OSCEOLA COUNTY LOCAL MITIGATION STRATEGY WORKING GROUP

2020 LOCAL MITIGATION STRATEGY

OSCEOLA COUNTY OFFICE OF EMERGENCY MANAGEMENT

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Hazard Identification Risk Assessment, Record of Changes and the By-Laws

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EXECUTIVE SUMMARY

The objective of the Local Mitigation Strategy (the Plan) is to make Osceola County and the community, as a "whole", safer and more disaster resilient. Understanding hazard mitigation at the local level enables the community to lessen vulnerability to the various threats and hazards which better supports economic and social development.

Through effective hazard mitigation programming, business disruption is lessened and governmental financial outlay reduced. By addressing hazards in advance using mitigation initiatives, businesses and citizens recover and achieve normalcy sooner following a catastrophic event.

The strategy is a multi-jurisdictional hazard mitigation document (the Plan) achieved through a coordinated, cooperative planning effort. Developing and maintaining the Plan is extremely important to the Osceola County community because of rapid population growth, seasonal population (tourism) influx, and expanding development. These factors contribute significantly to community vulnerability to natural and man-made disasters.

The Plan is a combined effort of the Local Mitigation Strategy Working Group through identifying, prioritizing, and executing mitigation goals and objectives including mitigation initiatives based on community hazards and vulnerabilities. The Plan identifies mitigation initiatives that are cost effective, technically feasible, and environmentally sound.

Included in the Plan is a complete revision of the Hazard Identification and Risk Assessment (Appendix "K"). The Office of Emergency Management assessed the various hazards and vulnerabilities, including historical records and current data, to provide a community-based analysis. The Local Mitigation Strategy Working Group set forth, and prioritized, specific mitigation initiatives aimed at minimizing vulnerability based on the assessment.

This Plan continues to evolve and expand for the future ensuring it addresses the changing conditions in the participating jurisdictions, including experiences with disasters that do occur, and any changes in the hazard characteristics threatening the involved communities. The process of versioning and future editions of the Plan serves to continue to inform and involve the public, including any interested groups, in making the community more resilient to the impacts of future disasters.

The initial draft was submitted to the Florida Division of Emergency Management for review in accordance with Florida Administrative Codes 27P-5 and 27P-22. Additionally, the review includes specifics on behalf of the Federal Emergency Management Agency (FEMA), particularly for comparison with the requirements outlined in the Disaster Mitigation Act of 2000, and Title 44 Code of Federal Regulations Part 201.6 regarding eligibility to apply for FEMA Hazard Mitigation Grant Programs.

Each participating jurisdiction has formally adopted and approved the updated Plan by Resolution. Copies of the executed Resolutions are available in Appendix H.

INTRODUCTION & OVERVIEW

The Osceola County Local Hazard Mitigation Strategy (the Plan) is established to make the population, neighborhoods, businesses, and institutions of the community more resistant to the potential impacts of future disasters.

As the second fastest growing county in Florida, Osceola County faces challenges in accommodating incoming residents, tourists, and businesses. Since 2010, Osceola County has seen a near 40% increase in population growth. Osceola County is able to support the projected growth in a sustainable manner, incorporating an expansion of the designated Urban Growth Boundary and the development of multimodal transportation corridors while simultaneously preserving areas designated for rural agricultural use. However, these changes, while positive, also increase community vulnerability to natural and man-made disasters.

The Local Mitigation Strategy Working Group (Working Group) continues to undertake a comprehensive, detailed evaluation of hazard vulnerabilities and identify ways to make the communities more resistant to their impacts. This document substantiates the results of that planning process for the current planning period.

PURPOSE

The Plan and the underlying planning process are intended by the Working Group to serve many purposes. These include the following:

- Provide a Methodical, Substantive Approach to Mitigation Planning
- Enhance Public Awareness and Understanding
- Create a Decision Tool for Management
- Promote Compliance with State and Federal Program Requirements
- Enhance Local Policies for Hazard Mitigation Capability
- Assure Inter-Jurisdictional Coordination of Mitigation-Related Programming
- Create Jurisdiction-Specific Hazard Mitigation Plans for Implementation
- Provide a Flexible Approach to the Planning Process

OVERVIEW

The Plan provides a description of the mitigation-related characteristics of each participating jurisdiction, including land usage and population growth trends, the mitigation-related policies already in place, identified critical facilities present in the community, and properties repetitively damaged by past events. In addition, the Plan:

- Includes the Hazard Identification and Risk Assessment (Appendix K);
- Addresses the adequacy of the current policy basis for hazard management by the participating jurisdictions and organizations;
- Documents the structural and non-structural mitigation initiatives proposed by the participating jurisdictions addressing the identified vulnerabilities;
- Addresses the mitigation goals and objectives established by the Working Group and the action to be taken to maintain, expand, and refine the Plan and the planning process; and
- Identifies any past and planned efforts of the Working Group for engaging the public and communities in the mitigation planning process

COMMUNITY PROFILE


Lake Tohopekaliga – 1800s

In the 1840s and 1850s, much of central Florida was swampland. The U.S. Congress granted a large portion of this land to Hamilton Disston for reclaiming wetlands. Hamilton Disston, the son of saw magnate Henry Disston, began the reclamation with the construction of canals and levees. His work formed portions of the now populated land in Osceola County.

The most notable was the separation of East and 'West' Lake Tohopekaliga by constructing the Saint Cloud Canal. Hamilton's accomplishment would later be responsible for the development of the cities of Kissimmee and Saint Cloud. Sugar production and farming along with cattle ranching would soon take hold.

Segments of Brevard County to the east and Orange County to the north were carved away to create Osceola County in 1887. Located in the center of the state, Osceola County extended south to the banks of Lake Okeechobee. This southerly extent remained until the formation of Okeechobee County in 1917.

Cattle ranching evolved into the largest industry until the arrival of Walt Disney World in the late 1960's. Disney World officially opened to the public in 1971. Since that time, industry has shifted to more tourist-based economy. Even through this significant evolution, much of Osceola County remains available for agriculture and ranching. Based on growth projections, it is possible that the county could triple in population by 2060.The projected growth increases the community's vulnerability to a number of hazards discussed in this report.

GEOGRAPHICAL PROFILE

Osceola County (including the Cities of Kissimmee and Saint Cloud)

