	HO	1	24
FFEF	PHOTOGRAPHIC SILVER RECOVERY CANNISTER	AD	2	60
FFEF	PHOTOGRAPHIC SILVER RECOVERY CANNISTER	ER	6	756
FFEF	PHOTOGRAPHIC SILVER RECOVERY CANNISTER	HH	1	12
FFEF	PHOTOGRAPHIC SILVER RECOVERY CANNISTER	HR	2	24
FWHF	PHOTOGRAPHIC WASTES-FIXANT SOLUTION	AN	1	1001
FWHF	PHOTOGRAPHIC WASTES-FIXANT SOLUTION	DP	3	300
FWHF	PHOTOGRAPHIC WASTES-FIXANT SOLUTION	HH	4	840
FWHF	PHOTOGRAPHIC WASTES-FIXANT SOLUTION	HR	1	500
FWHF	PHOTOGRAPHIC WASTES-FIXANT SOLUTION	OE	1	2502
FWNF	PHOTOGRAPHIC WASTES-NOT HW	DP	5	8619
FWNF	PHOTOGRAPHIC WASTES-NOT HW	HR	1	500
GFEO	FUEL FILTERS	AD	10	590
GFEO	FUEL FILTERS	AN	1	60
GFEO	FUEL FILTERS	AO	1	0
GFEO	FUEL FILTERS	ER	1	24
GFEO	FUEL FILTERS	EU	30	1260
GFEO	FUEL FILTERS	HH	1	60
GFEO	FUEL FILTERS	HR	1	12
GFEO	FUEL FILTERS	SL	1	36
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	AD	4	4082
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	AN	2	147
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	AO	1	68
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	ER	1	3396
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	EU	2	68260
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	HH	3	1149
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	HO	1	204
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	HR	11	22021
GPID	DISCARDED GASOLINE, DIESEL OR OTHER FUELS	OR	1	170
GWEE	PETROLEUM CONTACT WATERS- PCW	AD	13	36970
GWEE	PETROLEUM CONTACT WATERS- PCW	AN	1	5004

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
GWEE	PETROLEUM CONTACT WATERS- PCW	ER	1	4003
GWEE	PETROLEUM CONTACT WATERS- PCW	EU	39	249500
GWEE	PETROLEUM CONTACT WATERS- PCW	OP	1	2002
HBLT	DISTILATION BOTTOMS-HALOGENATED	HH	4	26712
HBLT	DISTILATION BOTTOMS-HALOGENATED	HR	1	1000
HFLO	DRY CLEANING FILTERS	HH	9	7180
HFLO	DRY CLEANING FILTERS	SL	1	36
HMLG	HALOGENATED SOLVENTS-CONTAIN CHLORINE/FLUORIN	BE	1	217
HMLG	HALOGENATED SOLVENTS-CONTAIN CHLORINE/FLUORIN	HH	3	2822
HPLU	SPENT FREON-113	HR	1	2000
HRLG	ABSORBENTS WITH HALOGENATED SOLVENTS	AD	1	12
HRLG	ABSORBENTS WITH HALOGENATED SOLVENTS	AN	1	60
HRLG	ABSORBENTS WITH HALOGENATED SOLVENTS	EC	1	60
HRLG	ABSORBENTS WITH HALOGENATED SOLVENTS	ER	1	60
HRLG	ABSORBENTS WITH HALOGENATED SOLVENTS	HH	3	2952
HRLG	ABSORBENTS WITH HALOGENATED SOLVENTS	SL	3	36
HWET	CONDENSATE H2O FROM DRY CLEANERS	BE	1	100
HWET	CONDENSATE H2O FROM DRY CLEANERS	HH	3	12
HWET	CONDENSATE H2O FROM DRY CLEANERS	OE	1	60
HWET	CONDENSATE H2O FROM DRY CLEANERS	TE	1	3002
IPHI	WASTE INKS - CONTAINS HEAVY METALS	AD	2	315
IPII	WASTE INKS - FLASHPOINT < 140 F	AD	1	120
IPII	WASTE INKS - FLASHPOINT < 140 F	DP	1	26
IPMI	WASTE INK-FLASHPOINT	HH	1	945
LDEB	FLUORESCENT LAMPS/DEVICES	AD	116	2913
LDEB	FLUORESCENT LAMPS/DEVICES	AN	26	363
LDEB	FLUORESCENT LAMPS/DEVICES	EE	543	27762621
LDEB	FLUORESCENT LAMPS/DEVICES	ER	8	456
LDEB	FLUORESCENT LAMPS/DEVICES	HH	2	79
LDEB	FLUORESCENT LAMPS/DEVICES	HO	67	491
LDEB	FLUORESCENT LAMPS/DEVICES	HQ	4	561
LDEB	FLUORESCENT LAMPS/DEVICES	HR	8	1500
LDEB	FLUORESCENT LAMPS/DEVICES	SD	1	7
LDEB	FLUORESCENT LAMPS/DEVICES	SL	40	246
LDEB	FLUORESCENT LAMPS/DEVICES	SO	6	292
MBHR	SLUDGES WITH HEAVY METALS	AD	1	1320

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
MBHR	SLUDGES WITH HEAVY METALS	AN	1	12
MBHR	SLUDGES WITH HEAVY METALS	ER	1	48
MBHR	SLUDGES WITH HEAVY METALS	HO	1	12
MBHR	SLUDGES WITH HEAVY METALS	SL	3	2.18E+08
MFHO	FILTERS WITH HEAVY METALS	AD	7	6168
MFHO	FILTERS WITH HEAVY METALS	AN	3	48
MFHO	FILTERS WITH HEAVY METALS	EU	4	528
MFHO	FILTERS WITH HEAVY METALS	HH	2	120
MFHO	FILTERS WITH HEAVY METALS	HQ	1	24
MFHO	FILTERS WITH HEAVY METALS	HR	2	48
MFHO	FILTERS WITH HEAVY METALS	SL	6	96
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	AD	29	9744
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	AN	5	696
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	EE	16	381700
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	ER	42	10324
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	HH	1	4800
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	HO	2	180
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	HR	1	24000
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	OR	2	36
MSEM	SOLIDS - SCRAP METALS, SOLDER, CIRCUIT BOARDS	SL	2	192
MSHS	DUST AND SOLIDS WITH HEAVY METALS	AN	1	0
MSHS	DUST AND SOLIDS WITH HEAVY METALS	ER	1	300
MSHS	DUST AND SOLIDS WITH HEAVY METALS	HH	2	636
MSHU	LEAD BACKING FROM XRAY,SCRAP AMALGAM	HR	1	0
MWHR	WASH, RINSE & OTHER WASTEWATER W HEAVY METALS	HH	1	2002
MWHR	WASH, RINSE & OTHER WASTEWATER W HEAVY METALS	HO	1	60
MWHR	WASH, RINSE & OTHER WASTEWATER W HEAVY METALS	HR	1	5504
NBLT	DIST. BOTTOMS-NON-HALOGENATED	HH	2	1200
NBLT	DIST. BOTTOMS-NON-HALOGENATED	SF	1	790
NPIA	MINERAL SPIRITS-PARTS CLEANER	AD	6	849
NPIA	MINERAL SPIRITS-PARTS CLEANER	AN	4	553
NPIA	MINERAL SPIRITS-PARTS CLEANER	AO	32	13577
NPIA	MINERAL SPIRITS-PARTS CLEANER	BE	1	79
NPIA	MINERAL SPIRITS-PARTS CLEANER	BO	1	395
NPIA	MINERAL SPIRITS-PARTS CLEANER	BU	1	1572094
NPIA	MINERAL SPIRITS-PARTS CLEANER	CU	1	60

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
NPIA	MINERAL SPIRITS-PARTS CLEANER	ER	1	1184
NPIA	MINERAL SPIRITS-PARTS CLEANER	EU	8	2303
NPIA	MINERAL SPIRITS-PARTS CLEANER	HH	36	27828
NPIA	MINERAL SPIRITS-PARTS CLEANER	HO	3	326
NPIA	MINERAL SPIRITS-PARTS CLEANER	HQ	1	197
NPIA	MINERAL SPIRITS-PARTS CLEANER	HR	76	62870
NPIA	MINERAL SPIRITS-PARTS CLEANER	OR	1	395
NPIA	MINERAL SPIRITS-PARTS CLEANER	SO	1	13
NPIG	NON-HALOGENATED SOLVENT-IGNITABLE LISTED ONLY	AD	1	1579
NPIG	NON-HALOGENATED SOLVENT-IGNITABLE LISTED ONLY	AO	4	1343
NPIG	NON-HALOGENATED SOLVENT-IGNITABLE LISTED ONLY	HH	5	7218
NPIG	NON-HALOGENATED SOLVENT-IGNITABLE LISTED ONLY	HO	1	79
NPIG	NON-HALOGENATED SOLVENT-IGNITABLE LISTED ONLY	HR	5	18400
NPLG	NON-HALOGENATED SOLVENT-TOX,REACT,ACUTE LISTED	HH	1	84
NPLG	NON-HALOGENATED SOLVENT-TOX,REACT,ACUTE LISTED	HO	1	79
NPLG	NON-HALOGENATED SOLVENT-TOX,REACT,ACUTE LISTED	SL	2	15
NPNA	NONHALOGENATED SOLVENTS-PURE HAZ LIQUIDS	HR	1	197
NRIG	ABSORBENTS W/IGNITABLE ONLY SOLVENT	SL	1	13
NRLG	ABSORBENTS WITH LISTED NONHALOGENATED SOLVENT	AN	1	144
NRLG	ABSORBENTS WITH LISTED NONHALOGENATED SOLVENT	EC	11	9288
NRLG	ABSORBENTS WITH LISTED NONHALOGENATED SOLVENT	HH	1	312
NRLG	ABSORBENTS WITH LISTED NONHALOGENATED SOLVENT	SL	8	268
OARD	OTHER TOXIC CHEMICALS-AEROSOL CANS - ETC.	SL	2	6
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	AD	1	240
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	AO	1	24
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	BO	1	12
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	HR	1	312
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	SD	1	12
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	SF	1	13200

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
OBOU	SLUDGES & SOLIDS WITH TC ORGANICS -ALSO SOILS	SO	1	12
OLED	OTHER CHEMICAL-NOT HAZ WASTE	AD	6	3424
OLED	OTHER CHEMICAL-NOT HAZ WASTE	AN	1	480
OLED	OTHER CHEMICAL-NOT HAZ WASTE	DP	3	4236
OLED	OTHER CHEMICAL-NOT HAZ WASTE	EE	1	12
OLED	OTHER CHEMICAL-NOT HAZ WASTE	ER	6	516
OLED	OTHER CHEMICAL-NOT HAZ WASTE	HH	6	6528
OLED	OTHER CHEMICAL-NOT HAZ WASTE	HO	3	672
OLED	OTHER CHEMICAL-NOT HAZ WASTE	HR	3	3456
OLED	OTHER CHEMICAL-NOT HAZ WASTE	SL	3	54
OLED	OTHER CHEMICAL-NOT HAZ WASTE	SO	1	12
OLIU	OTHER IGNITABLE WASTES	AD	4	144
OLIU	OTHER IGNITABLE WASTES	AN	1	12
OLIU	OTHER IGNITABLE WASTES	AO	1	6
OLIU	OTHER IGNITABLE WASTES	BE	1	12
OLIU	OTHER IGNITABLE WASTES	EE	1	12
OLIU	OTHER IGNITABLE WASTES	HH	22	8785
OLIU	OTHER IGNITABLE WASTES	HO	7	180
OLIU	OTHER IGNITABLE WASTES	HR	5	14532
OLIU	OTHER IGNITABLE WASTES	OR	1	3840
OLIU	OTHER IGNITABLE WASTES	SL	4	168
OLLD	OTHER TOXIC CHEMICALS-LAB PACK/MIXED-UNKNOWN	HR	1	24
OLMD	OTHER CHEMICAL LAB PACKED WASTE	AD	4	4500
OLMD	OTHER CHEMICAL LAB PACKED WASTE	HH	8	1392
OLMD	OTHER CHEMICAL LAB PACKED WASTE	HO	3	384
OLMD	OTHER CHEMICAL LAB PACKED WASTE	HR	1	12
OLMD	OTHER CHEMICAL LAB PACKED WASTE	RD	5	324
OPAD	ACUTE DISCARDED UNUSED OR OFF-SPEC CHEM	AD	2	30
OPAD	ACUTE DISCARDED UNUSED OR OFF-SPEC CHEM	ER	1	0
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	AD	11	43044
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	AN	3	40620
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	BE	1	0
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	EE	2	72
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	HH	11	2329

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	HO	6	492
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	HQ	1	12
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	HR	5	816
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	RD	7	300
OPLD	DISCARDED UNUSED OR OFF-SPEC COMMERCIAL CHEM	SL	1	12
OTAC	ACUTE CHEMICAL SPILL CLEANUP - P LIST	AD	2	18
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	AD	3	660
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	AN	3	1049
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	BE	4	208
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	EU	1	94
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	HH	17	1024887
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	HO	12	21028
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	HR	11	12128
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	OR	4	2249
PMIP	IGNITABLE PAINT WASTES - FLASHPOINT < 140 F	SL	1	14808
PMMP	PAINT WASTE-MIXED HW	AD	2	188
PMMP	PAINT WASTE-MIXED HW	AN	4	2570
PMMP	PAINT WASTE-MIXED HW	BE	1	94
PMMP	PAINT WASTE-MIXED HW	HH	11	32644
PMMP	PAINT WASTE-MIXED HW	HO	2	566
PMMP	PAINT WASTE-MIXED HW	SL	2	39
PPRD	PAINTS/COATINGS-PURE HAZ LIQUIDS	AD	1	94
PSHP	OTHER PAINT WASTES W/HEAVY METALS	AD	1	60
PSHP	OTHER PAINT WASTES W/HEAVY METALS	AN	2	72
PSHP	OTHER PAINT WASTES W/HEAVY METALS	HH	2	1680
PSHP	OTHER PAINT WASTES W/HEAVY METALS	SL	2	108
RDEB	RECHARGEABLE BATTERIES: PBACID,NICAD,HG,AG	AD	3	264
RDEB	RECHARGEABLE BATTERIES: PBACID,NICAD,HG,AG	EE	25	258196
RDEB	RECHARGEABLE BATTERIES: PBACID,NICAD,HG,AG	ER	18	4314
RDEB	RECHARGEABLE BATTERIES: PBACID,NICAD,HG,AG	HH	1	180
RDEB	RECHARGEABLE BATTERIES: PBACID,NICAD,HG,AG	HR	1	240
RDHB	RECHARGEABLE BATTERIES-DEVICES (BATTERY, LAMP, ET	EE	1	5
SBRT	SOLVENT DISTILLATION BOTTOMS	OR	1	600
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	AD	1	0

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	AO	2	900
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	ER	1	84
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	EU	1	420
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	HH	3	420
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	HR	2	1260
SMHA	AQUEOUS PARTS WASHER W/HEAVY METALS	OR	1	1260
SMIA	AQUEOUS PARTS WASHER W/IGNITABLE ONLY HW	HH	1	252
SMMA	AQUEOUS PARTS WASHER W/MIXED HW	AO	2	148
SMMA	AQUEOUS PARTS WASHER W/MIXED HW	HH	1	280
SMMA	AQUEOUS PARTS WASHER W/MIXED HW	HR	1	336
SMRA	SPENT SOLVENTS (MIX/OTHER)	AN	3	588
SMRA	SPENT SOLVENTS (MIX/OTHER)	AO	2	504
SMRA	SPENT SOLVENTS (MIX/OTHER)	HH	8	31536
SMRA	SPENT SOLVENTS (MIX/OTHER)	HO	2	102
SMRA	SPENT SOLVENTS (MIX/OTHER)	HR	5	6024
SPNA	AQUEOUS PARTS WASHER, NOT HW	AD	2	192
SPNA	AQUEOUS PARTS WASHER, NOT HW	AN	1	0
SPNA	AQUEOUS PARTS WASHER, NOT HW	AO	4	1720
SPNA	AQUEOUS PARTS WASHER, NOT HW	EU	5	1752
SPNA	AQUEOUS PARTS WASHER, NOT HW	HH	1	3168
SPNA	AQUEOUS PARTS WASHER, NOT HW	HR	1	480
SPNA	AQUEOUS PARTS WASHER, NOT HW	OR	2	12672
SPNA	AQUEOUS PARTS WASHER, NOT HW	TP	1	8640
SRIG	RAGS WITH IGNITABLE ONLY SOLVENTS	AD	3	276
SRIG	RAGS WITH IGNITABLE ONLY SOLVENTS	EC	5	1232
SRIG	RAGS WITH IGNITABLE ONLY SOLVENTS	HO	1	12
SRIG	RAGS WITH IGNITABLE ONLY SOLVENTS	SL	3	42
TDEB	MERCURY CONTAINING DEVICES (THERMOSTATS,ETC.)	AD	1	12
TDEB	MERCURY CONTAINING DEVICES (THERMOSTATS,ETC.)	EE	2	48
TDEB	MERCURY CONTAINING DEVICES (THERMOSTATS,ETC.)	ER	2	36
TDEB	MERCURY CONTAINING DEVICES (THERMOSTATS,ETC.)	HH	4	96
TDEB	MERCURY CONTAINING DEVICES (THERMOSTATS,ETC.)	HR	2	3258
UBNE	OILY SLUDGE (FROM SUMP PUMP OUTS)	EU	2	1200
UCNO	CRUSHED OIL FILTERS	AN	1	240
UCNO	CRUSHED OIL FILTERS	EU	34	854195

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
UKEH	ABSORBENTS CONTAMINATED W/OIL	AD	6	396
UKEH	ABSORBENTS CONTAMINATED W/OIL	AN	1	24
UKEH	ABSORBENTS CONTAMINATED W/OIL	EC	22	12694
UKEH	ABSORBENTS CONTAMINATED W/OIL	ER	2	84240
UKEH	ABSORBENTS CONTAMINATED W/OIL	EU	23	167492
UKEH	ABSORBENTS CONTAMINATED W/OIL	HH	2	398
UKEH	ABSORBENTS CONTAMINATED W/OIL	SD	2	102
UKEH	ABSORBENTS CONTAMINATED W/OIL	SL	44	2448
UMEO	USED OIL (AND FILTERS)-MIXED LIQUIDS	EU	1	419
UOEO	USED OILCOLLECTED BY PUOCC FACS	EU	63	164
UPEM	METALWORKING (CUTTING) OILS	AN	1	12
UPEM	METALWORKING (CUTTING) OILS	AO	1	914
UPEM	METALWORKING (CUTTING) OILS	ER	1	1200
UPEM	METALWORKING (CUTTING) OILS	EU	3	7283
UPEM	METALWORKING (CUTTING) OILS	HO	1	91
UPEM	METALWORKING (CUTTING) OILS	SL	1	12
UPEO	USED OILS & OTHER LUBRICANTS	AD	18	10388
UPEO	USED OILS & OTHER LUBRICANTS	AN	11	4308
UPEO	USED OILS & OTHER LUBRICANTS	BU	1	2107235
UPEO	USED OILS & OTHER LUBRICANTS	EE	4	4206
UPEO	USED OILS & OTHER LUBRICANTS	ER	3	55908
UPEO	USED OILS & OTHER LUBRICANTS	EU	338	12272232
UPEO	USED OILS & OTHER LUBRICANTS	HO	4	1111
UPEO	USED OILS & OTHER LUBRICANTS	HR	1	120
UPEO	USED OILS & OTHER LUBRICANTS	OR	3	4298
UREH	RAGS WITH OIL	EC	129	53238
UREH	RAGS WITH OIL	EU	2	840
UREH	RAGS WITH OIL	SL	6	744
UREH	RAGS WITH OIL	SO	1	12
UREH	RAGS WITH OIL	TO	1	60
UUNO	UNCRUSHED OIL FILTERS	AD	14	1368
UUNO	UNCRUSHED OIL FILTERS	AN	4	108
UUNO	UNCRUSHED OIL FILTERS	EE	1	120
UUNO	UNCRUSHED OIL FILTERS	ER	7	2052
UUNO	UNCRUSHED OIL FILTERS	EU	193	2205986
UUNO	UNCRUSHED OIL FILTERS	HH	1	158
UUNO	UNCRUSHED OIL FILTERS	HO	2	72

Leon County Small Quantity Generator Waste Types, January 1, 2009 – December 31, 2013

Waste	Description	Disposal Method	Count of Facilities	Pounds
UUNO	UNCRUSHED OIL FILTERS	HR	2	2611
UUNO	UNCRUSHED OIL FILTERS	SL	7	144
UWNE	OILY WASTE WATER	AD	8	51240
UWNE	OILY WASTE WATER	AN	4	1501
UWNE	OILY WASTE WATER	AO	2	1101
UWNE	OILY WASTE WATER	DS	2	2002
UWNE	OILY WASTE WATER	ER	1	2002
UWNE	OILY WASTE WATER	EU	40	2335725
UWNE	OILY WASTE WATER	EW	8	380505
UWNE	OILY WASTE WATER	HH	4	35029
UWNE	OILY WASTE WATER	HR	2	2702
UWNE	OILY WASTE WATER	SL	1	10008
XSVU	REACTIVE WASTES-SOLIDS	AD	2	18
XSVU	REACTIVE WASTES-SOLIDS	AN	1	2
XSVU	REACTIVE WASTES-SOLIDS	HH	7	1284
XSVU	REACTIVE WASTES-SOLIDS	HR	1	108
XWVU	REACTIVE WASTES-WASTEWATER	HR	1	1080
			606	0
	Total:			292,742,100

APPENDIX G:

Leon County Wildfire Risk
Summary Report for Leon County (2014)

Southern Wildfire Risk Assessment Summary Report

Leon County

Report was generated using
www.SouthernWildfireRisk.com

Report version: 3.0

Report generated: 8/12/2014

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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.SouthWildfireRisk.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
Wildfire Ignition Density	Likelihood of a wildfire starting based on historical ignition patterns
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
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 County** project area, it is estimated that **264,807** people or **94 percent** of the total project area population (281,779) 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.

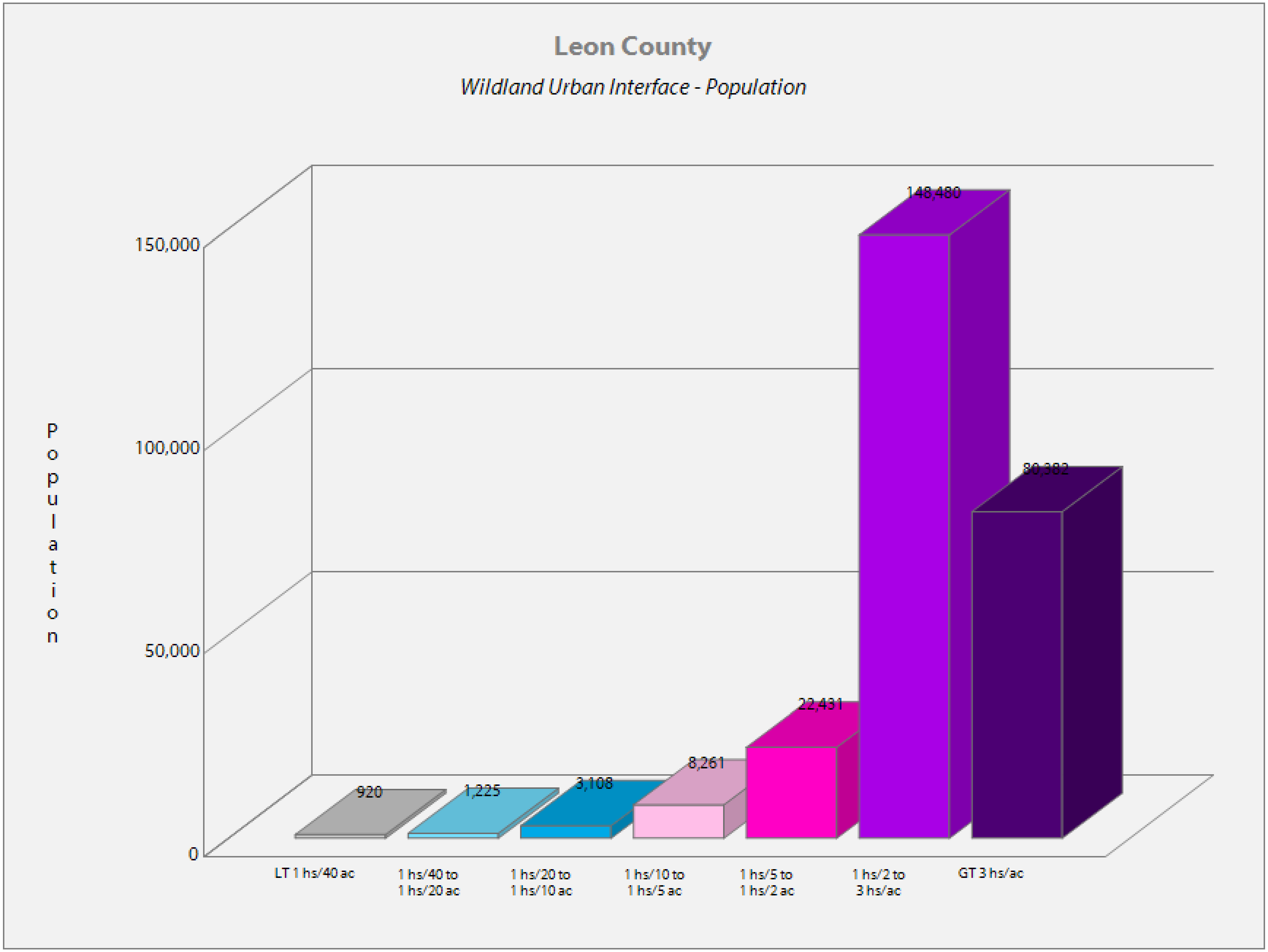
In the past, conventional wildland urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources do not provide the level of detail for defining population living in the wildland as needed by Southern state WUI specialists and local fire protection agencies.

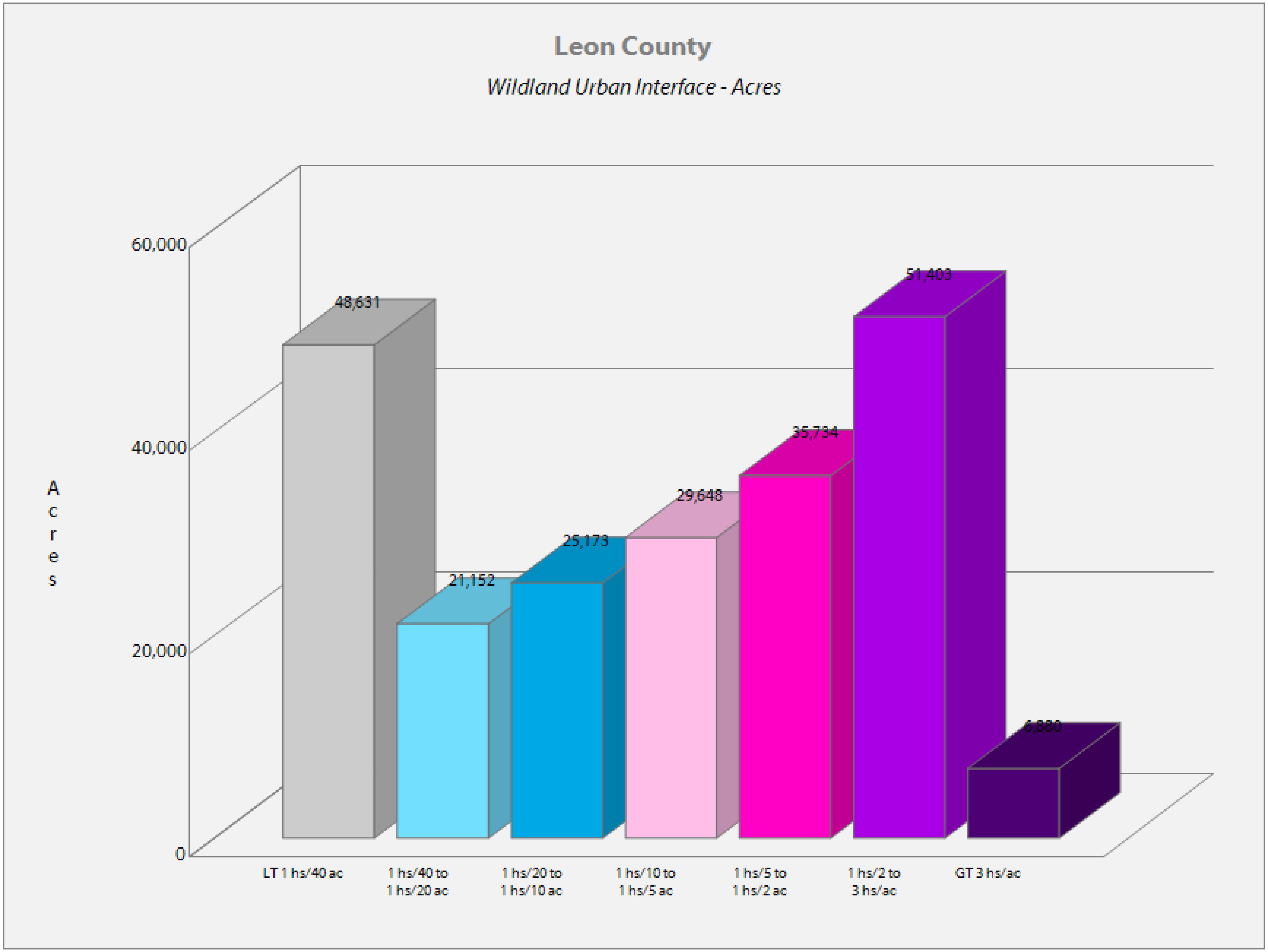
The new SWRA WUI 2012 dataset is derived using advanced modeling techniques based on the SWRA Where People Live (housing density) dataset and 2012 LandScan population count data available from the Department of Homeland Security, HSIP Freedom Data Set. WUI is simply a subset of the Where People Live 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.

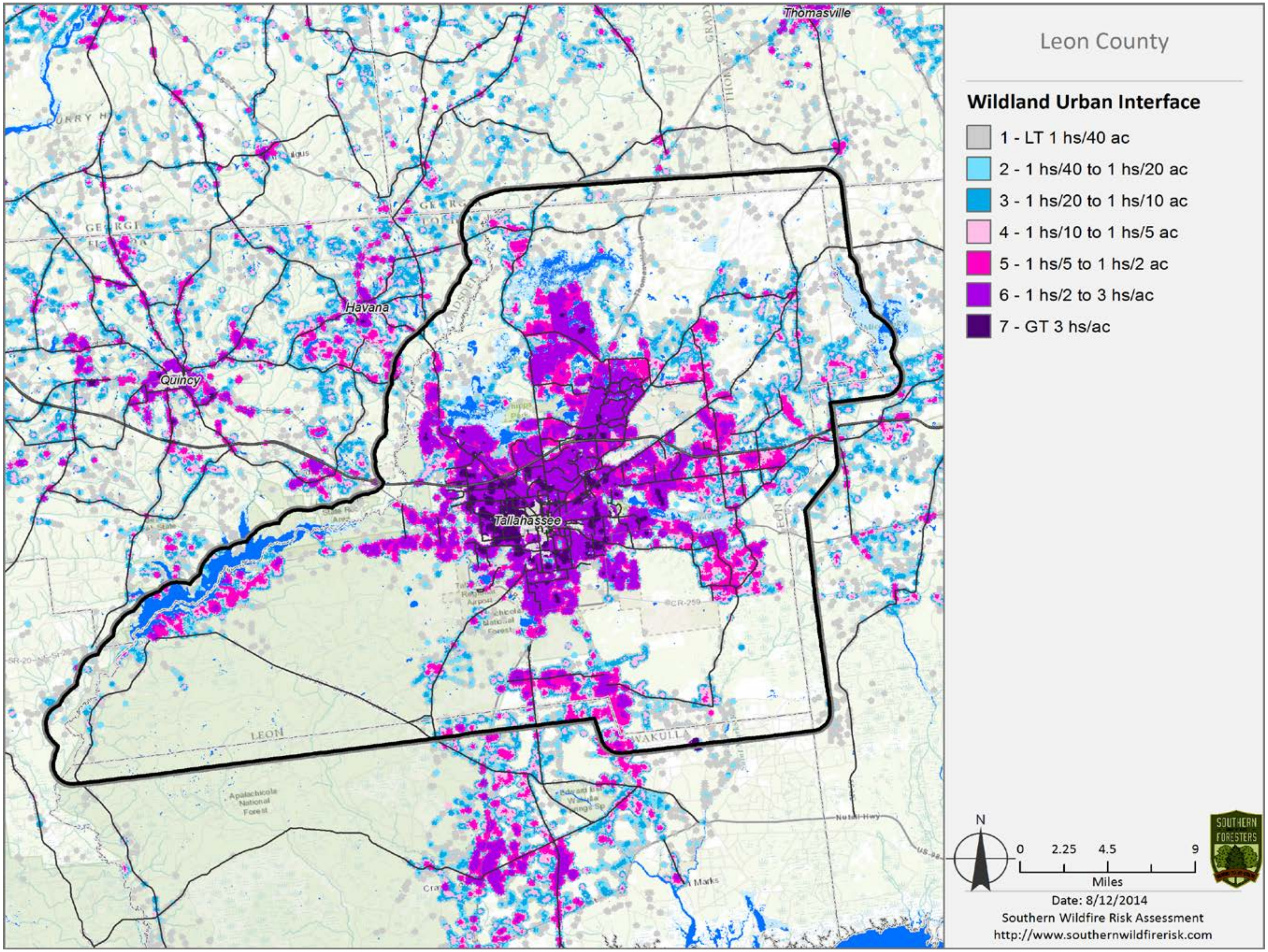
Data is modeled at a 30-meter cell resolution, which is consistent with other SWRA layers. The following table shows the total population for each WUI area within the project area.

WUI – Population and Acres

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
LT 1hs/40ac	920	0.3%	48,631	22.2%
1hs/40ac to 1hs/20ac	1,225	0.5%	21,152	9.7%
1hs/20ac to 1hs/10ac	3,108	1.2%	25,173	11.5%
1hs/10ac to 1hs/5ac	8,261	3.1%	29,648	13.6%
1hs/5ac to 1hs/2ac	22,431	8.5%	35,734	16.3%
1hs/2ac to 3hs/1ac	148,480	56.1%	51,403	23.5%
GT 3hs/1ac	80,382	30.4%	6,880	3.1%
Total	**264,807**	**100.0%**	**218,621**	**100.0%**


Leon County
Wildland Urban Interface - Population
Population
150,000
100,000
50,000
0
920
1,225
3,108
8,261
22,431
148,480
80,382
LT 1 hs/40 ac
1 hs/40 to 1 hs/20 ac
1 hs/20 to 1 hs/10 ac
1 hs/10 to 1 hs/5 ac
1 hs/5 to 1 hs/2 ac
1 hs/2 to 3 hs/ac
GT 3 hs/ac


Leon County
Wildland Urban Interface - Acres
60,000
40,000
20,000
0
Acres
48,631
21,152
25,173
29,648
35,734
51,403
6,880
LT 1 hs/40 ac
1 hs/40 to 1 hs/20 ac
1 hs/20 to 1 hs/10 ac
1 hs/10 to 1 hs/5 ac
1 hs/5 to 1 hs/2 ac
1 hs/2 to 3 hs/ac
GT 3 hs/ac



Leon County
Wildland Urban Interface
1 - LT 1 hs/40 ac
2 - 1 hs/40 to 1 hs/20 ac
3 - 1 hs/20 to 1 hs/10 ac
4 - 1 hs/10 to 1 hs/5 ac
5 - 1 hs/5 to 1 hs/2 ac
6 - 1 hs/2 to 3 hs/ac
7 - GT 3 hs/ac
Thomasville
Havana
Quincy
Tallahassee
LEON
WAKULLA
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
http://www.southernwildfirerisk.com
SOUTHERN FORESTERS

WUI Risk Index

Description

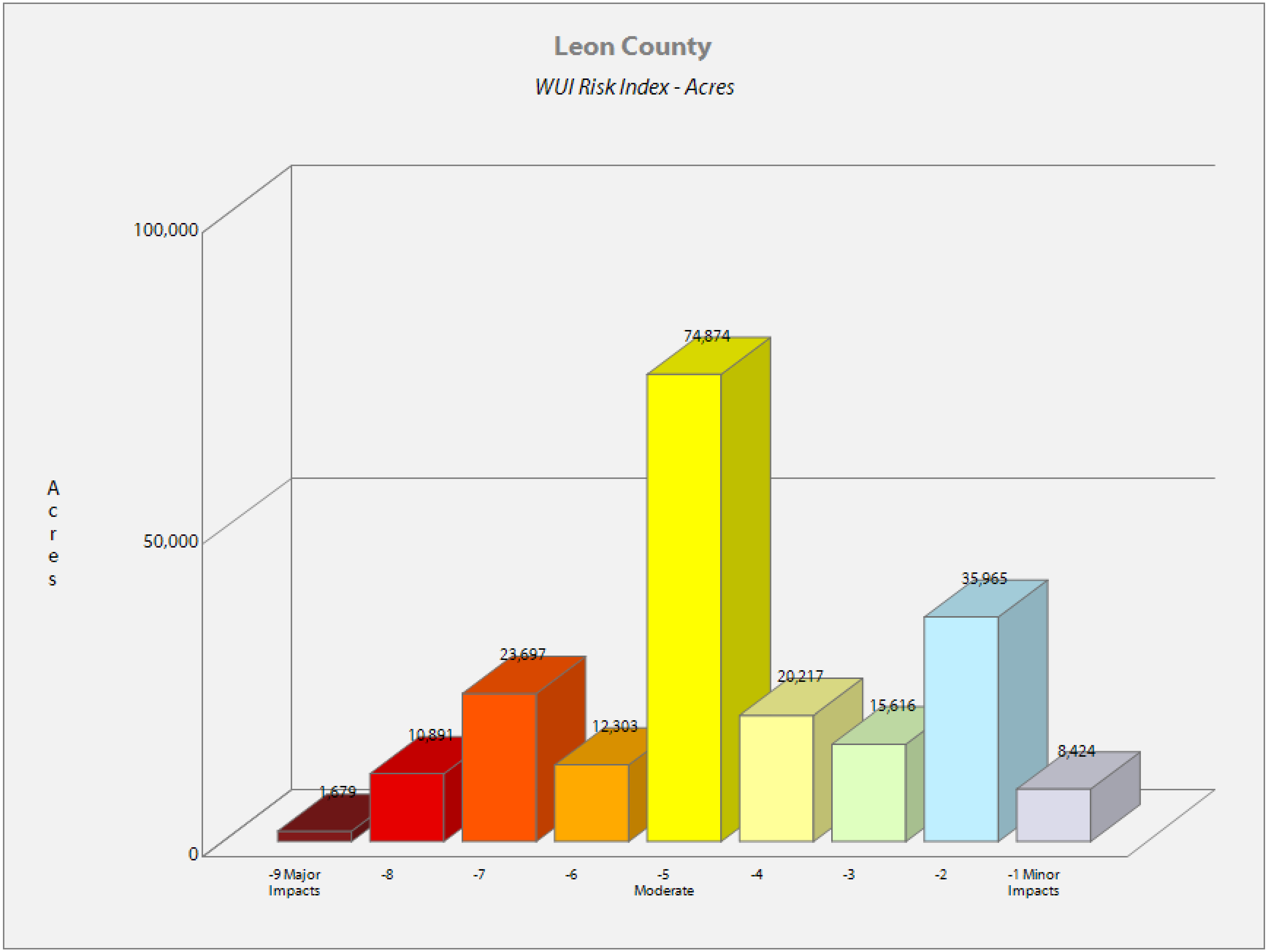
The Wildland Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes.