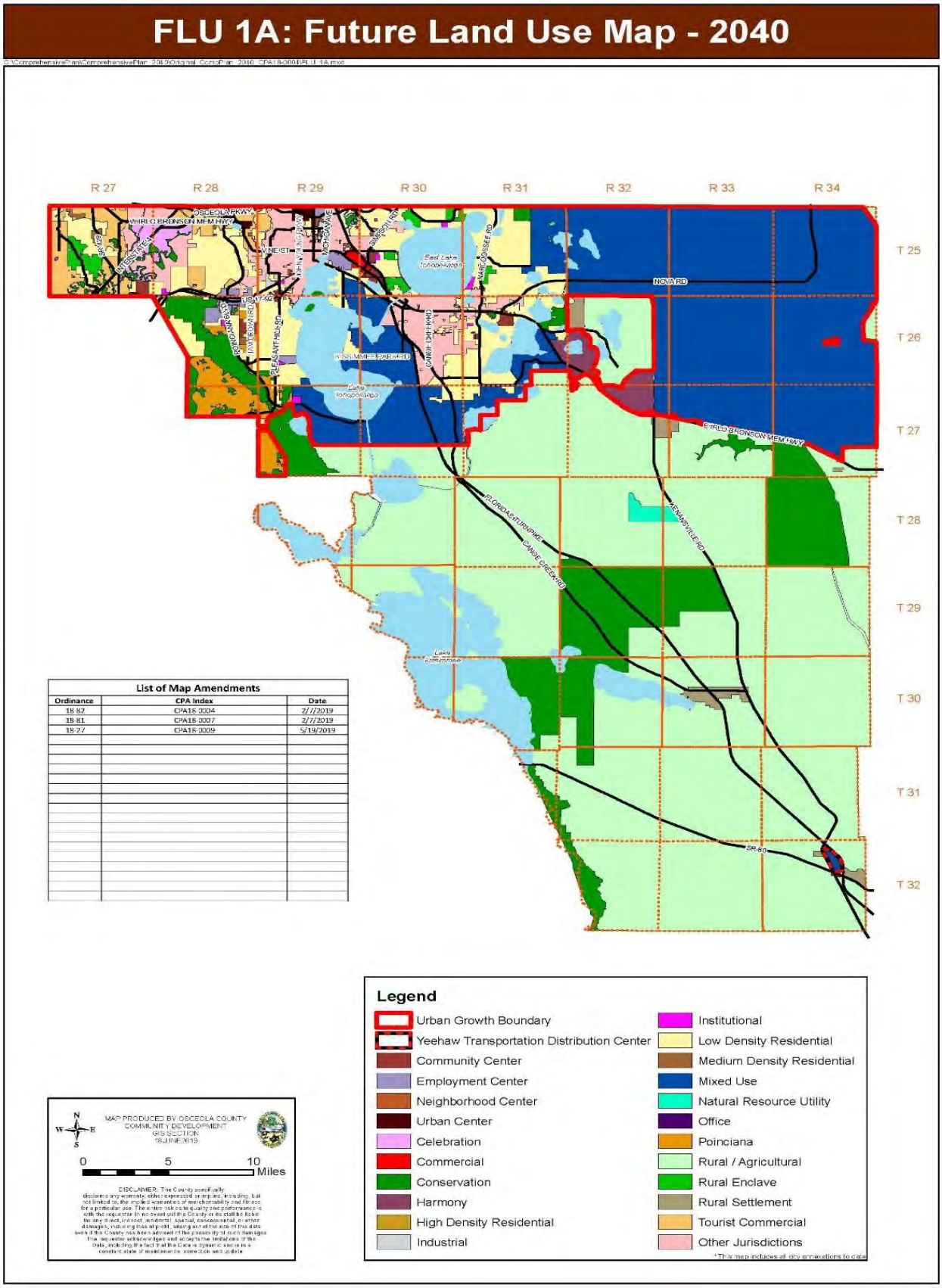
***Area*:** 1,506 square miles

***Topography*:** The County is located within the Osceola Plain, a broad, flat area of land lying immediately adjacent to the Lake Wales and Mount Dora Ridges on the northwest and west. Elevations range from a minimum of about 15 feet above the National Geodetic Vertical Datum (NGVD) in the northeast part of the county to a maximum of over 100 feet NGVD in the northwest part of the county near the top of the Lake Wales Ridge. Orange, Brevard, Indian River, Okeechobee, Highlands, Polk, and Lake Counties bound Osceola County.

***Land Use*:** The majority of land in the county, approximately 74%, is an undeveloped mix of agricultural land, bodies of water, forests, and conservation land.

While ranching and agricultural lands are important to Osceola County's economy and heritage, it is the County's intent to capture the majority of future growth near the existing urbanized areas, anticipating urban, mixed-use development. The following map is an illustration of the County's Future Land Uses.

OSCEOLA COUNTY FUTURE LAND USE



***Water Area*:** 184 square miles

Nearly 15% of the County's topography consists of surface water. The following table provides a list of the major lakes, waterways and creeks.

Lakes	Rivers	Canals/Tributaries	Creeks
Lake Ajay	Econlockhatchee River	Bass Slough	Boggy Creek
Alligator Lake	(headwaters)	Blanket Bay Slough	Bonnet Creek
Bay Lake		C-29B	Bull Creek
Brick Lake		C-30	Crabgrass Creek
Brown Lake		C-31 (St. Cloud Canal)	Davenport Creek Swamp
Buck Lake		C-32 B, C, D, F & G	Jane Green Creek
Bullock Lake		C-33	Jim Branch Creek
Cat Lake		C-34	Penny Wash Creek
Lake Cecile		C-35 (Southport Canal)	Reedy Creek
Lake Center		C-36	Shingle Creek
Lake Conlin		C-37	Taylor Creek
Clay Lake		C-35 (Southport Canal)	West Branch Shingle Creek
Coon Lake		C-36	Wolf Creek
Lake Cypress		C-37	
Drawdy Bay		Drawdy Bay Ditch	
East Lake Tohopekaliga		East & West City Ditch	
Fish Lake		Fanny Bass Pond & Slough	
Lake Gentry		Fennel Slough	
Lake Hatchineha		Fourmile Swamp	
Lake Hendon		Gator Bay Branch	
Lake Jackson		Hogpen Slough	
Lake Joel		Jackson Canal	
Lake Kissimmee		Marian Creek	
Live Oak Lake		Mill Slough	
Lake Lizzie		Myrtle Slough	
Lake Marian		Oakey Pond	
Lake Myrtle		Otter Slough North	
Lake Preston		Ox Pond	
Lake Runnymede		Partin Canal	
Lake Russell		Peg Horn Slough (FDOT Canal)	
Sardine Lake		Sawgrass Slough	
Lake Tohopekaliga			
Trout Lake			

Drainage Patterns

Osceola County is the headwaters for two of Florida's most important and best-known water systems, the Florida Everglades and the St. John's River Basin.

The Kissimmee Basin is the northernmost basin in the South Florida Water Management District (SFWMD) and encompasses the western two thirds of the County. Major urban areas in the Kissimmee Basin include the City of Kissimmee on Lake Tohopekaliga and the City of St. Cloud on East Lake Tohopekaliga, as well as Poinciana and Disney World, which drains to Lake Cypress. The Kissimmee Basin flows South through the Kissimmee River and directly into Lake Okeechobee.