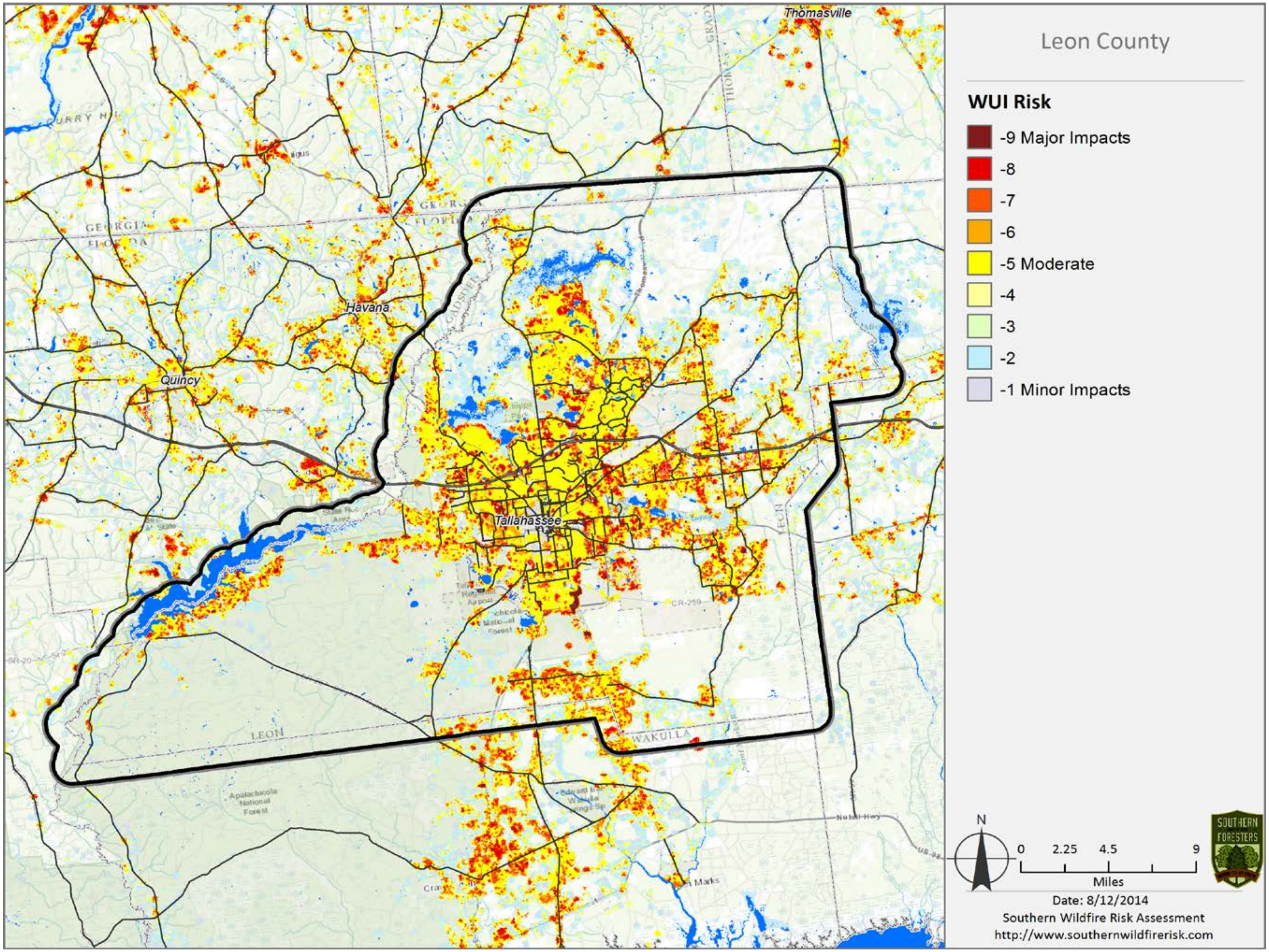
The WUI Risk Rating is derived using a Response Function modeling approach. Response functions are a method of assigning a net change in the value to a *resource* or *asset* based on susceptibility to fire at different intensity levels, such as flame length. The range of values is from -1 to -9, with -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	1,679	0.8%
-8	10,891	5.3%
-7	23,697	11.6%
-6	12,303	6.0%
-5 Moderate	74,874	36.8%
-4	20,217	9.9%
-3	15,616	7.7%
-2	35,965	17.7%
-1 Minor Impacts	8,424	4.1%
Total	**203,666**	**100.0%**


Leon County
WUI Risk Index - Acres
100,000
50,000
0
Acres
74,874
35,965
23,697
20,217
15,616
12,303
10,891
8,424
1,679
-9 Major Impacts
-8
-7
-6
-5 Moderate
-4
-3
-2
-1 Minor Impacts


Leon County
WUI Risk
-9 Major Impacts
-8
-7
-6
-5 Moderate
-4
-3
-2
-1 Minor Impacts
Thomasville
Havana
Quincy
Tallahassee
LEON
WAKULLA
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
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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.

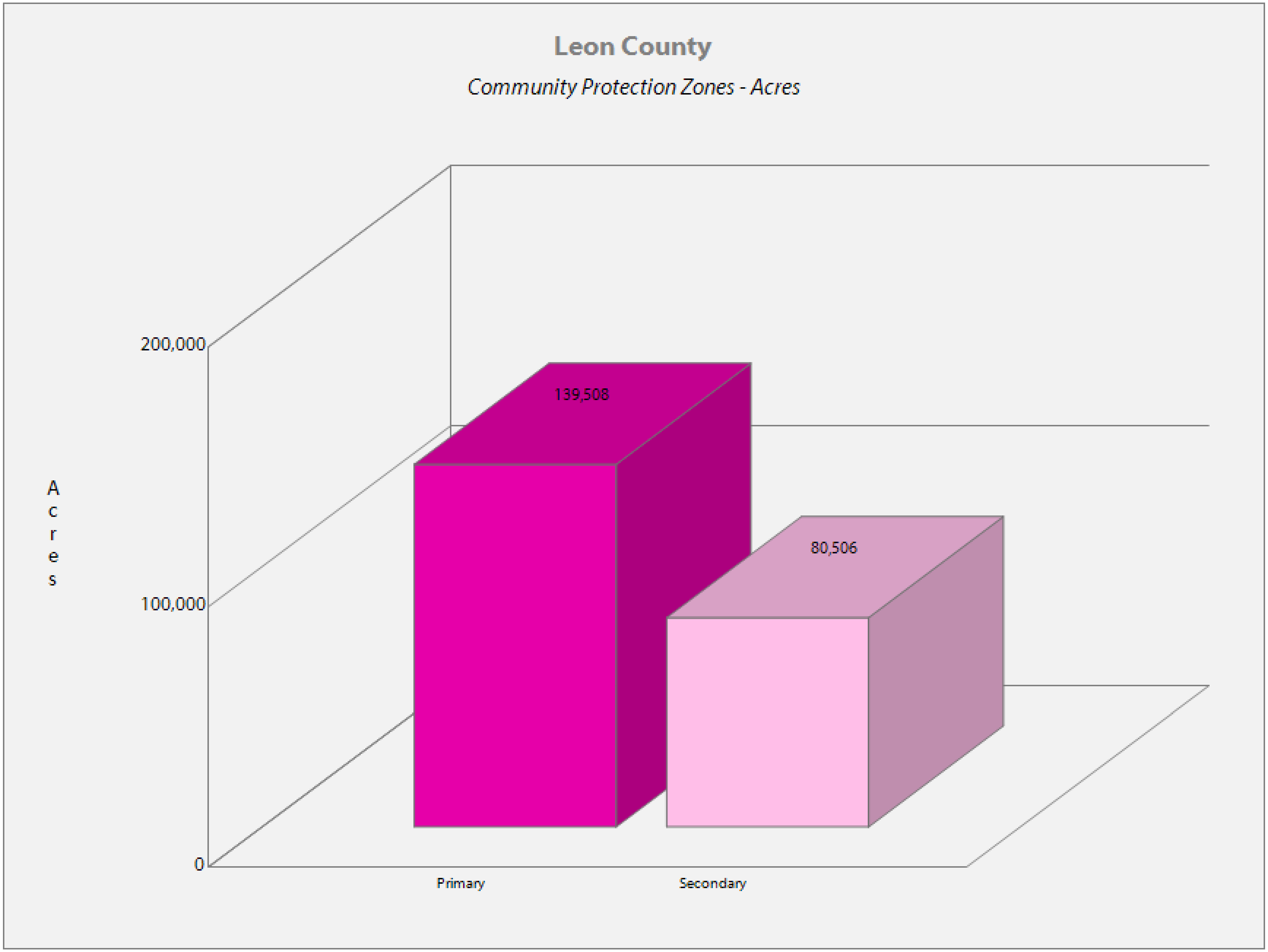
Secondary CPZs represent a variable width buffer around populated areas that are within a 2-hour fire spread distance. Accordingly, CPZs will extend farther in areas where rates of spread are greater and less in areas where minimal rate of spread potential exists. Secondary CPZ boundaries inherently incorporate fire behavior conditions.

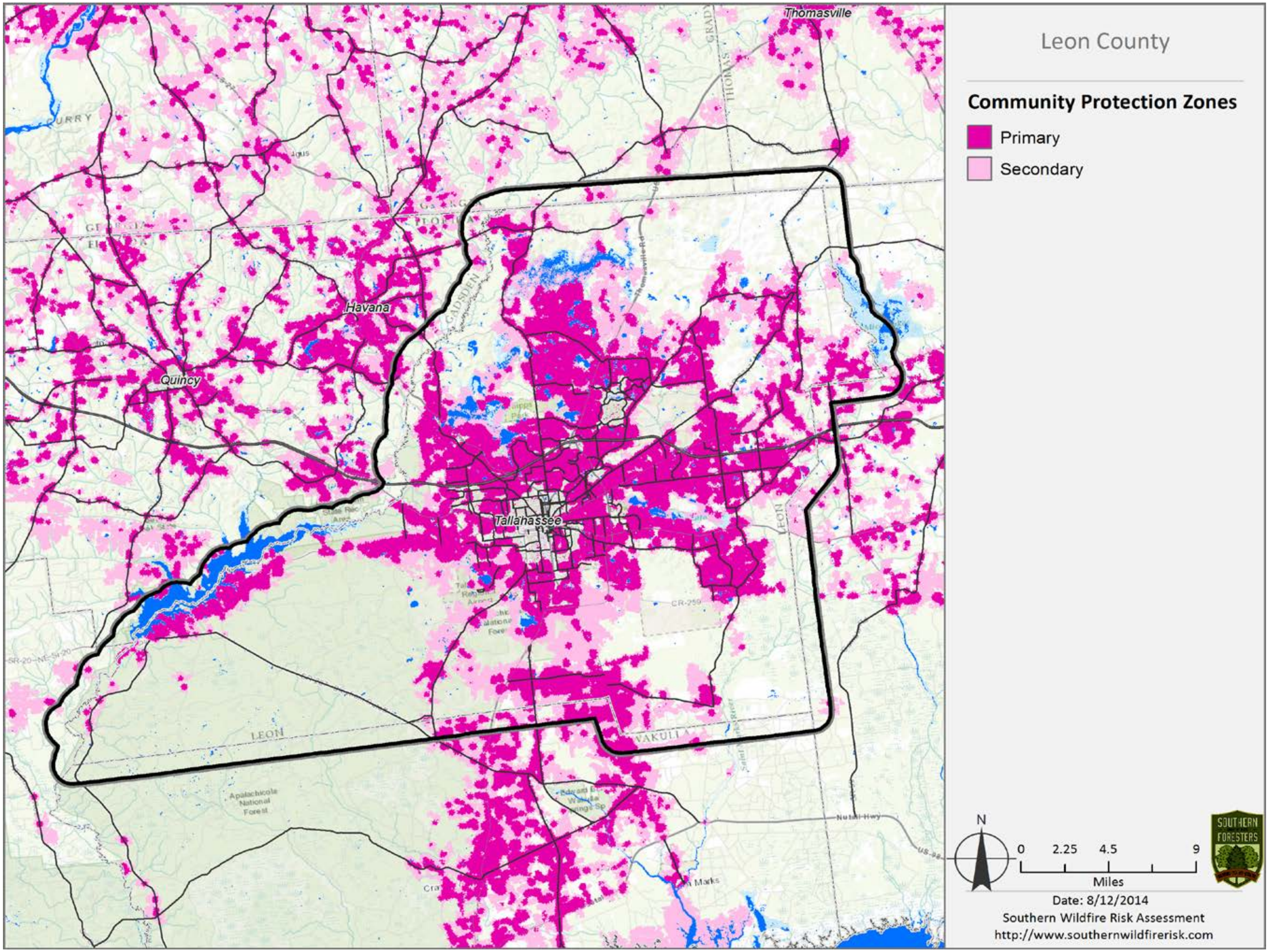
Primary CPZs reflect areas with a predefined housing density, such as greater than 1 house per 20 acres. Secondary CPZs are the areas around Primary CPZs within a 2 hour fire spread distance.

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.

Community Protection Zones - Acres

Class	Acres	Percent
Primary	139,508	63.4%
Secondary	80,506	36.6%
Total	**220,013**	**100.0%**


Leon County
Community Protection Zones - Acres
200,000
100,000
0
Acres
139,508
80,506
Primary
Secondary


Thomasville
Havana
Quincy
Tallahassee
LEON
WAKULLA
Leon County
Community Protection Zones
Primary
Secondary
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
http://www.southernwildfirerisk.com

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).

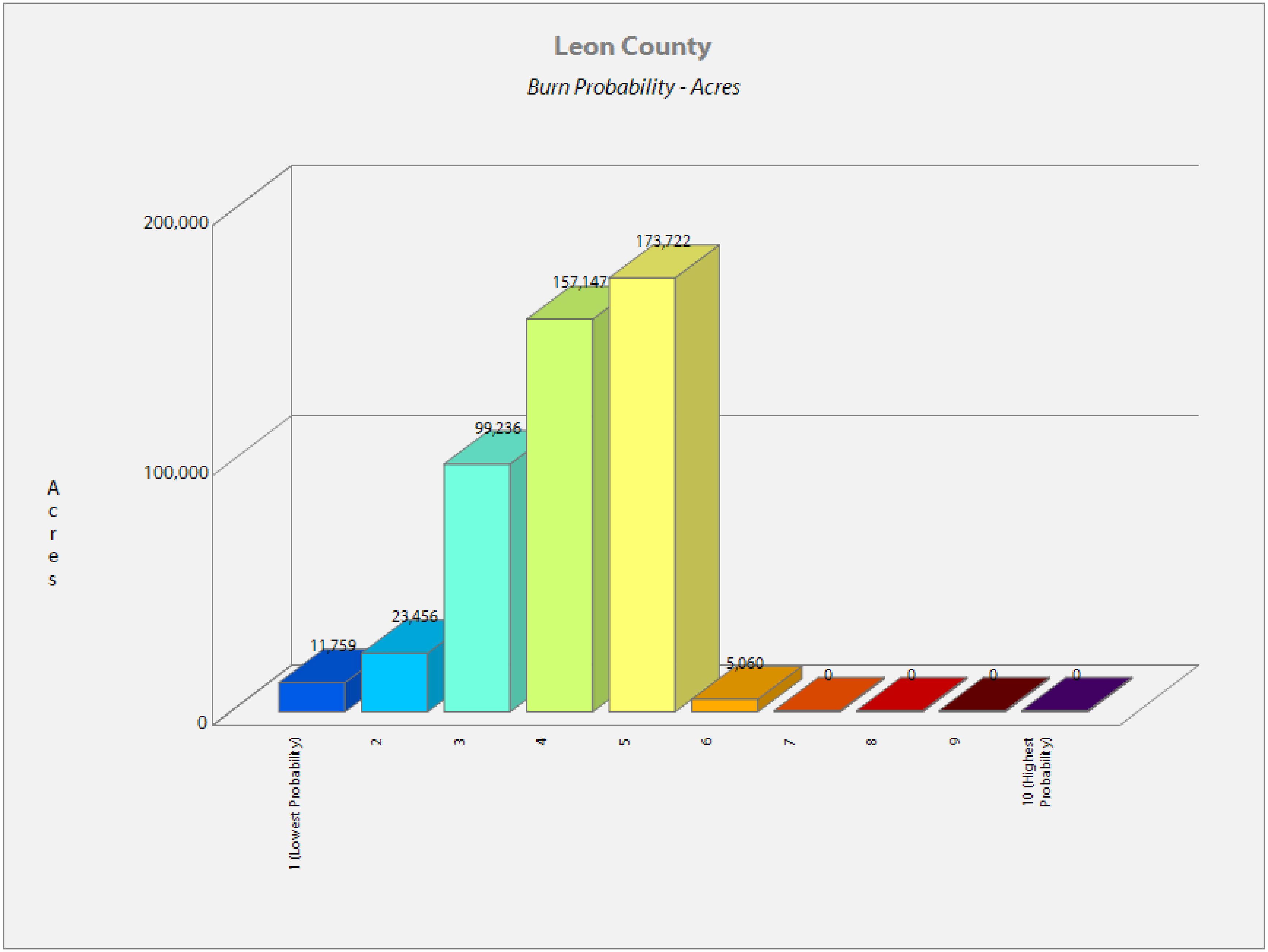
Please refer to the metadata available for this dataset for a detailed description of the data processing methods, assumptions and references that pertain to the development of this data. This information is available from the USFS Missoula Fire Sciences Laboratory.

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.

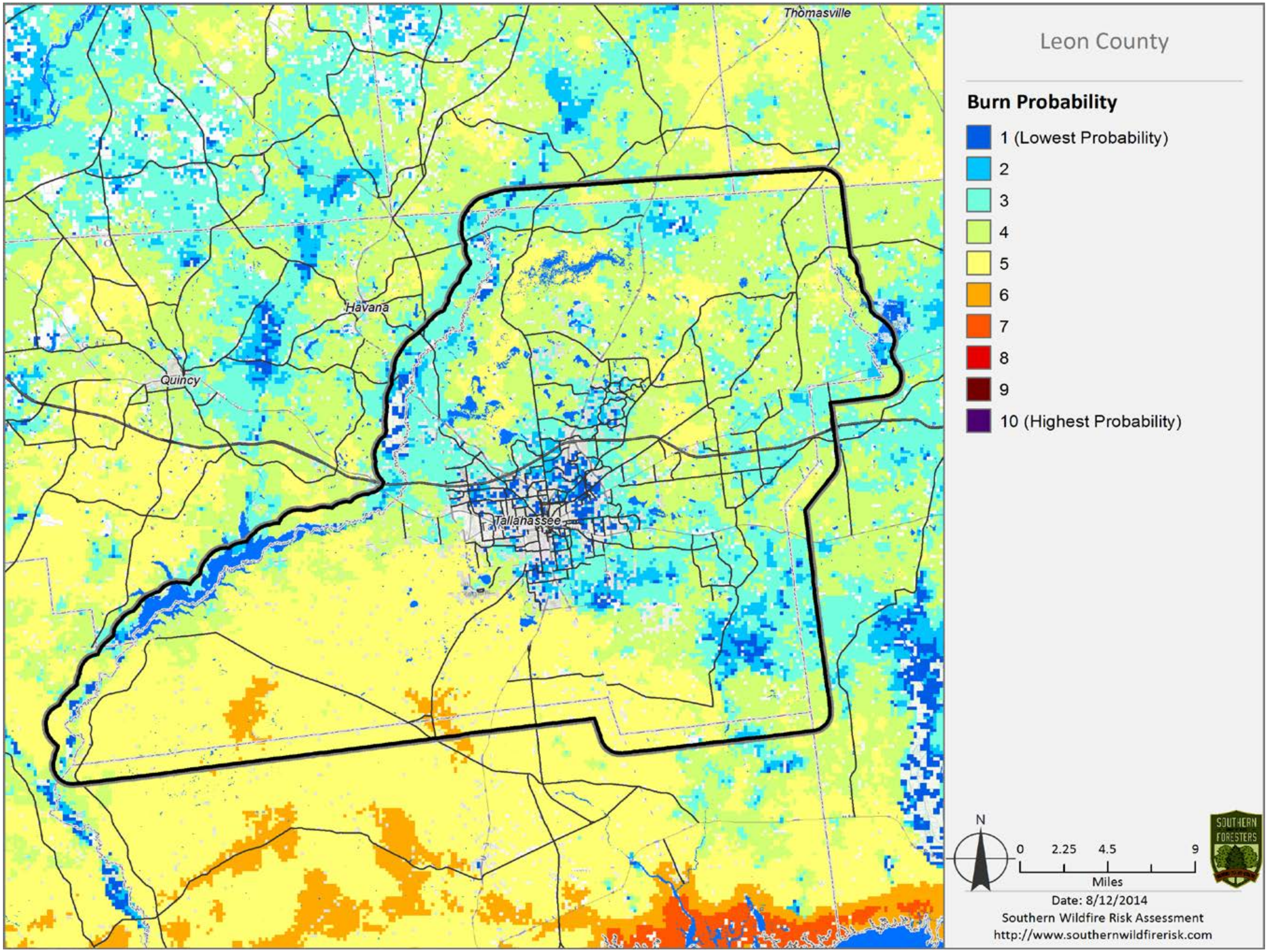
Burn Probability replaces the Wildland Fire Susceptibility Index (WFSI) layer developed in the original SWRA project completed in 2005.

Burn Probability - Acres

Class	Acres	Percent
1	11,759	2.5%
2	23,456	5.0%
3	99,236	21.1%
4	157,147	33.4%
5	173,722	36.9%
6	5,060	1.1%
7	0	0.0%
8	0	0.0%
9	0	0.0%
10	0	0.0%
Total	**470,380**	**100.0%**



Leon County
Burn Probability - Acres
200,000
100,000
0
Acres
11,759
23,456
99,236
157,147
173,722
5,060
0
0
0
0
1 (Lowest Probability)
2
3
4
5
6
7
8
9
10 (Highest Probability)


Thomasville
Havana
Quincy
Tallahassee
Leon County
Burn Probability
1 (Lowest Probability)
2
3
4
5
6
7
8
9
10 (Highest Probability)
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
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Wildfire Behavior Outputs

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 there 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

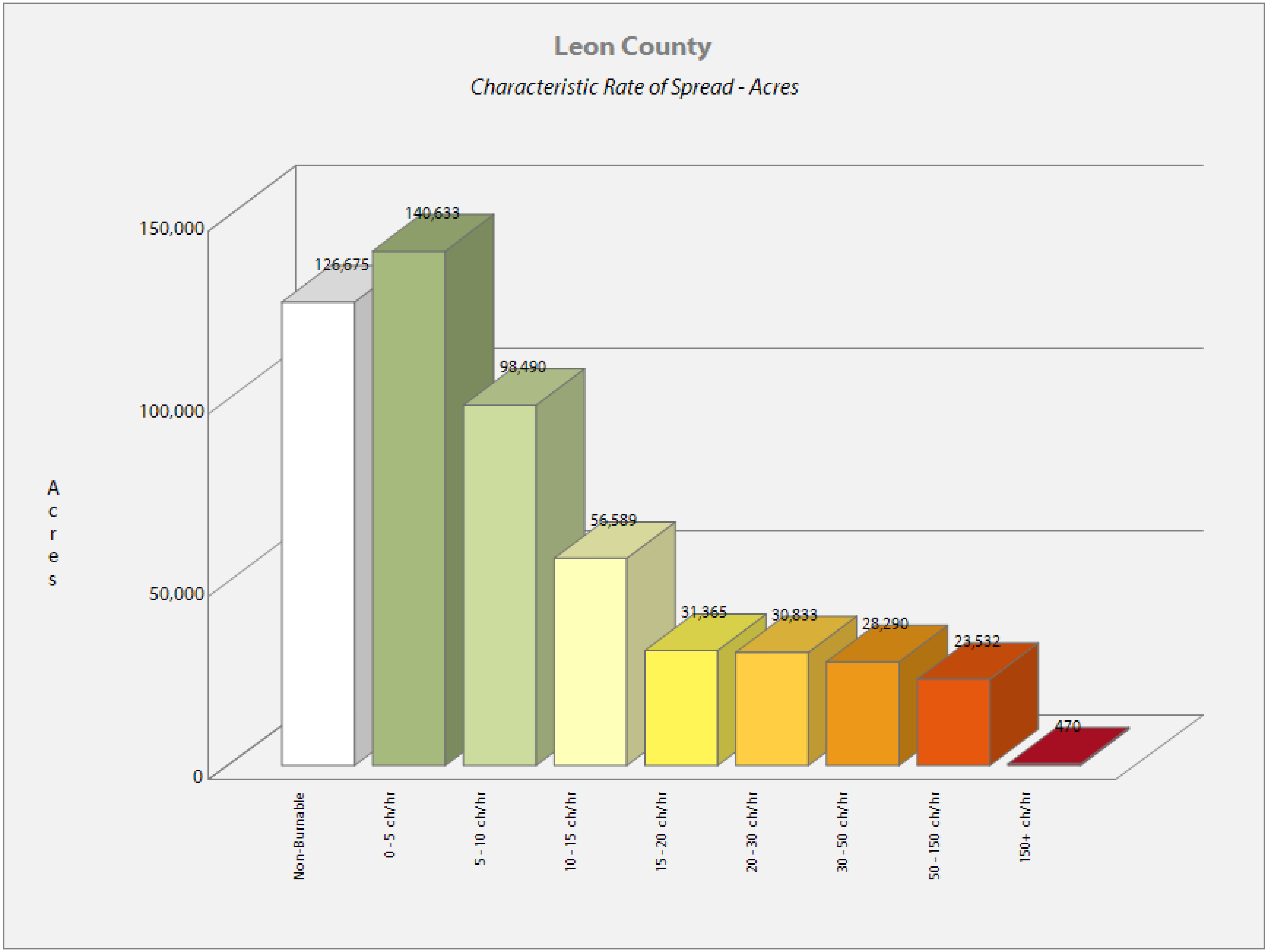
Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (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.

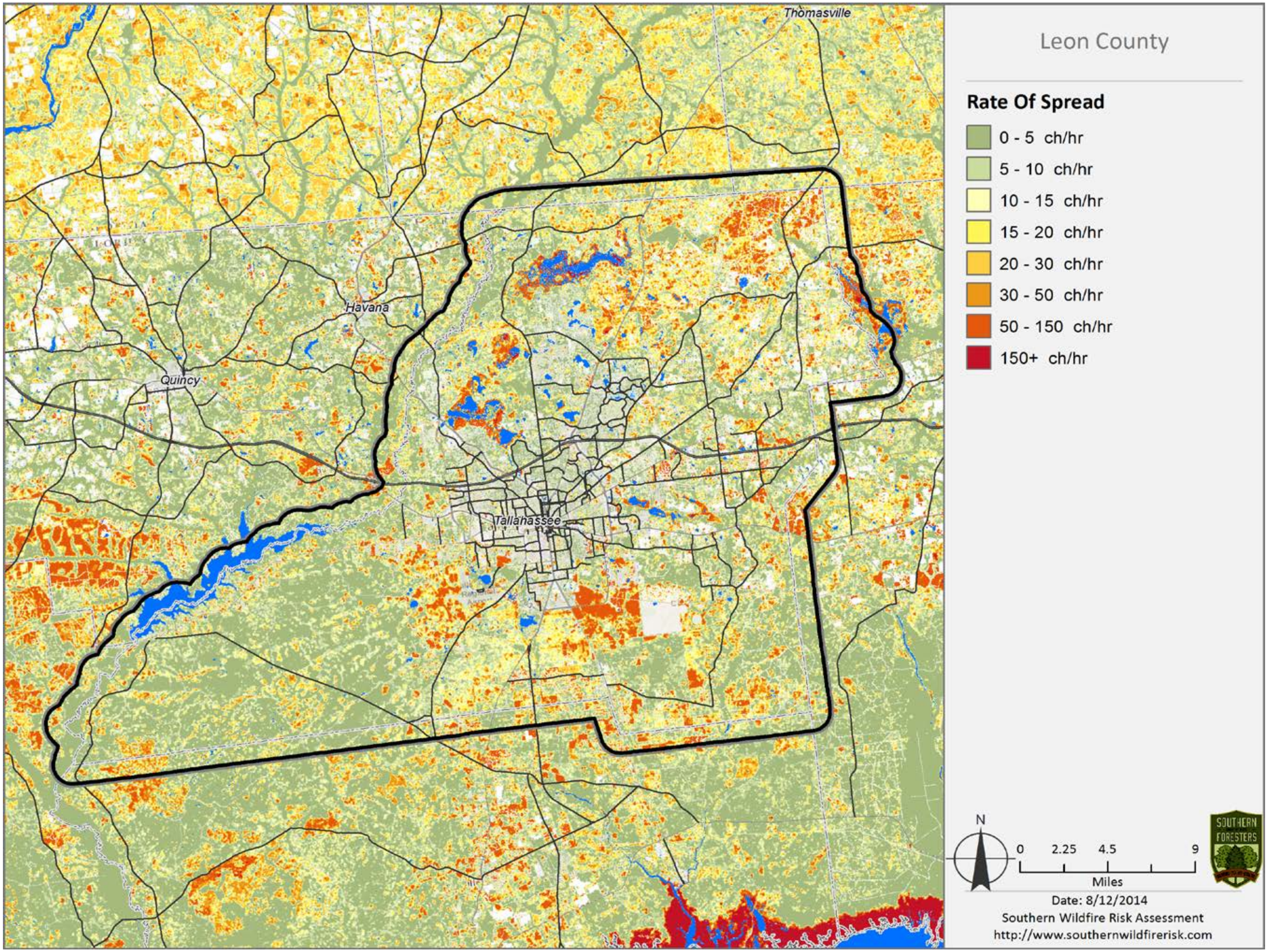
Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather 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.

Characteristic Rate of Spread – Acres

Rate of Spread	Acres	Percent
Non-Burnable	126,675	23.6%
0 - 5 (ch/hr)	140,633	26.2%
5 - 10 (ch/hr)	98,490	18.3%
10 – 15 (ch/hr)	56,589	10.5%
15 - 20 (ch/hr)	31,365	5.8%
20 - 30 (ch/hr)	30,833	5.7%
30 - 50 (ch/hr)	28,290	5.3%
50 - 150 (ch/hr)	23,532	4.4%
150 + (ch/hr)	470	0.1%
Total	**536,876**	**100.0%**


Leon County
Characteristic Rate of Spread - Acres
150,000
100,000
50,000
0
Acres
126,675
140,633
98,490
56,589
31,365
30,833
28,290
23,532
470
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



Leon County
Rate Of Spread
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
Thomasville
Havana
Quincy
Tallahassee
N
0 2.25 4.5 9
Miles
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Characteristic Flame Length

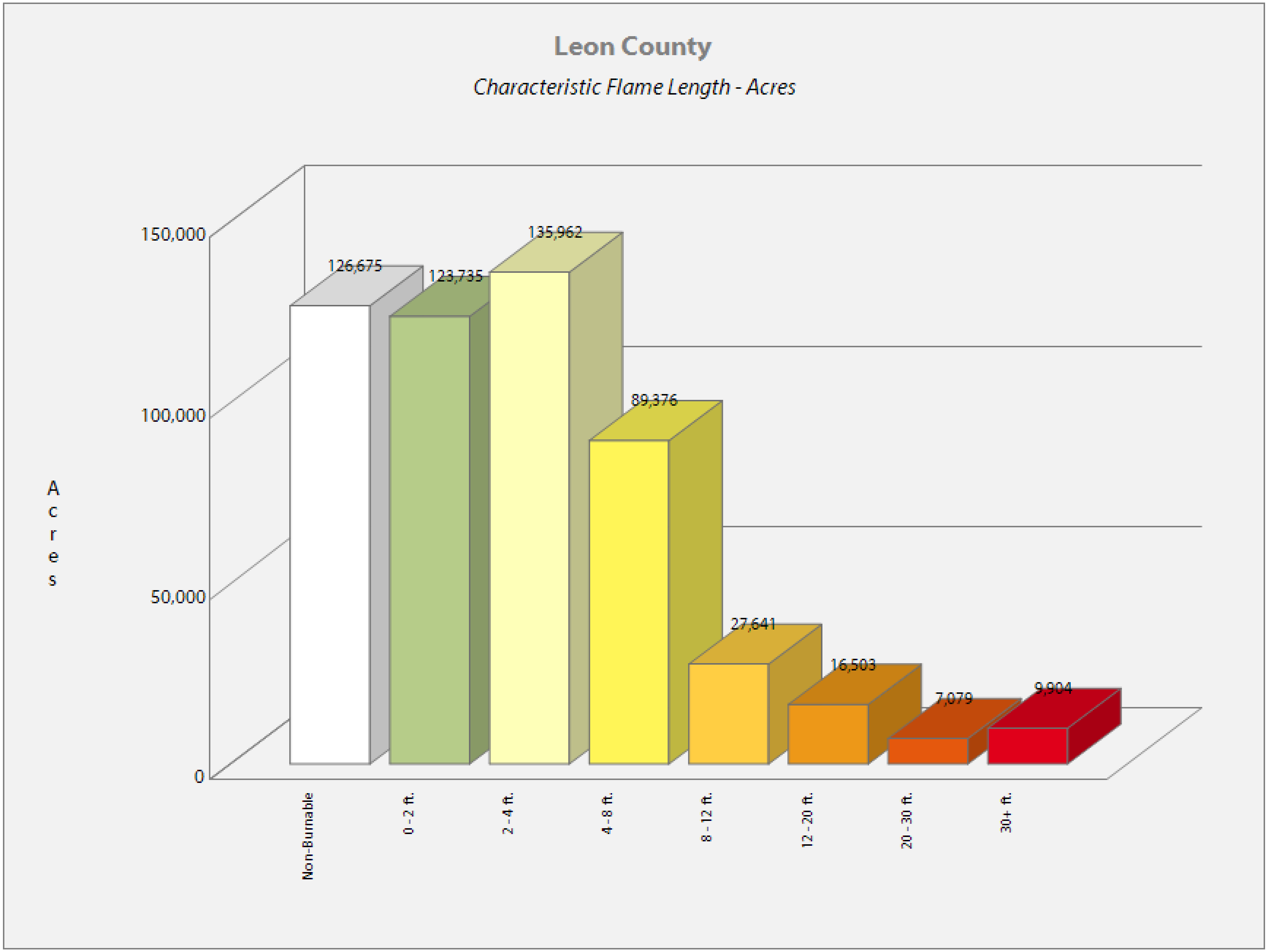
Characteristic Flame Length is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally 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.

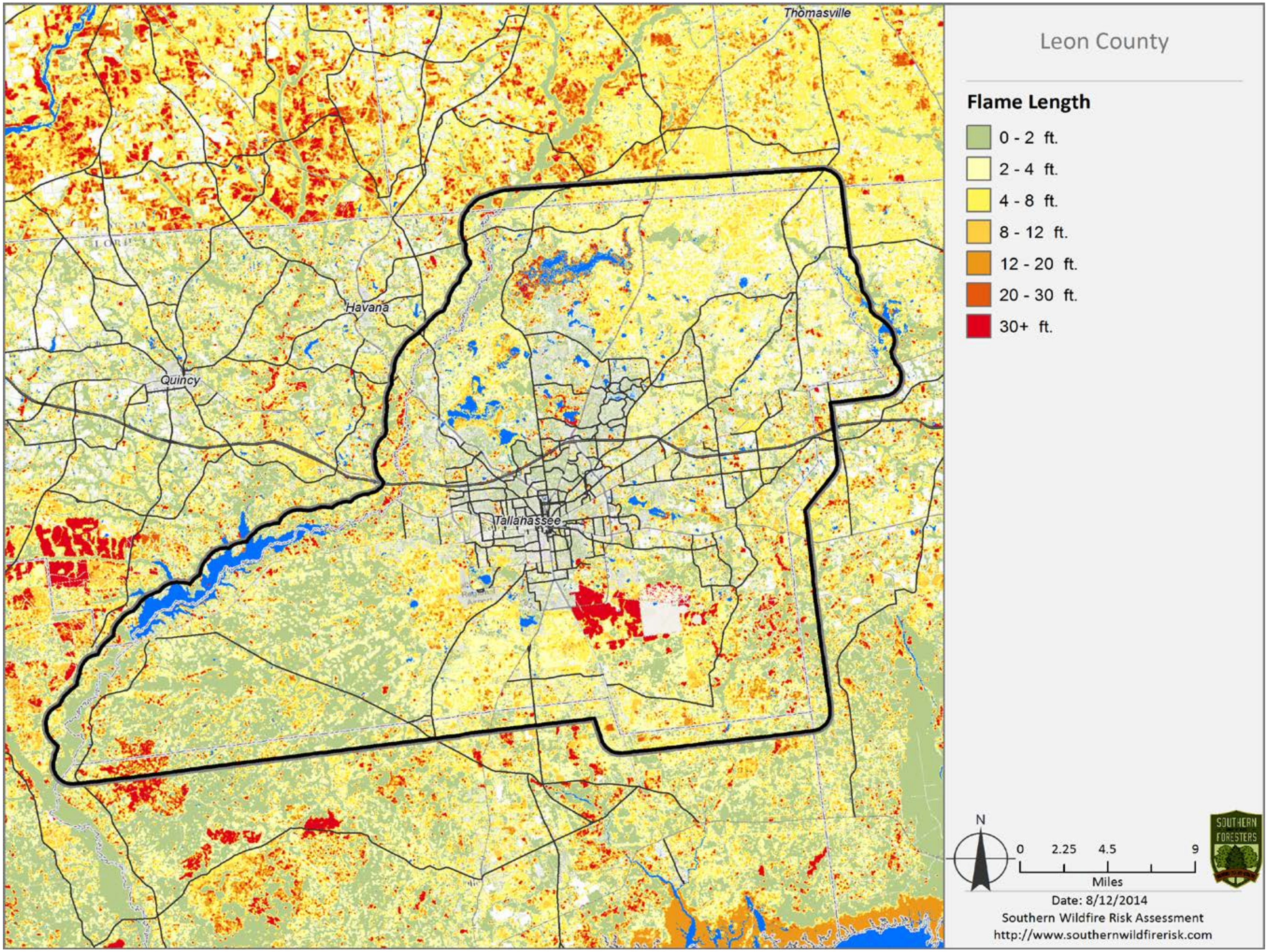
For all Southern states, except Florida and Texas, this dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. For Texas, the 2010 Texas risk update data is portrayed. For Florida, the 2010 Florida risk assessment update data is shown.