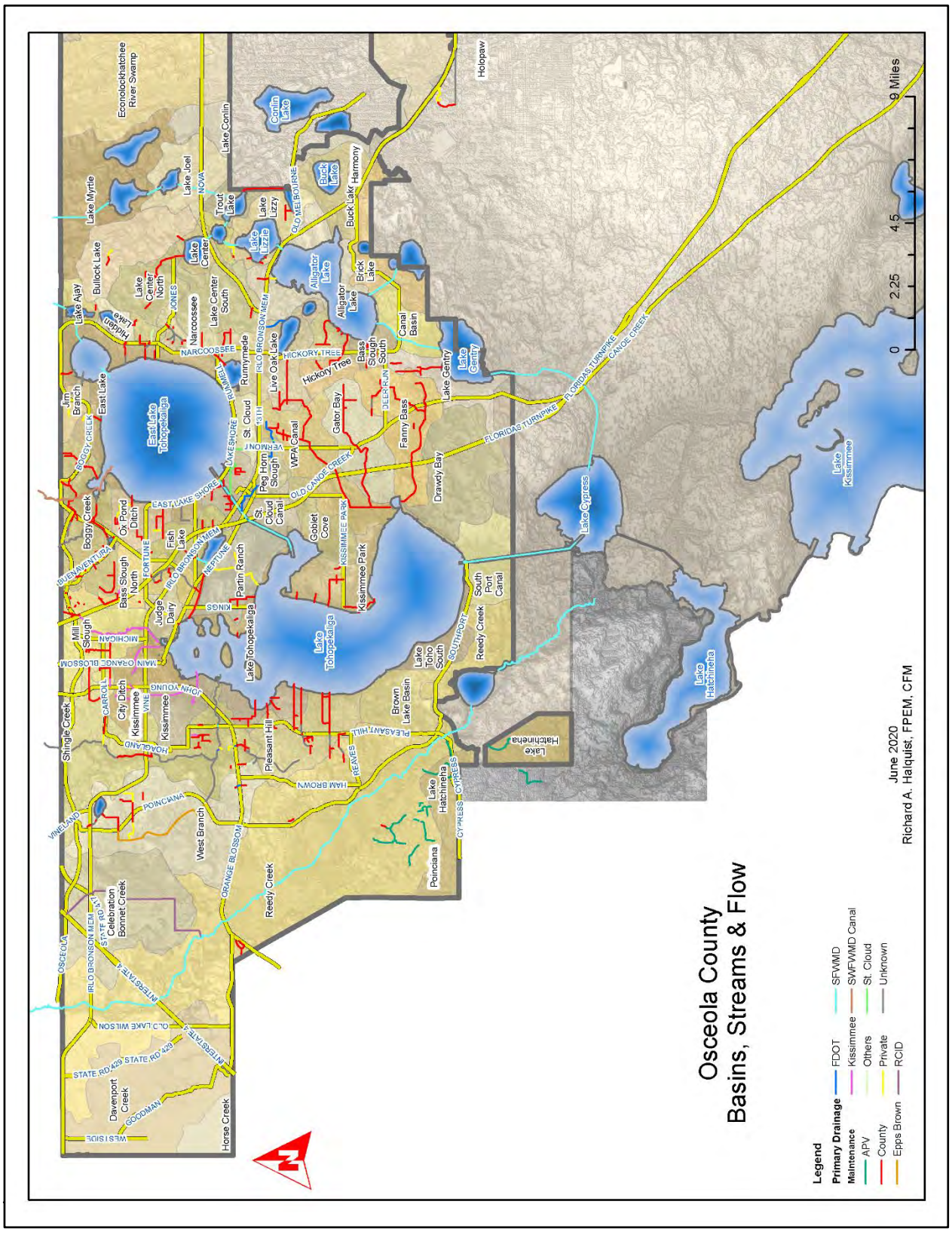
Historically, the Kissimmee Chain of Lakes (KCOL) and the Kissimmee River were an integrated system comprised of headwater lakes connected by broad shallow wetlands and creeks. Under these natural conditions, lake levels would rise in the wet season and overflow to adjoining lands, creating broad, marshy connections between the lakes. The KCOL has been substantially altered from this historical condition through the dredging of canals, installation and operation of water control structures, increased development, and proliferation of problematic plant and animal species. The most dramatic alteration is in water level fluctuations. Lake level fluctuation has been reduced from 2–10 ft (0.6–3.0 m) to about 2–4 ft (0.6–1.2 m) annually.