Characteristic Flame Length – Acres

Flame Length	Acres	Percent
Non-Burnable	126,675	23.6%
0 - 2 ft	123,735	23.0%
2 - 4 ft	135,962	25.3%
4 - 8 ft	89,376	16.6%
8 - 12 ft	27,641	5.1%
12 - 20 ft	16,503	3.1%
20 - 30 ft	7,079	1.3%
30 + ft	9,904	1.8%
Total	**536,876**	**100.0%**



Leon County
Characteristic Flame Length - Acres
150,000
100,000
50,000
0
Acres
126,675
123,735
135,962
89,376
27,641
16,503
7,079
9,904
Non-Burnable
0 - 2 ft.
2 - 4 ft.
4 - 8 ft.
8 - 12 ft.
12 - 20 ft.
20 - 30 ft.
30+ ft.


Thomasville
Havana
Quincy
Tallahassee
Leon County
Flame Length
0 - 2 ft.
2 - 4 ft.
4 - 8 ft.
8 - 12 ft.
12 - 20 ft.
20 - 30 ft.
30+ ft.
N
0 2.25 4.5 9
Miles
SOUTHERN FORESTERS
Date: 8/12/2014
Southern Wildfire Risk Assessment
http://www.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.

1. **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.
2. **Class2, 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.
3. **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.
4. **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.
5. **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.

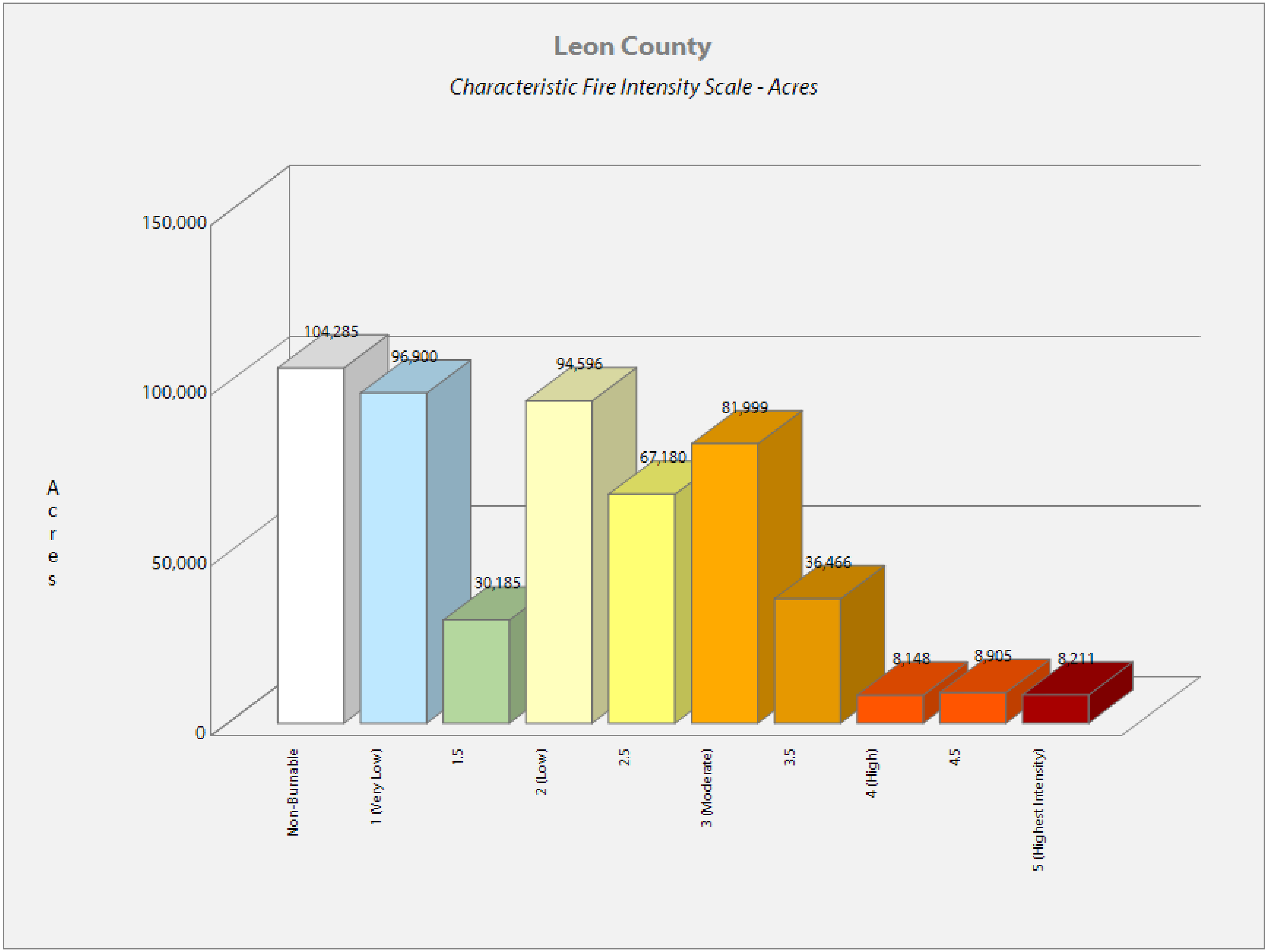
Since all areas in the South have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire region.

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.

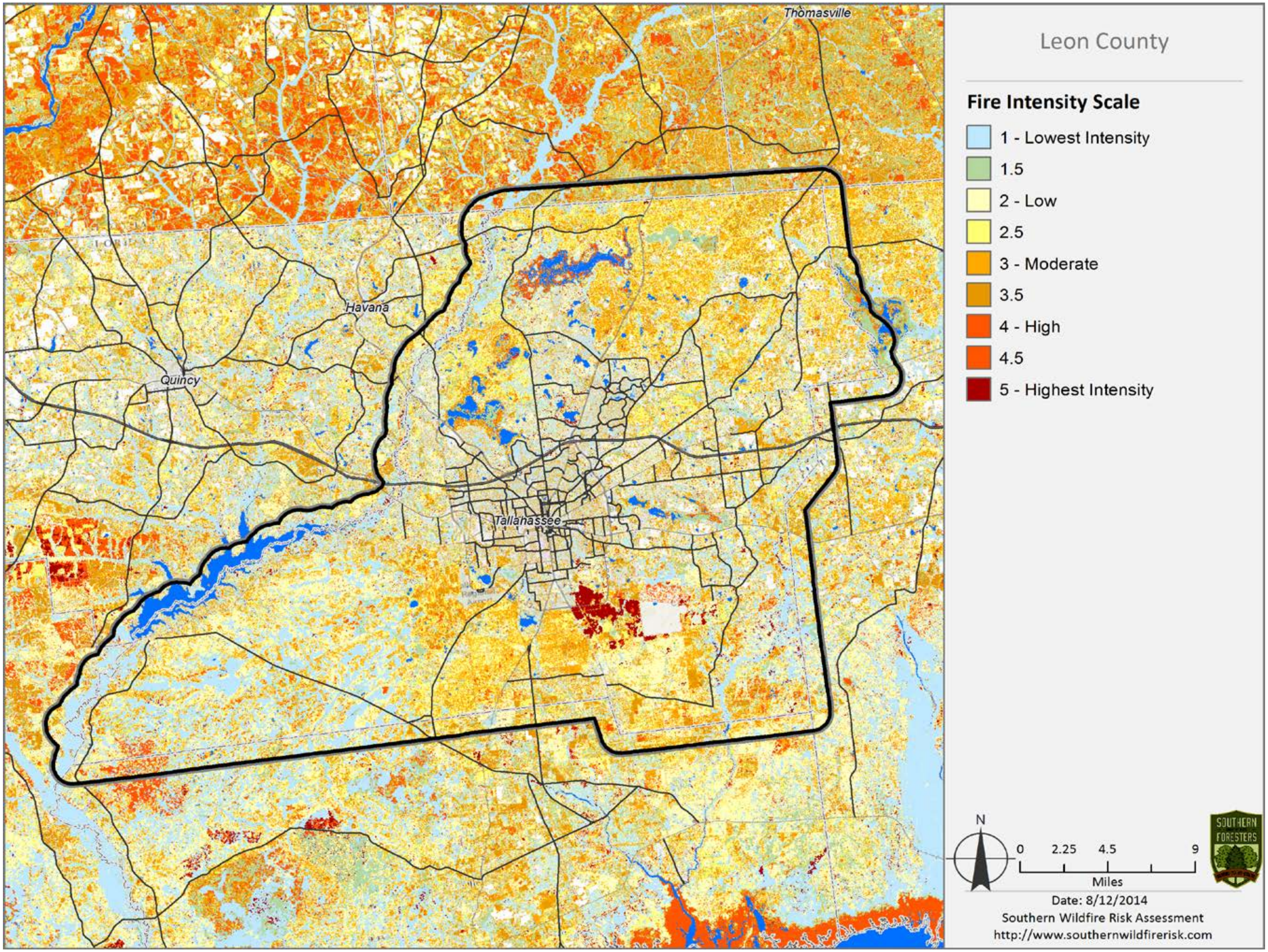
The fire intensity scale map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Characteristic Fire Intensity Scale - Acres

Class	Acres	Percent
Non-Burnable	104,285	19.4%
1 Lowest Intensity	96,900	18.0%
2	30,185	5.6%
3	94,596	17.6%
4	67,180	12.5%
5 Moderate	81,999	15.3%
6	36,466	6.8%
7	8,148	1.5%
8	8,905	1.7%
9 Highest Intensity	8,211	1.5%
Total	**536,876**	**100.0%**



Leon County
Characteristic Fire Intensity Scale - Acres
150,000
100,000
50,000
0
Acres
104,285
96,900
30,185
94,596
67,180
81,999
36,466
8,148
8,905
8,211
Non-Burnable
1 (Very Low)
1.5
2 (Low)
2.5
3 (Moderate)
3.5
4 (High)
4.5
5 (Highest Intensity)



Thomasville
Havana
Quincy
Tallahassee
Leon County
Fire Intensity Scale
1 - Lowest Intensity
1.5
2 - Low
2.5
3 - Moderate
3.5
4 - High
4.5
5 - Highest Intensity
N
0
2.25
4.5
9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
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SOUTHERN FORESTERS

Fire Type - Extreme

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.

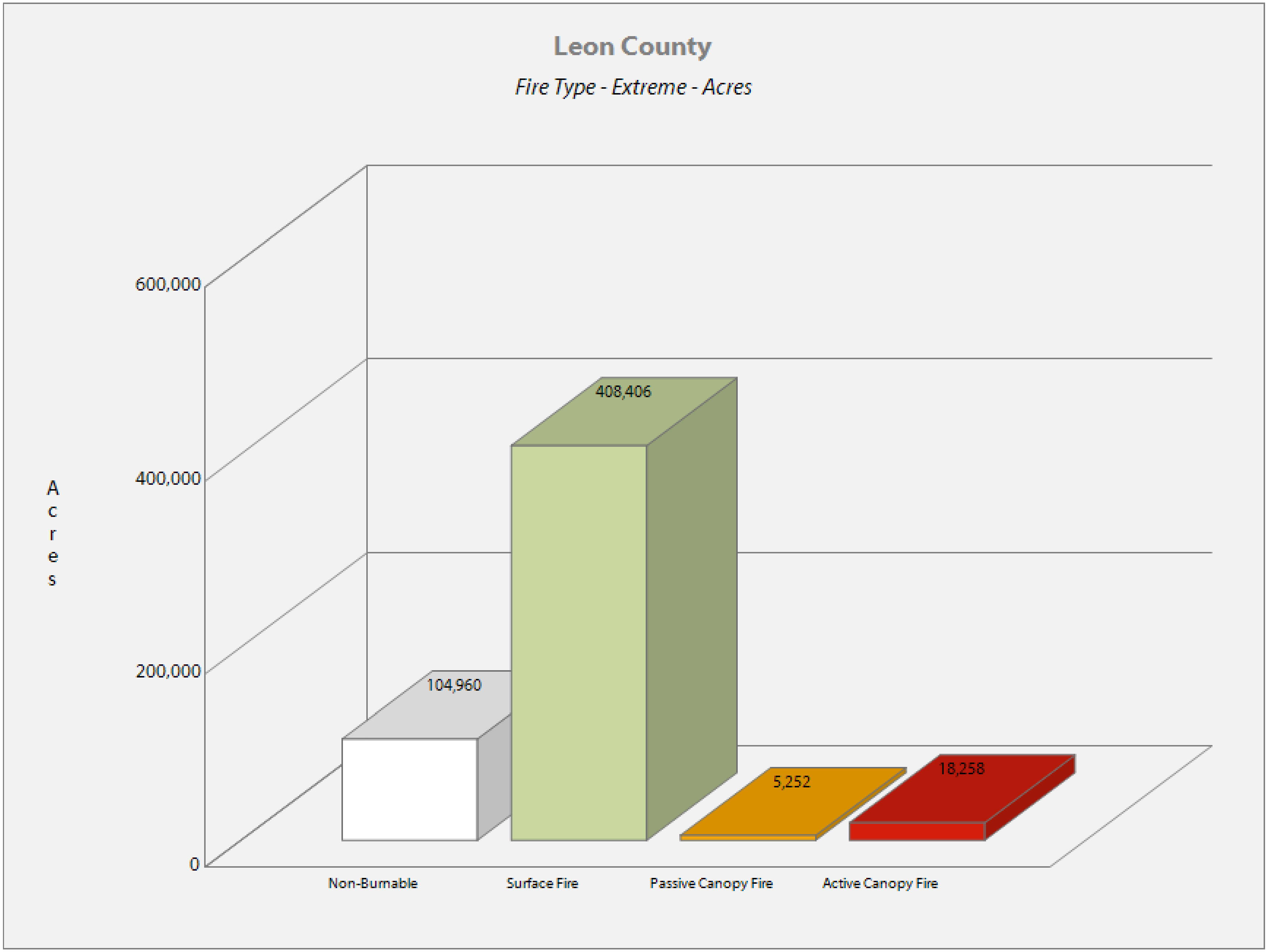
Canopy fires are very dangerous, destructive and difficult to control due to their increased fire intensity. From a planning perspective, it is important to identify where these conditions are likely to occur on the landscape so that special preparedness measure can be taken if necessary. The Fire Type – 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.

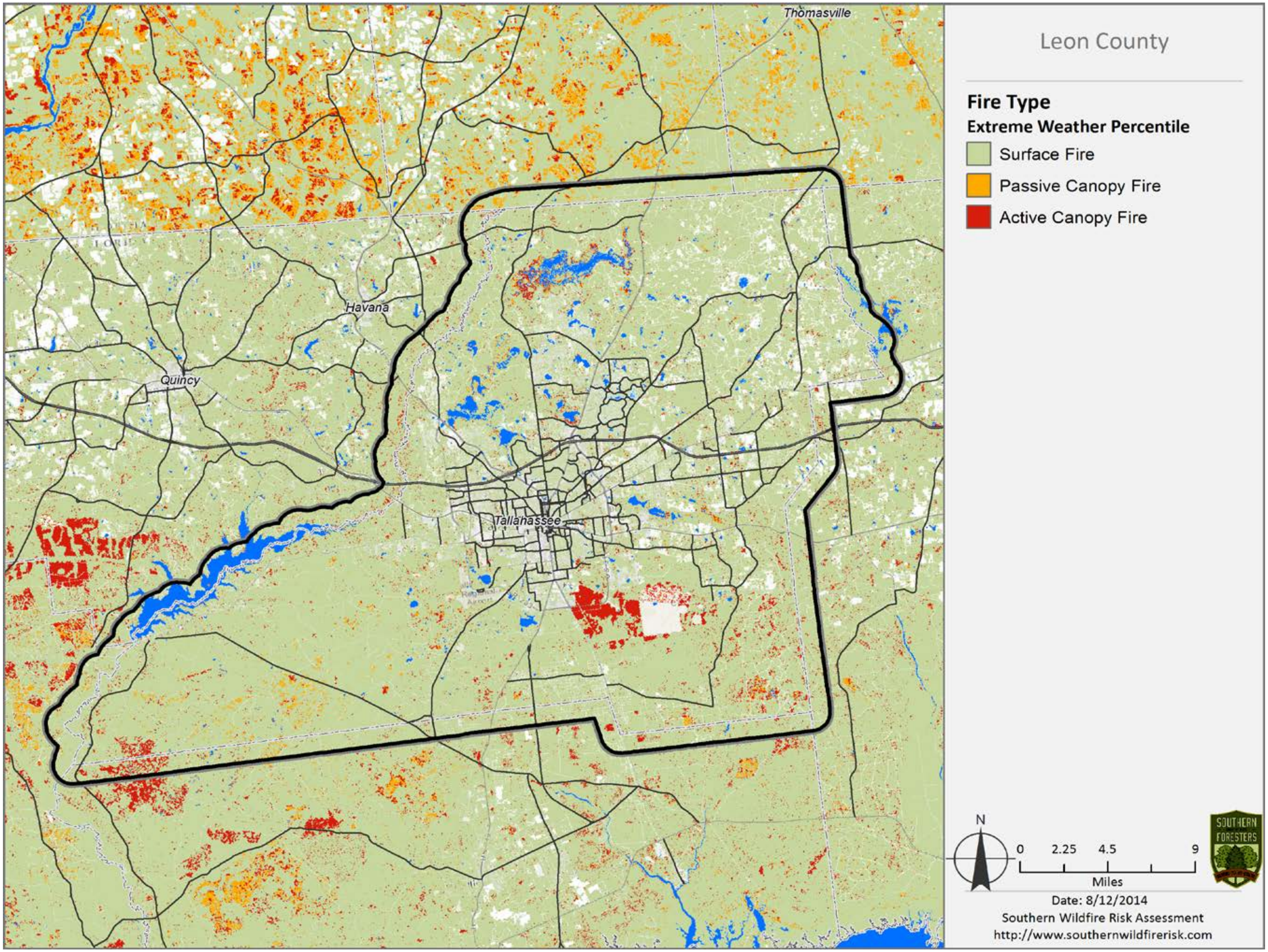
For all Southern states, except Florida and Texas, this dataset was derived from updated fuels and canopy data as part of the 2010 SWRA Update Project recently completed in May 2014. For Texas, the 2010 Texas risk update data is portrayed. For Florida, the 2010 Florida risk assessment update data is 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 (Extreme) - Acres

Fire Type	Acres	Percent
Non-Burnable	104,960	19.6%
Surface Fire	408,406	76.1%
Passive Canopy	5,252	1.0%
Active Canopy	18,258	3.4%
Total	**536,876**	**100.0%**


Leon County
Fire Type - Extreme - Acres
A c r e s
600,000
400,000
200,000
0
104,960
408,406
5,252
18,258
Non-Burnable
Surface Fire
Passive Canopy Fire
Active Canopy Fire


Thomasville
Havana
Quincy
Tallahassee
Leon County
Fire Type
Extreme Weather Percentile
Surface Fire
Passive Canopy Fire
Active Canopy Fire
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
http://www.southernwildfirerisk.com
SOUTHERN FORESTERS

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.

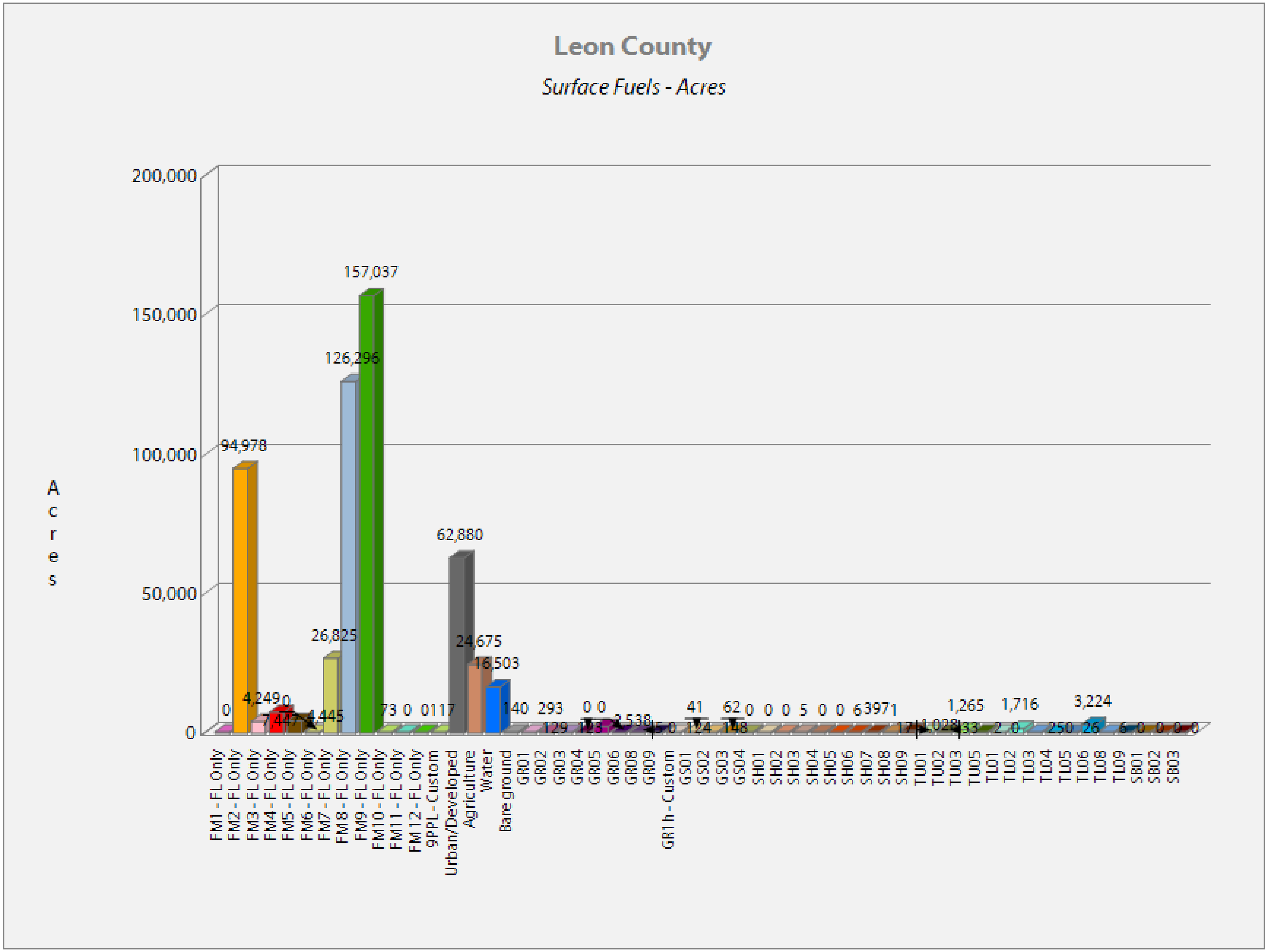
	Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
Grass Fuels Type Models (nearly pure grass and/or forb type)					
	GR01	2005	Grass is short, patchy, and possibly heavily grazed. Spread rate moderate; flame length low.	129	0.0%
	GR02	2005	Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate.	293	0.1%
	GR03	2005	Very coarse grass, average depth about 2 feet. Spread rate high; flame length moderate.	123	0.0%
	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.	2,538	0.5%
	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.	5	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 Fuel 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.	41	0.0%
	GS02	2005	Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate.	148	0.0%
	GS03	2005	Moderate grass/shrub load, average grass/shrub depth less than 2 feet. Spread rate high; flame length moderate.	62	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%

	Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
	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.	5	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%
	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.	6	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.	397	0.1%
	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.	1,028	0.2%
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.	17	0.0%
	TU02	2005	Fuelbed is moderate litter load with shrub component. Spread rate moderate; flame length low.	33	0.0%
	TU03	2005	Fuelbed is moderate litter load with grass and shrub components. Spread rate high; flame length moderate.	1,265	0.2%
	TU05	2005	Fuelbed is high load conifer litter with shrub understory. Spread rate moderate; flame length moderate.	2	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%

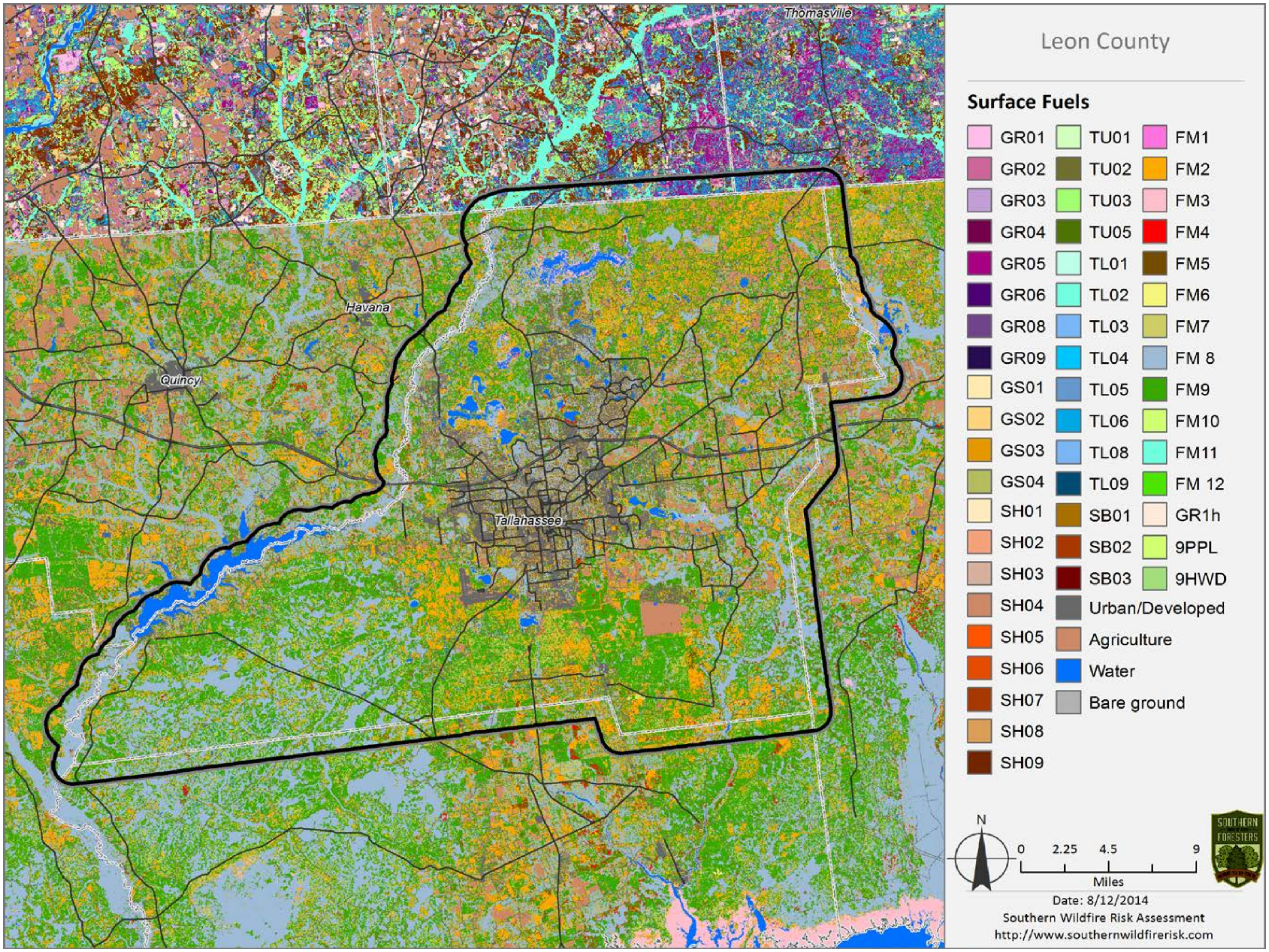
	Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
	TL02	2005	Low load, compact. Spread rate very low; flame length very low.	1,716	0.3%
	TL03	2005	Moderate load conifer litter. Spread rate very low; flame length low.	25	0.0%
	TL04	2005	Moderate load, includes small diameter downed logs. Spread 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.	26	0.0%
	TL06	2005	Moderate load, less compact. Spread rate moderate; flame length low.	3,224	0.6%
	TL08	2005	Moderate load and compactness may include small amount of herbaceous load. Spread rate moderate; flame length low.	6	0.0%
	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	117	0.0%
	GR01h	Custom	Pasture and hayland	124	0.0%
Non-burnable Fuel Type Models (insufficient wildland fuel to carry a wildland fire under any condition)					

	Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
	NB01	2005	Urban or suburban development; insufficient wildland fuel to carry wildland fire. Includes roads.	62,880	11.7%
	NB03	2005	Agricultural field, maintained in nonburnable condition.	24,675	4.6%
	NB08	2005	Open water	16,503	3.1%
	NB09	2005	Bare ground	140	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	94,978	17.7%
	FM 3	1982	Tall grass	4,249	0.8%
	FM 4	1982	Chaparral	7,447	1.4%
	FM 5	1982	Brush	4,445	0.8%
	FM 6	1982	Dormant brush	0	0.0%
	FM 7	1982	Southern rough	26,825	5.0%
	FM 8	1982	Compact timber litter	126,296	23.5%
	FM 9	1982	Hardwood litter	157,037	29.3%
	FM 10	1982	Timber (understory)	73	0.0%

	Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
	FM 11	1982	Light logging slash	0	0.0%
	FM 12	1982	Medium logging slash	0	0.0%
				536,876	**100.0%**



Leon County
Surface Fuels - Acres
Acres
200,000
150,000
100,000
50,000
0



Thomasville
Havana
Quincy
Tallahassee
Leon County
Surface Fuels
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
Urban/Developed
Agriculture
Water
Bare ground
FM1
FM2
FM3
FM4
FM5
FM6
FM7
FM 8
FM9
FM10
FM11
FM 12
GR1h
9PPL
9HWD
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
http://www.southernwildfirerisk.com

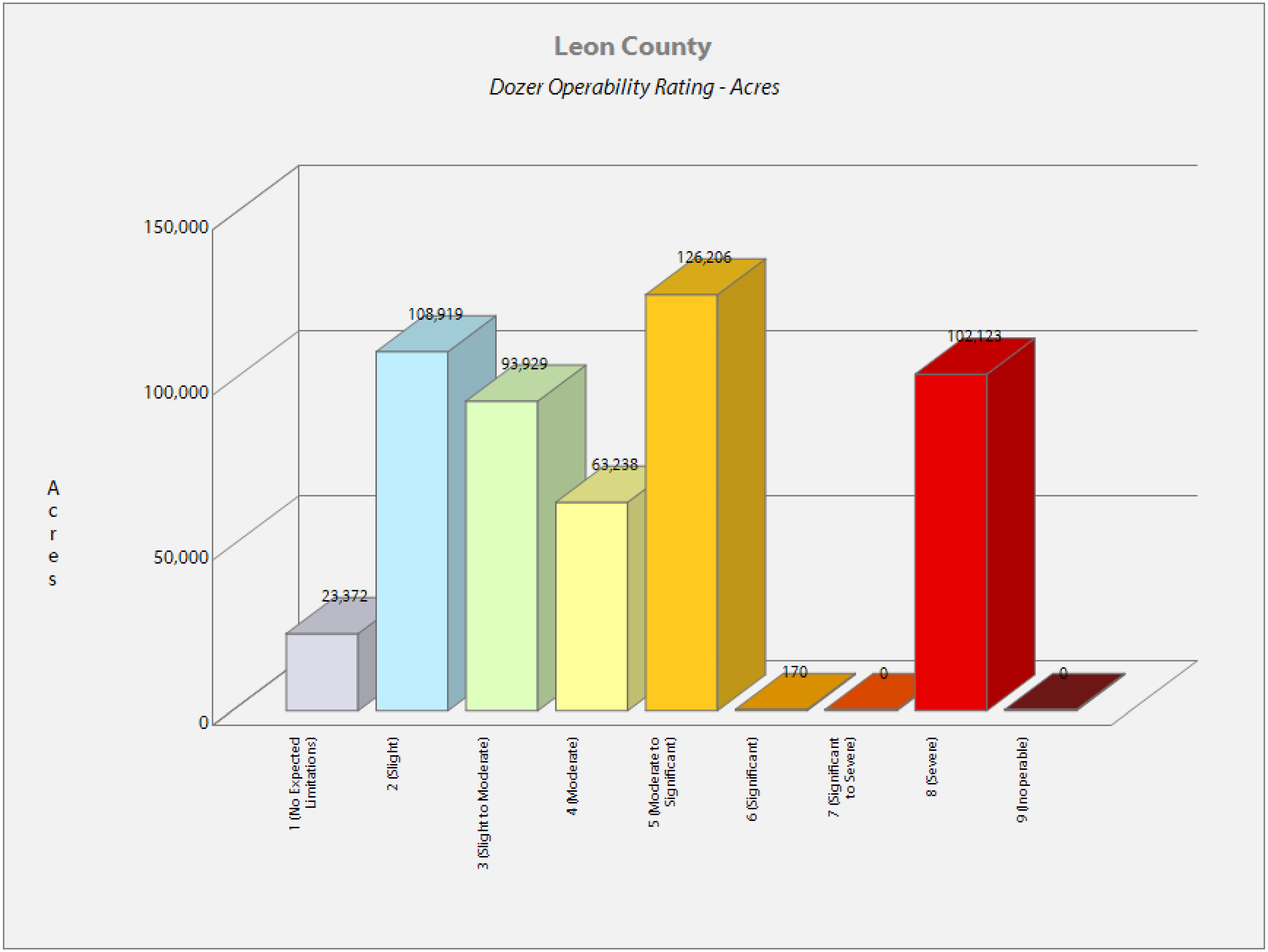
Dozer Operability Rating

Description

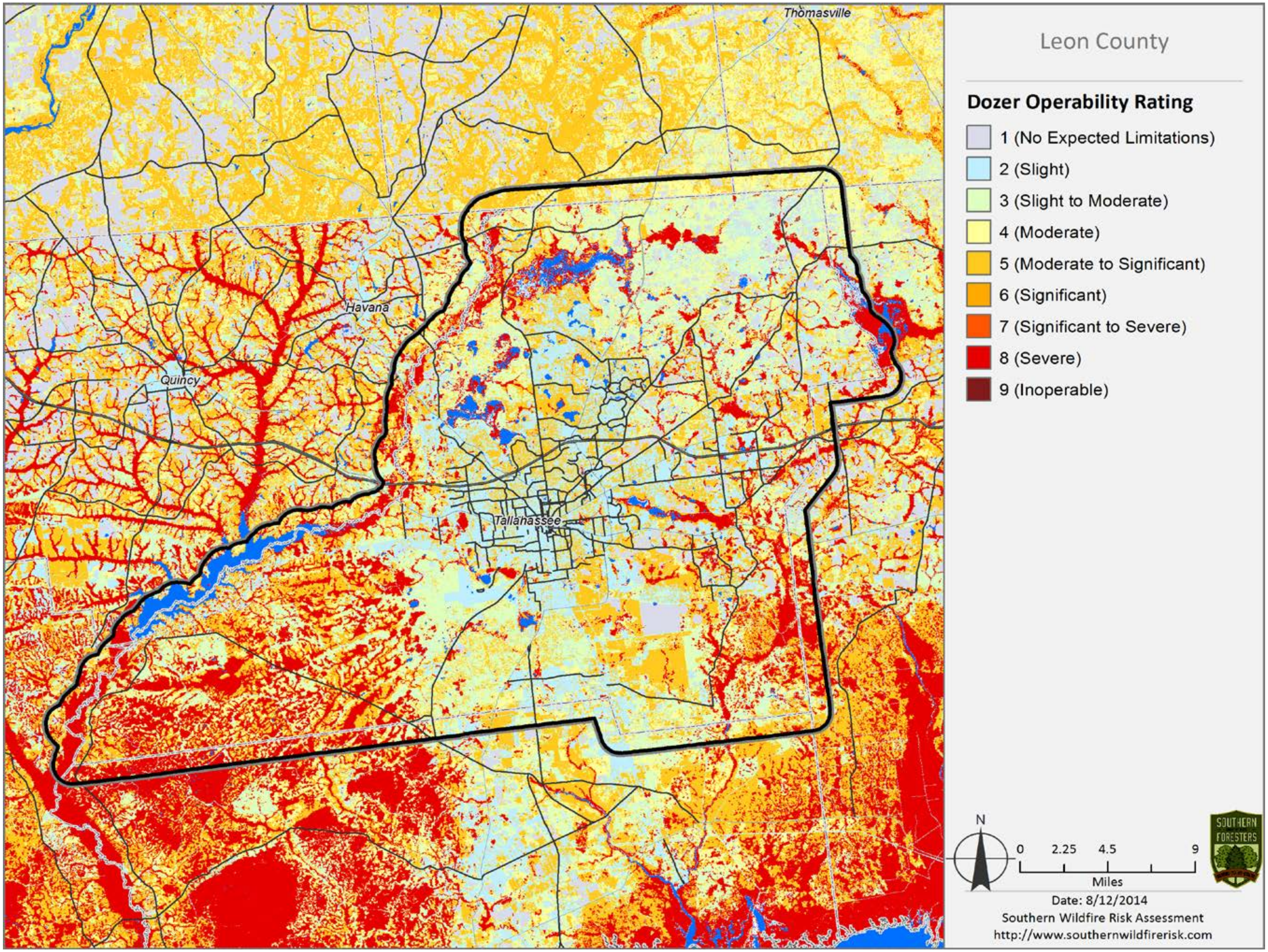
The Dozer Operability Rating (DOR) expresses how difficult it is to operate a dozer in an area based on limitations associated with slope and vegetation/fuel type. Using the fireline production rates published in the NWCG Fireline Handbook 3 (PMS 410-1) as a guide, operability values were assigned to 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.