The hydrologic modification of the Kissimmee Chain of Lakes watershed began in the 1880s. During that time, Hamilton Disston began excavating canals between the lakes to improve navigation and drainage of the surrounding lands. The Federal Rivers and Harbors Act of 1954 as an addition to the Central and Southern Florida (C&SF) Project authorized flood control works for the Kissimmee Basin.

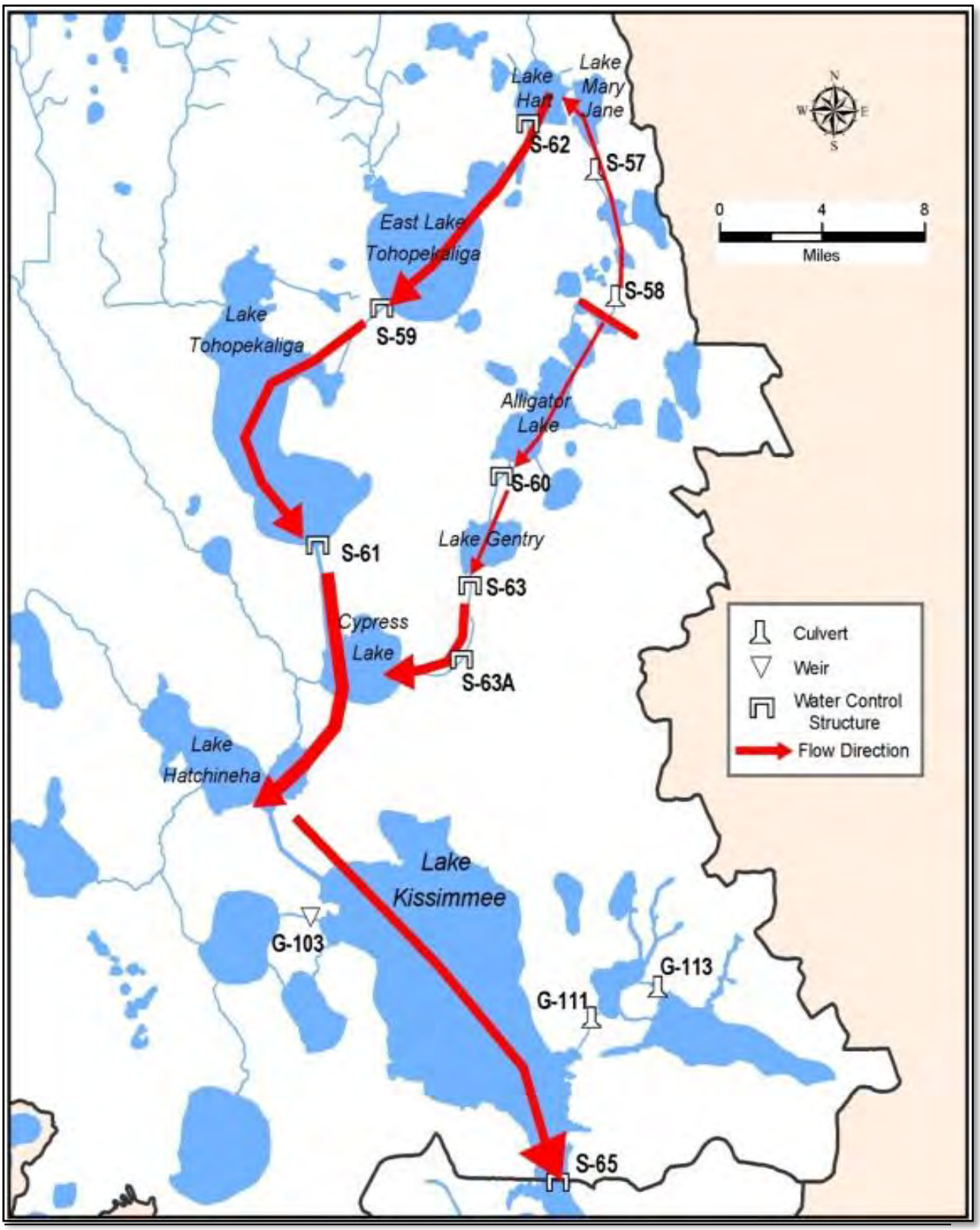
The primary purposes were to relieve flooding and minimize flood damage within the Kissimmee Basin. The Upper Kissimmee Basin portion of the project was constructed between 1964 and 1970 and included construction of nine water control structures (S-57, S-58, S-59, S-60, S-61, S-62, S-63, S-63A, and S-65) to regulate lake levels and outflows.