Dozer Operability Rating - Acres

Class	Acres	Percent
1 (No Expected Limitations)	23,372	4.5%
2 (Slight)	108,919	21.0%
3 (Slight to Moderate)	93,929	18.1%
4 (Moderate)	63,238	12.2%
5 (Moderate to Significant)	126,206	24.4%
6 (Significant)	170	0.0%
7 (Significant to Severe)	0	0.0%
8 (Severe)	102,123	19.7%
9 (Inoperable)	0	0.0%
Total	**517,956**	**100.0%**



Leon County
Dozer Operability Rating - Acres
150,000
100,000
50,000
0
Acres
23,372
108,919
93,929
63,238
126,206
170
0
102,123
0
1 (No Expected Limitations)
2 (Slight)
3 (Slight to Moderate)
4 (Moderate)
5 (Moderate to Significant)
6 (Significant)
7 (Significant to Severe)
8 (Severe)
9 (Inoperable)



Thomasville
Havana
Quincy
Tallahassee
Leon County
Dozer Operability Rating
1 (No Expected Limitations)
2 (Slight)
3 (Slight to Moderate)
4 (Moderate)
5 (Moderate to Significant)
6 (Significant)
7 (Significant to Severe)
8 (Severe)
9 (Inoperable)
N
0 2.25 4.5 9
Miles
Date: 8/12/2014
Southern Wildfire Risk Assessment
http://www.southernwildfirerisk.com

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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 H:

PUBLIC MEETING NOTICE

PUBLIC MEETING NOTICE
TALLAHASSEE – LEON COUNTY
LOCAL MITIGATION STRATEGY

THURSDAY, MARCH 12, 2015, 6-8 p.m.

LEON COUNTY DEVELOPMENT SUPPORT
AND ENVIRONMENTAL MANAGEMENT
2ND FLOOR CONFERENCE ROOM
RENAISSANCE CENTER
435 N. Macomb Street
Tallahassee, Florida

The Tallahassee – Leon County Planning Department, in coordination with the LMS Steering Committee, LMS Working Group, and the LMS Update Subcommittee, has developed a draft copy of the updated 2015 Tallahassee – Leon County Local Mitigation Strategy (LMS) for public review. The LMS is the joint plan that guides hazard mitigation efforts for both Leon County and the City of Tallahassee. It is required under federal and state rules in order to qualify for hazard mitigation funding, and it is also required to be updated every five (5) years.

A public meeting to present this plan and solicit public input is scheduled for Thursday, March 12, 2015 from 6-8 p.m. This meeting will be held in the Leon County Development Support and Environmental Management Conference Room on the second floor of the Renaissance Center at 435 N. Macomb Street. The Conference Room will be accessible to the public after business hours from the ground floor parking area on the east side of the Renaissance Center. Building security will be provided until 8 p.m.

Please plan to attend and provide your comments. A copy of this draft plan will be made available online at the Planning Department's website at http://www.talgov.com/planning/planning-mitstrat-mitstra.aspx. Comments may be provided via email to the staff person below until April 3, 2015.

Please contact staff at 891-6408 if you have any special requests, questions, or comments.

Stephen M. Hodges, AICP
Senior Planner
Tallahassee – Leon County Planning Department
Renaissance Center
435 N. Macomb Street
Tallahassee, Florida 32301
850.891.6408 work
850.891.6404 fax
steven.hodges@talgov.com
People Focused, Performance Driven

TALLAHASSEE-LEON COUNTY PLANNING DEPARTMENT
PLACE - PLANNING, LAND MANAGEMENT AND COMMUNITY ENHANCEMENT
APA 2014 National Planning Excellence Award for a Planning Agency

APPENDIX I:

Common Invasive Plants of Leon County

Common Invasive, Exotic Plant Species of Leon County Waterbodies and Wetlands

Invasive, exotic plant species are those plants that invade natural areas that are from somewhere other than Florida, the Southeast, or North America. These plants are undesirable in Leon County's natural areas because they displace native plants and associated wildlife, including endangered species, and can alter natural processes such as fire and water flow [1]. In their natural habitat, predators and competition with other plant species keep them in check. When introduced here, either by accident or purposely, the checks and balances that keep them under control in their native habitat are no longer present and they begin to take over. Many of these plants have become widespread in Florida and Leon County. Approximately 30% of Florida's 4,255 plant species are non-native [2]. A 2011 survey of public lakes and rivers found that 96% contain invasive, exotic plants [3]. The Florida Fish and Wildlife Conservation Commission's (FFWCC) Invasive Plant Management Section spent over $25 million in the 2010-2011 budget year to control upland and aquatic invasive plants, which is the largest invasive plant management program of its kind in the United States [3,4].

So, what can we do to help slow the invasion of exotic plant species? The first thing we can do is to learn to identify the invasive, exotic plants that occur in our backyards and local waterways. Once we know what we're dealing with, we can take steps to prevent the spread of these invaders.

Steps to prevent the spread of invasive, exotic species:

- Do not purchase or plant any invasive, exotic species.
- Remove any existing invasive, exotic species from our own backyards.
- Educate friends and family and help them remove the invaders from their yards.
- Check boat trailers for invasive, exotic hitchhikers and properly dispose of them.

Many of the worst invasive, exotic species are prohibited from being sold at local nurseries but some roadside stands will still sell you a prohibited invader.

Removing invasive, exotic species isn't easy and may take many attempts to completely rid your yard of them. The local County Extension Office can help you determine the best way to eradicate specific invasive, exotic species.

Many aquatic invasive, exotic species hitchhike on boat trailers and can be spread from waterbody to waterbody. When leaving the ramp, check your trailer for any hitchhikers and throw them in the trash can (not back in the water!).

Identification of Common Invasive, Exotic Plant Species in Leon County Waterbodies and Wetlands

Scientific Name: *Ardisia crenata*

Common Name: Coral Ardisia or Scratchthroat

Habitat: Uplands, Floodplains

Characteristics: Showy fruits; thick, glossy leaves

Scientific Name: *Colocasia esculenta*

Common Name: Wild Taro

Habitat: Wetlands, Lake shores, streambanks

Characteristics: Large arrowhead shaped leaves

Scientific Name: *Eichhornia crassipes*

Common Name: Water Hyacinth

Habitat: Lakes, ponds, streams

Characteristics: Showy flower; floats; forms dense mats

Scientific Name: *Hydrilla verticillata*

Common Name: Hydrilla

Habitat: Lakes, ponds, streams

Characteristics: Dense ribbons of whorled, toothed leaves; mostly under water

Scientific Name: *Ligustrum lucidum*

Common Name: Glossy Privet

Habitat: Uplands

Characteristics: Dark green, glossy leaves; showy, fragrant flowers; purple/black fruits

Scientific Name: *Ligustrum sinense*

Common Name: Chinese Privet

Habitat: Uplands, floodplains

Characteristics: Similar flower and fruit as glossy privet but with smaller, duller leaves

Scientific Name: *Lygodium japonicum*

Common Name: Japanese Climbing Fern

Habitat: Uplands

Characteristics: Viny fern

Scientific Name: *Nandina domestica*

Common Name: Heavenly Bamboo

Habitat: Uplands

Characteristics: Showy flowers and fruits, glossy, divided leaves

Scientific Name: *Panicum repens*

Common Name: Torpedo Grass

Habitat: Lakes, ponds, streams, wetlands

Characteristics: Light green leaves; spreads from shore over water; strong, pointed root leaders

Scientific Name: *Sapium sebiferum*

Common Name: Tallow Tree or Popcorn Tree

Habitat: Uplands, floodplains, lake shores

Characteristics: Showy fall foliage; tear-drop shaped leaf; white fruit

Scientific Name: *Alternanthera philoxeroides*

Common Name: Alligator Weed

Habitat: Lakes, ponds, streams

Characteristics: Fleshy, round stem; white, papery flower head

For more information on invasive, exotic plants, see the following links:

Leon County Cooperative Extension - http://leon.ifas.ufl.edu/

Atlas of Florida Vascular Plants - http://www.florida.plantatlas.usf.edu/

FFWCC's Invasive Plant Management Section - http://www.myfwc.com/wildlifehabitats/invasive-plants

University of Florida's Center for Aquatic and Invasive Plants - http://plants.ifas.ufl.edu/

Florida Exotic Pest Plant Council - http://www.fleppc.org

Florida Native Plant Society - http://www.fnps.org

Florida Invasive Species Partnership - http://www.floridainvasives.org/

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2. Wunderlin, Richard P., Hansen, Bruce F. 2011. Guide to the Vascular Plants of Florida, Third Edition. University Press of Florida. Gainesville, Florida.
3. Florida Fish and Wildlife Conservation Commission. 2011. Annual Report of Activities Conducted under the Cooperative Aquatic Plant Control Program in Florida Public Waters for Fiscal Year 2010-2011. Tallahassee, Florida.
4. Florida Fish and Wildlife Conservation Commission. 2011. Upland Invasive Exotic Plant Control Projects Fiscal Year 2010-2011. Tallahassee, Florida

APPENDIX J:

Channeled Apple Snail

CHANNELED APPLE SNAILS INVADE NUMEROUS FLORIDA WATERS

Article courtesy of:

Dana Denson, Aquatic Biologist
FL Department of Environmental Protection

Photo courtesy of Katasha Cornwell, FDOT.

Populations of the channeled apple snail (*Pomacea canaliculata* group), a larger relative of the native Florida apple snail (*Pomacea paludosa*), are exploding in many locations across the state. Breeding populations of these snails have been reported in scattered locations in Florida since as early as 1978, but only in the past few years has their range expanded dramatically, and has the numbers of snails occurring in many areas become so very large.

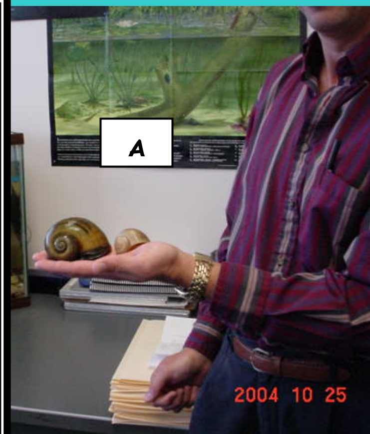
Originating in South America, channeled apple snails (also known as golden apple snails) have become serious agricultural pests in many Asian countries. In the Philippines, more than half of all rice fields are infested with these pests. Some wetlands in Thailand have become virtually devoid of aquatic vegetation due the aggressive and non-discriminate herbivory of these snails (Carlsson *et al.* 2004).

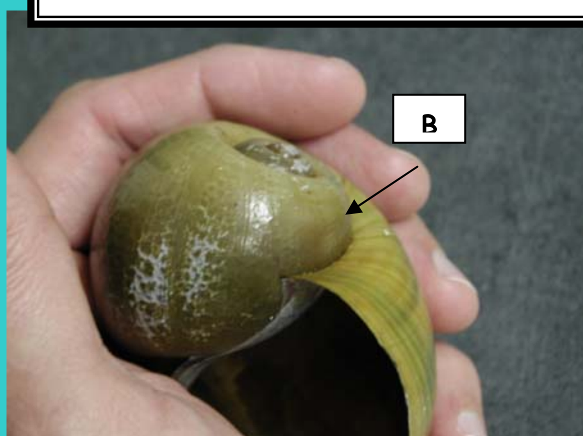
Populations of channeled apple snails have been reported in Florida, California, Texas, Georgia, Alabama, Hawaii, and Louisiana. In Florida, they pose a potentially serious threat to the ecological health of rivers, lakes, and wetlands, due to their affinity for aquatic plants, their extremely high fecundity (reproductive capability), and their tolerance for a range of environmental conditions.

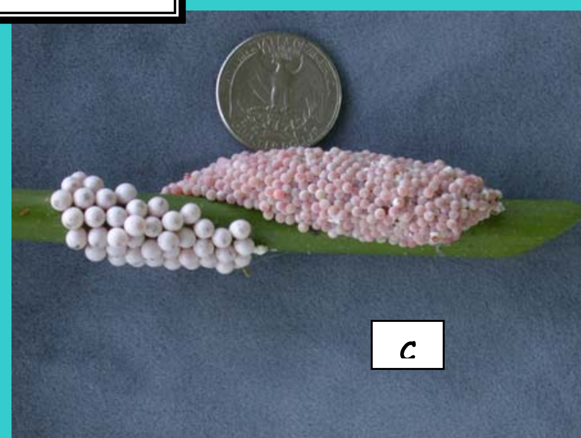
Females lay masses of 100-1200 bright pink (or sometimes green) eggs an average of 1.4 times per week on any type of firm substrate available about 6 to 8 inches above the water line. Egg-laying continues year-round in central and south Florida, though it appears to slow down during the winter. Neonate snails 2mm in length hatch out in about two weeks, drop into the water, and immediately begin feeding on periphyton. At one inch in diameter, they switch to vascular plants.

How do you tell the difference between native and channeled apple snails?

1. adult channeled much larger (A)
2. channeled have deep groove (channel) between whorls of shell (B)
3. eggs are smaller ('grit-sized'), bright pink and much more numerous (C)

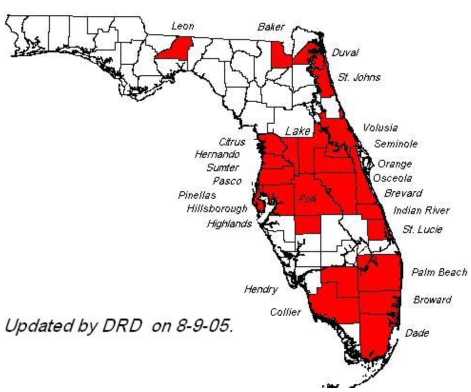






In tests, they have been shown to consume almost every submersed aquatic plant species offered. *Unfortunately, they do not appear to prefer hydrilla*, but are more fond of plants like southern naiad, red ludwigia, *Cabomba*, and bladderworts. Young snails may become reproductive as early as 2 to 3 months of age. In Lake Linda in Lake County, they have removed essentially *all* of the aquatic plants present in the lake.

Like native *Pomacea*, channeled apple snails possess both a lung and a gill, as well as a snorkel-like siphon through which they can breathe atmospheric air, at the same time reducing the risk of attack by terrestrial predators. They can resist desiccation by closing their shells using their opercula, as well as by estivating (similar to hibernation) in sediments for up to 5 months. They can tolerate salinity to 8 parts per thousand, and seem unaffected by nutrient enrichment and low oxygen levels.



In Florida, populations are now reported in all central Florida counties, most south Florida counties, Leon County in the panhandle, and near Jacksonville (see map). It is likely that they will spread to many other areas, and perhaps throughout the state.

No effective control measures have yet been found. The use of molluscicides would be expensive, and would likely have significant negative effects on non-target organisms. Although there are predators which feed on channeled apple snails (snail kites, large herons, large turtles, alligators, and most notably, limpkins), the relative abundance of these predators is eclipsed by the huge populations of channeled apple snails that have been seen in many locations. The use of water-level manipulations to drown eggs in controlled situations would probably help in reducing egg densities somewhat, but at a rate of one clutch laid every 4 or 5 days, the impact to snail populations would probably be limited. Physical removal projects have been carried out in Seminole County's Lake Brantley, and are being considered in some locations in Osceola County. These will help to reduce snail densities somewhat, but are probably most valuable as educational and media events. The most important step in lessening their impact and, especially, reducing their spread, in to educate the public about them. School groups, scientific and professional meetings, conservation organizations, and the media are all good outlets for disseminating information. Research aimed at determining the specific effects these snails might have on water quality, endangered species, and ecosystems as a whole are sorely needed.

If you find these channeled apple snails and/or their eggs, or want more information, please contact Johnny Richardson, Water Quality Scientist, Leon County Public Works, at richardsonjo@leoncountyfl.gov, or call (850) 606-1500.

Note: Many people ask whether or not these snails are edible. They are, BUT they are known to carry a parasite called *Angiostrongylus cantonensis* or rat lung worm, which can cause a serious form of meningitis. Consumption is not recommended.