A number of canals between the lakes were enlarged, and new canals were dredged to connect Alligator Lake with Lake Gentry, and to connect Lake Gentry with Cypress Lake. Under an agreement between the United States Army Corps of Engineers and the SFWMD, the SFWMD is required to operate and maintain all completed portions of the C&SF Project pursuant to regulations prescribed by the Secretary of the Army.

URBAN GROWTH BOUNDARY PRIMARY DRAINAGE



CHAIN OF LAKES FLOW DIRECTION



OSCEOLA COUNTY BASINS

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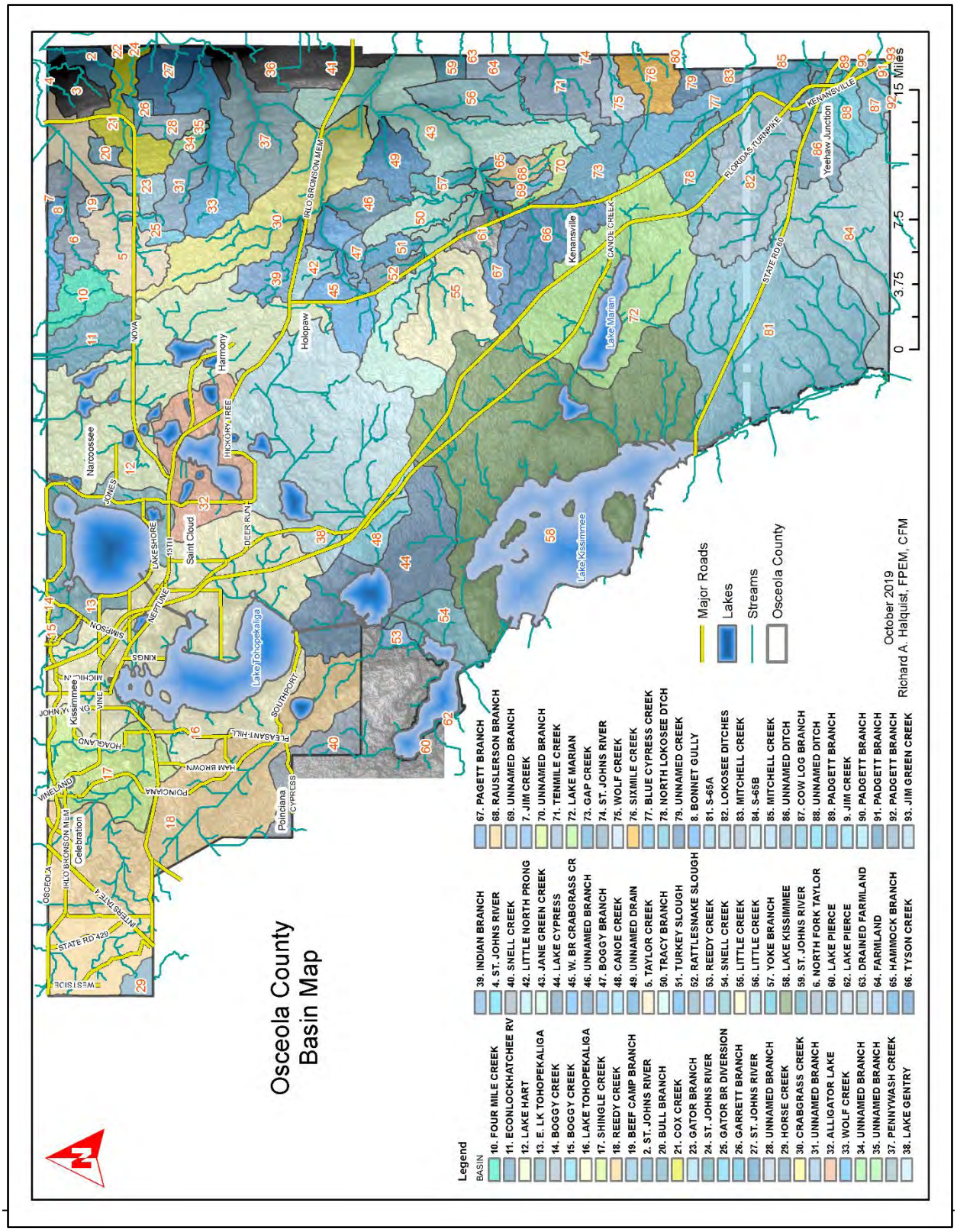
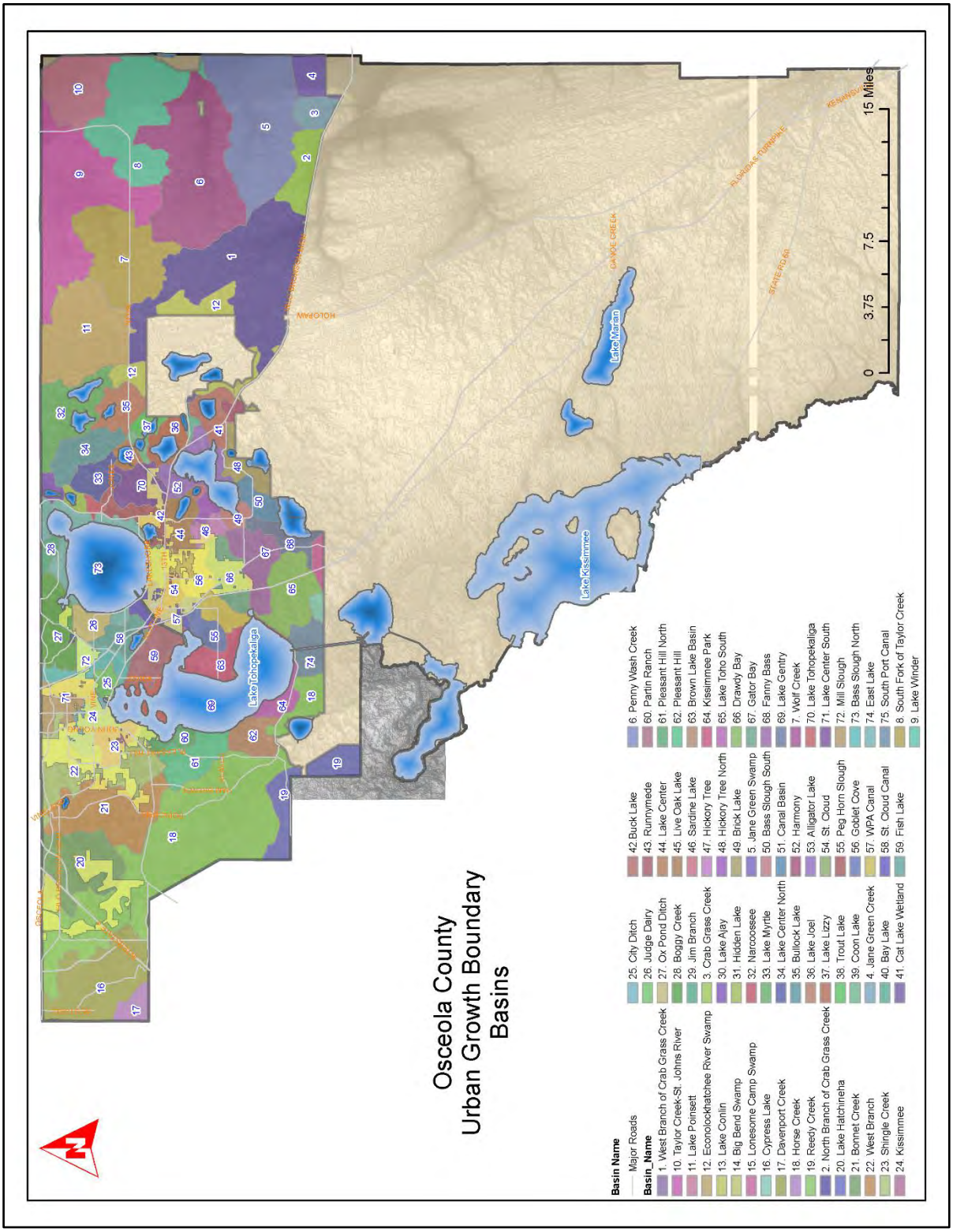