FOR MORE INFORMATION:

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APPENDIX K:

Thunderstorm Events
January 1, 2010 – December 31, 2014

TECHNICAL APPENDIX K
THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Florida State University (FSU)	1/21/2010	Thunderstorm Wind	50	0	0	0	0	0	0	NWS Employee	Florida State University (FSU)
Leon Co.	Winthrop Park	5/28/2010	Thunderstorm Wind	50	0	0	0	0	0	0	NWS Employee	Winthrop Park
Leon Co.	Winthrop Park	5/28/2010	Thunderstorm Wind	50	0	0	0	0	0	0	NWS Employee	Winthrop Park
Leon Co.	Capitola	6/16/2010	Thunderstorm Wind	50	0	0	500	0	0	0	Law Enforcement	Capitola
Leon Co.	Pisgah Church	6/19/2010	Thunderstorm Wind	50	0	0	7500	0	0	0	Law Enforcement	Pisgah Church
Leon Co.	Chaires	6/19/2010	Thunderstorm Wind	50	0	0	7500	0	0	0	Law Enforcement	Chaires
Leon Co.	(TLH)Tallahassee Rgnl Arpt	7/31/2010	Thunderstorm Wind	57	0	0	0	0	0	0	ASOS	(TLH)Tallahassee Rgnl Arpt
Leon Co.	Lake Bradford	8/4/2010	Thunderstorm Wind	50	0	0	500	0	0	0	Law Enforcement	Lake Bradford
Leon Co.	Woodville	8/7/2010	Thunderstorm Wind	50	0	0	1500	0	0	0	Law Enforcement	Woodville
Leon Co.	Lake Ella	4/5/2011	Thunderstorm Wind	50	0	0	1500	0	0	0	NWS Employee	Lake Ella
Leon Co.	Tom Brown Park	4/5/2011	Thunderstorm Wind	55	0	0	5000	0	0	0	NWS Employee	Tom Brown Park
Leon Co.	Winthrop Park	4/28/2011	Thunderstorm Wind	50	0	0	5000	0	0	0	Emergency Manager	Winthrop Park
Leon Co.	Killearn Estates	4/28/2011	Thunderstorm Wind	55	0	0	7000	0	0	0	NWS Storm Survey	Killearn Estates
Leon Co.	Tallahassee Community College	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Tallahassee Community College
Leon Co.	Lake Munson	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Lake Munson
Leon Co.	Macon Community Park	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Macon Community Park
Leon Co.	Tallahassee Mall	5/13/2011	Thunderstorm Wind	50	0	0	2000	0	0	0	Utility Company	Tallahassee Mall
Leon Co.	Levy Park	5/13/2011	Thunderstorm Wind	50	0	0	2000	0	0	0	Utility Company	Levy Park
Leon Co.	Famu Bragg Stadium	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Famu Bragg Stadium
Leon Co.	Macon Community Park	5/13/2011	Thunderstorm Wind	50	0	0	1500	0	0	0	Utility Company	Macon Community Park
Leon Co.	Winthrop Park	5/13/2011	Thunderstorm Wind	50	0	0	5000	0	0	0	Utility Company	Winthrop Park
Leon Co.	Indian Head Acres	5/13/2011	Thunderstorm Wind	50	0	0	25000	0	0	0	Utility Company	Indian Head Acres
Leon Co.	Woodville	5/13/2011	Thunderstorm Wind	50	0	0	2000	0	0	0	Utility Company	Woodville

TECHNICAL APPENDIX K
THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Lake Ella	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Lake Ella
Leon Co.	Tallahassee Memorial Hospital	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Tallahassee Memorial Hospital
Leon Co.	Indian Head Acres	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Indian Head Acres
Leon Co.	Indian Head Acres	5/13/2011	Thunderstorm Wind	50	0	0	100000	0	0	0	Emergency Manager	Indian Head Acres
Leon Co.	Killearn Estates	5/13/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Utility Company	Killearn Estates
Leon Co.	Winthrop Park	5/13/2011	Thunderstorm Wind	50	0	0	1500	0	0	0	Utility Company	Winthrop Park
Leon Co.	Tallahassee Mall	6/5/2011	Thunderstorm Wind	50	0	0	25000	0	0	0	Utility Company	Tallahassee Mall
Leon Co.	Florida State University (FSU)	6/5/2011	Thunderstorm Wind	41	0	0	1500	0	0	0	Mesonet	FSU Doak Campbell Stadium
Leon Co.	Killearn Estates	6/26/2011	Thunderstorm Wind	50	0	0	25000	0	0	0	Law Enforcement	Killearn Estates
Leon Co.	Killearn Estates	6/26/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Law Enforcement	Killearn Estates
Leon Co.	Killearn Estates	6/26/2011	Thunderstorm Wind	50	0	0	5000	0	0	0	Public	Killearn Estates
Leon Co.	Bradfordville	6/26/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	NWS Employee	Bradfordville
Leon Co.	Capitola	6/26/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Law Enforcement	Capitola
Leon Co.	Tallahassee Mall	6/26/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Law Enforcement	Tallahassee Mall
Leon Co.	Fallschase	6/26/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Law Enforcement	Fallschase
Leon Co.	Kleman Plaza	6/26/2011	Thunderstorm Wind	50	0	0	300	0	0	0	Law Enforcement	Kleman Plaza
Leon Co.	Chaires	6/27/2011	Thunderstorm Wind	50	0	0	4000	0	0	0	Law Enforcement	Chaires
Leon Co.	Winthrop Park	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Winthrop Park
Leon Co.	Maclay Gardens	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Newspaper	Maclay Gardens
Leon Co.	Winthrop Park	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Winthrop Park
Leon Co.	Tallahassee Community College	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Tallahassee Community College
Leon Co.	Tallahassee Community College	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Tallahassee Community College
Leon Co.	Florida State University (FSU)	6/30/2011	Thunderstorm Wind	55	0	0	3000	0	0	0	Broadcast Media	Florida State University (FSU)

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THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Florida State University (FSU)	6/30/2011	Thunderstorm Wind	56	0	0	3000	0	0	0	Mesonet	FSU Doak Campbell Stadium
Leon Co.	Florida State University (FSU)	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Florida State University (FSU)
Leon Co.	Southwood	6/30/2011	Thunderstorm Wind	50	0	0	1000	0	0	0	Public	Southwood
Leon Co.	Belair	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Belair
Leon Co.	Indian Head Acres	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Broadcast Media	Indian Head Acres
Leon Co.	Southwood	6/30/2011	Thunderstorm Wind	52	0	0	0	0	0	0	Public	Southwood
Leon Co.	Woodville	6/30/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Public	Woodville
Leon Co.	Lake Iamonia	8/13/2011	Thunderstorm Wind	55	0	0	4000	0	0	0	Law Enforcement	Lake Iamonia
Leon Co.	Maclay Gardens	9/5/2011	Thunderstorm Wind	50	0	0	2000	0	0	0	Public	Maclay Gardens
Leon Co.	Bradfordville	9/5/2011	Thunderstorm Wind	50	0	0	3000	0	0	0	Amateur Radio	Bradfordville
Leon Co.	Tom Brown Park	1/26/2012	Thunderstorm Wind	50	0	0	20000	0	0	0	Broadcast Media	Tom Brown Park
Leon Co.	Tallahassee Community Airport	2/24/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	County Official	
Leon Co.	Moccasin Gap	2/24/2012	Thunderstorm Wind	50	0	0	3000	0	0	0	Emergency Manager	
Leon Co.	Miccosukee	2/24/2012	Thunderstorm Wind	50	0	0	3000	0	0	0	Emergency Manager	
Leon Co.	Baum	3/3/2012	Thunderstorm Wind	50	0	0	4000	0	0	0	Emergency Manager	
Leon Co.	North Florida Fairgrounds	3/3/2012	Thunderstorm Wind	50	0	0	1500	0	0	0	NWS Employee	
Leon Co.	Killearn Lakes	3/14/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Pisgah Church	3/14/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	(TLH)Tallahassee Rgnl Arpt	4/3/2012	Thunderstorm Wind	54	0	0	0	0	0	0	ASOS	
Leon Co.	North Florida Fairgrounds	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Lake Ella	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Tallahassee Community Airport	4/3/2012	Thunderstorm Wind	60	1	0	50000	0	0	0	Broadcast Media	
Leon Co.	Tallahassee Community Airport	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	

TECHNICAL APPENDIX K

THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Tallahassee Community Airport	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Orchard Pond	4/3/2012	Thunderstorm Wind	50	0	0	25000	0	0	0	Broadcast Media	
Leon Co.	Bradfordville	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Iamonia	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Lake Iamonia	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Pisgah Church	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Concord	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Concord	4/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Maclay Gardens	5/6/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Forest Meadows Park	5/6/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Tallahassee Community Airport	5/6/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Tallahassee Community Airport	5/6/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Apalachee Regional Park	5/7/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Park/Forest Service	
Leon Co.	Lake Ella	5/13/2012	Thunderstorm Wind	45	0	0	500	0	0	0	NWS Employee	
Leon Co.	Macon Community Park	5/31/2012	Thunderstorm Wind	45	0	0	750	0	0	0	Broadcast Media	
Leon Co.	Tom Brown Park	6/5/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Winthrop Park	6/5/2012	Thunderstorm Wind	55	0	0	1000	0	0	0	Public	
Leon Co.	Fallschase	6/5/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	Fallschase	6/5/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Fallschase	6/5/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	Pisgah Church	6/5/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	Moccasin Gap	6/5/2012	Thunderstorm Wind	60	0	0	4000	0	0	0	Emergency Manager	
Leon Co.	Moccasin Gap	6/5/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	

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THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Concord	6/11/2012	Thunderstorm Wind	50	0	0	3000	0	0	0	Law Enforcement	
Leon Co.	Orchard Pond	6/11/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Iamonia	6/11/2012	Thunderstorm Wind	50	0	0	750	0	0	0	County Official	
Leon Co.	Tallahassee Community Airport	7/1/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Tallahassee Mall	7/3/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	County Official	
Leon Co.	Tallahassee Community Airport	7/3/2012	Thunderstorm Wind	50	0	0	3000	0	0	0	County Official	
Leon Co.	Moccasin Gap	7/3/2012	Thunderstorm Wind	50	0	0	750	0	0	0	Law Enforcement	
Leon Co.	Tom Brown Park	7/17/2012	Thunderstorm Wind	60	0	0	5000	0	0	0	Public	
Leon Co.	J R Alford Greenway	7/17/2012	Thunderstorm Wind	50	0	0	3000	0	0	0	Emergency Manager	
Leon Co.	Fallschase	7/17/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	Capitola	7/17/2012	Thunderstorm Wind	50	0	0	5000	0	0	0	Emergency Manager	
Leon Co.	Springsax Park	7/17/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Public	
Leon Co.	Tom Brown Park	7/17/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	J R Alford Greenway	7/17/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Concord	7/17/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	Concord	7/17/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	
Leon Co.	Tallahassee Mall	7/17/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Lake Munson	7/17/2012	Thunderstorm Wind	50	0	0	2000	0	0	0	Public	
Leon Co.	Lake Iamonia	7/25/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Fallschase	7/25/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Apalachee Regional Park	7/25/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	
Leon Co.	Lake Jackson	9/18/2012	Thunderstorm Wind	50	0	0	1000	0	0	0	County Official	Lake Jackson
Leon Co.	Lake Iamonia	9/18/2012	Thunderstorm Wind	50	0	0	1500	0	0	0	County Official	Lake Iamonia

TECHNICAL APPENDIX K

THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Lake Jackson	12/17/2012	Thunderstorm Wind	50	0	0	5000	0	0	0	Utility Company	
Leon Co.	Tallahassee Community College	1/30/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Social Media	Tallahassee Community College
Leon Co.	State Capitol Complex	1/30/2013	Thunderstorm Wind	50	0	0	3000	0	0	0	911 Call Center	State Capitol Complex
Leon Co.	Woodville	1/30/2013	Thunderstorm Wind	50	0	0	500	0	0	0	Broadcast Media	Woodville
Leon Co.	Southwood	2/26/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	Southwood
Leon Co.	Apalachee Regional Park	2/26/2013	Thunderstorm Wind	50	0	0	500	0	0	0	NWS Employee	Apalachee Regional Park
Leon Co.	Bloxham	3/24/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	Bloxham
Leon Co.	Tallahassee Mall	3/24/2013	Thunderstorm Wind	50	0	0	30000	0	0	0	Public	Tallahassee Mall
Leon Co.	Tallahassee Mall	3/24/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	Tallahassee Mall
Leon Co.	State Capitol Complex	7/3/2013	Thunderstorm Wind	55	0	0	25000	0	0	0	Social Media	State Capitol Complex
Leon Co.	Woodville	7/4/2013	Thunderstorm Wind	45	0	0	1000	0	0	0	911 Call Center	Woodville
Leon Co.	State Capitol Complex	7/4/2013	Thunderstorm Wind	50	0	0	5000	0	0	0	Social Media	State Capitol Complex
Leon Co.	Apalachee Regional Park	7/22/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Public	Apalachee Regional Park
Leon Co.	Killearn Estates	7/23/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Broadcast Media	Killearn Estates
Leon Co.	Killearn Estates	8/30/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	Law Enforcement	Killearn Estates
Leon Co.	Killearn Estates	8/30/2013	Thunderstorm Wind	50	0	0	500	0	0	0	NWS Employee	Killearn Estates
Leon Co.	Killearn Estates	8/30/2013	Thunderstorm Wind	50	0	0	2000	0	0	0	Law Enforcement	Killearn Estates
Leon Co.	Killearn Estates	8/30/2013	Thunderstorm Wind	50	0	0	2000	0	0	0	Law Enforcement	Killearn Estates
Leon Co.	Florida A&M University (Famu)	8/30/2013	Thunderstorm Wind	50	0	0	2000	0	0	0	Law Enforcement	Florida A&M University (Famu)
Leon Co.	Chaires Crossing	8/30/2013	Thunderstorm Wind	50	0	0	1000	0	0	0	NWS Employee	Chaires Crossing
Leon Co.	Bradfordville	11/26/2013	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Moccasin Gap
Leon Co.	Lake Jackson	1/11/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	Lake Jackson
Leon Co.	Maclay Gardens	1/11/2014	Thunderstorm Wind	50	0	0	500	0	0	0	Public	Maclay Gardens

TECHNICAL APPENDIX K
THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Maclay Gardens	1/11/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	Emergency Manager	Maclay Gardens
Leon Co.	Woodville	1/11/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	Woodville
Leon Co.	Miccosukee	4/29/2014	Thunderstorm Wind	50	0	0	3000	0	0	0	Emergency Manager	Miccosukee
Leon Co.	FSU Doak Campbell Stadium	6/6/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	Social Media	FSU Doak Campbell Stadium
Leon Co.	State Capitol Complex	6/6/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	State Capitol Complex
Leon Co.	Macon Community Park	6/6/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	Social Media	Macon Community Park
Leon Co.	Lake Jackson	6/8/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Lake Jackson
Leon Co.	Eight Mile Pond Area	6/8/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Eight Mile Pond Area
Leon Co.	Eight Mile Pond Area	6/8/2014	Thunderstorm Wind	55	0	0	4000	0	0	0	Broadcast Media	Eight Mile Pond Area
Leon Co.	Woodville	6/8/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Woodville
Leon Co.	Florida State University (FSU)	6/8/2014	Thunderstorm Wind	50	0	0	0	0	0	0	Broadcast Media	Florida State University (FSU)
Leon Co.	Tom Brown Park	6/8/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Tom Brown Park
Leon Co.	Killearn Estates	6/8/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Killearn Estates
Leon Co.	Woodville	6/8/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Woodville
Leon Co.	Baum	6/8/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Baum
Leon Co.	Baum	6/8/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Baum
Leon Co.	Concord	6/8/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Concord
Leon Co.	Lake Bradford	6/21/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Lake Bradford
Leon Co.	Tallahassee Community Airport	6/21/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Tallahassee Community Airport
Leon Co.	Woodville	6/21/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	911 Call Center	Woodville
Leon Co.	Forest Meadows Park	6/21/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Forest Meadows Park
Leon Co.	Apalachee Regional Park	6/26/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	Apalachee Regional Park
Leon Co.	Chaires Crossing	6/26/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Chaires Crossing

TECHNICAL APPENDIX K

THUNDERSTORM EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	MAG-NITUDE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Bloxham	7/9/2014	Thunderstorm Wind	55	0	0	50000	0	0	0	Public	Bloxham
Leon Co.	Macon Community Park	7/9/2014	Thunderstorm Wind	50	0	0	500	0	0	0	Law Enforcement	Macon Community Park
Leon Co.	Baum	7/9/2014	Thunderstorm Wind	50	0	0	500	0	0	0	Emergency Manager	Baum
Leon Co.	Macon Community Park	7/28/2014	Thunderstorm Wind	50	0	0	500	0	0	0	911 Call Center	Macon Community Park
Leon Co.	Southwood	8/21/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	911 Call Center	Southwood
Leon Co.	Apalachee Regional Park	8/24/2014	Thunderstorm Wind	50	0	0	500	0	0	0	911 Call Center	Apalachee Regional Park
Leon Co.	Lake Munson	10/14/2014	Thunderstorm Wind	50	0	0	0	0	0	0	NWS Employee	Lake Munson
Leon Co.	Southwood	10/14/2014	Thunderstorm Wind	50	0	0	500	0	0	0	NWS Employee	Southwood
Leon Co.	Macon Community Park	12/23/2014	Thunderstorm Wind	50	0	0	1000	0	0	0	Emergency Manager	
Leon Co.	Tallahassee Memorial Hospital	12/23/2014	Thunderstorm Wind	50	0	0	10000	0	0	0	Broadcast Media	
Leon Co.	Lake Ella	12/24/2014	Thunderstorm Wind	50	0	0	2000	0	0	0	Social Media	

APPENDIX L:

Lightning Events
January 1, 2010 – December 31, 2014

TECHNICAL APPENDIX L
LIGHTNING EVENTS FROM JANUARY 1, 2010 TO DECEMBER 31, 2014

COUNTY	LOCATION	BEGIN DATE	EVENT TYPE	DEATHS DIRECT	INJURIES DIRECT	PROPERTY DAMAGE	CROP DAMAGE	INJURIES INDIRECT	DEATHS INDIRECT	SOURCE	END LOCATION
Leon Co.	Tallahassee Memorial Hospital	8/25/2010	Lightning	0	0	15000	0	0	0	Fire Department/Rescue	Tallahassee Memorial Hospital
Leon Co.	FSU Doak Campbell Stadium	4/21/2012	Lightning	0	0	1500	0	0	0	Broadcast Media	
Leon Co.	Springsax Park	9/17/2012	Lightning	0	0	20000	0	0	0	Newspaper	Springsax Park
Leon Co.	Fallschase	9/17/2012	Lightning	0	0	55000	0	0	0	Fire Department/Rescue	Fallschase
Leon Co.	Macon Community Park	8/14/2013	Lightning	0	0	100000	0	0	0	Fire Department/Rescue	Macon Community Park
Leon Co.	Levy Park	9/3/2013	Lightning	0	0	2000	0	0	0	Public	Levy Park
Leon Co.	Kleman Plaza	6/8/2014	Lightning	0	0	75000	0	0	0	County Official	Kleman Plaza
Leon Co.	Tallahassee Memorial Hospital	8/25/2010	Lightning	0	0	15000	0	0	0	Fire Department/Rescue	Tallahassee Memorial Hospital

APPENDIX M:

Ranking System for Proposed Hazard Mitigation Grant Program Applications

Project Ranking System Example		A	B	C	D	E	F	G	Score	Rank
		Emergency Back-up Power Generator (2-1-1 Big Bend, Inc.)	12386 Waterfront Drive Structure Elevation (Leon County DSEM)	4908 Crooked Road Property Acquisition (Leon County DSEM)	Improving Operational Reliability of Water Supply Well #18 (COT)	Tallahassee Memorial Hospital Generators (TMH)	Providing Redundant Electrical Circuits to the Main Pump Station #PS 149 (COT)	Permanent Generators at Branch Libraries and Community Centers		
A	Emergency Back-up Power Generator (2-1-1 Big Bend, Inc.)		A	A	D	A	F	G	3	4
B	12386 Waterfront Drive Structure Elevation (Leon County DSEM)			C	D	B	F	G	1	6
C	4908 Crooked Road Property Acquisition (Leon County DSEM)				D	C	F	G	2	5
D	Improving Operational Reliability of Water Supply Well #18 (COT)					D	D	D	6	1
E	Tallahassee Memorial Hospital Generators (TMH)						F	G	0	7
F	Providing Redundant Electrical Circuits to the Main Pump Station #PS 149 (COT)							F	5	2
G	Permanent Generators at Branch Libraries and Community Centers (Leon County)								4	3

The above matrix is a system to rank projects by one-on-one comparison. Start on the first row, comparing project A to all of the Projects listed in the columns, giving the letter of which project should take precedent. Once the projects have all been compared, and the matrix is complete, count the number of times each project took precendent over the others and total each project score in the associated row. The project with the highest number of precedents (score) will have a number 1 ranking, and the project with the loweset number of precedents ranks last.