OSCEOLA COUNTY URBAN GROWTH BOUNDARY STORMWATER BASINS



Environmentally Sensitive Areas & Conservation Lands

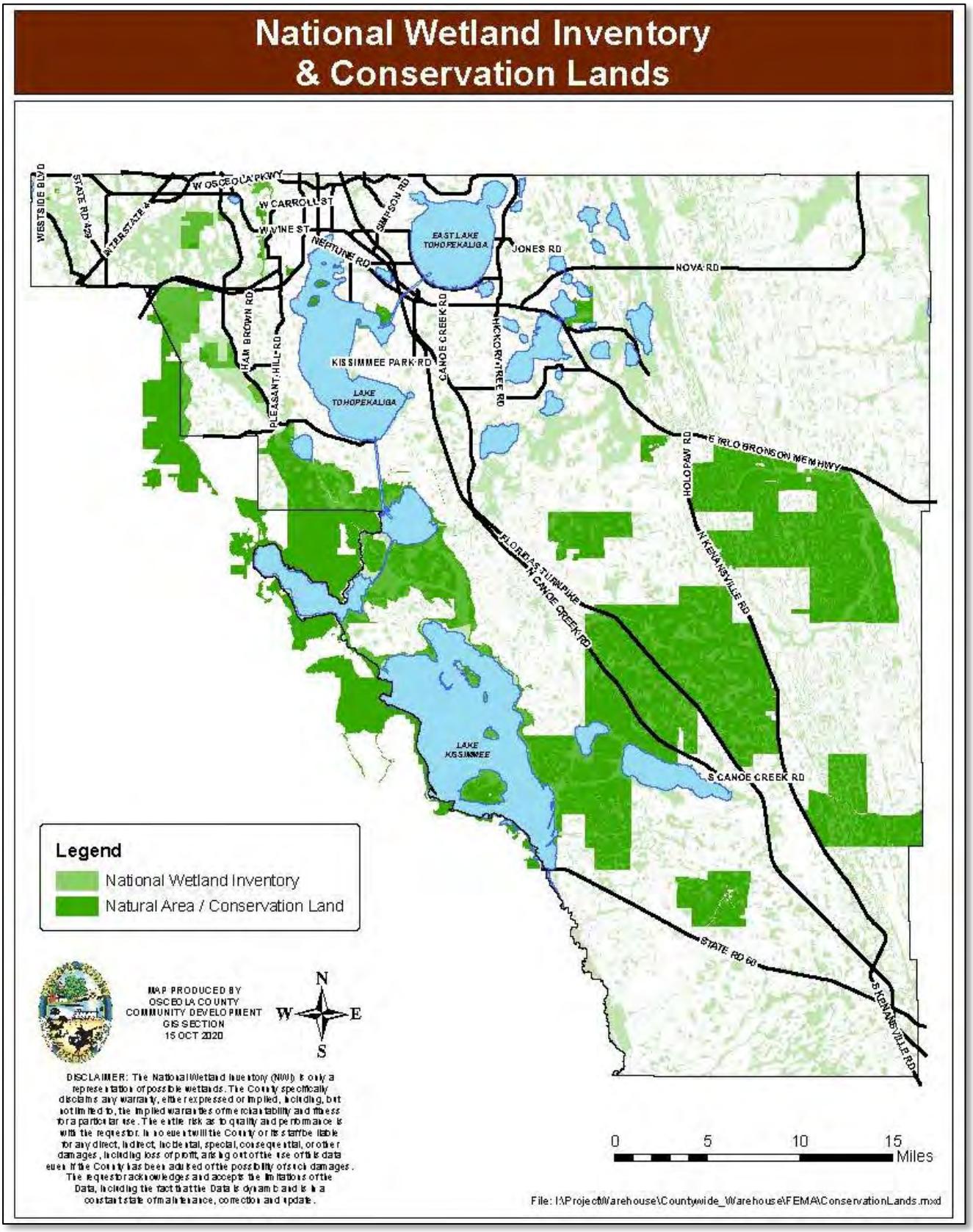
There are approximately 178,000 acres of conservation area within Osceola County, with several areas managed by the County itself. Most of the lands managed by the County were purchased through the Environmental Lands Conservation Program. These include County park sites such as Lake Lizzie, Camp Lonesome, Candella Island, Scotty's Cove, Twin Oaks, Holopaw, Cherokee Point Conservation Areas and Shingle Creek Regional Park. Non-County managed conservation properties also located within the County boundary includes The Nature Conservancy's Disney Wilderness Preserve (11,500 acres), Forever Florida (4,700 acres), Bull Creek Wildlife Management Area (23,646 acres), Triple N Ranch Wildlife Management Area (16,285 acres) and Three Lakes Wildlife Management Area (63,487 acres).

As the headwaters of the Everglades, Osceola County has always had large wetland areas. These wetlands are instrumental in providing fish and wildlife habitats, protecting water quality, preventing erosion, storing water, and providing flood control. Over the years as development has spread throughout the county, the wetlands split into two groups, urban and rural wetlands.

Urban wetlands are wetlands that reside in developed portions of the county, some of which may suffer damage by continued development. Urban wetlands are found mainly in the northwestern part of the county and include Reedy Creek Swamp, Davenport Creek Swamp, Lake Tohopekaliga, East Lake Tohopekaliga, Cypress Lake, and the Alligator chain of lakes.

Rural wetlands are wetlands that reside in the agriculture and undeveloped sections of the county, some of which experience damage from continued agricultural development. The Big Bend Swamp, Bull Creek Swamp, Blue Cypress Wetland System, and the Econlockhatchee River Swamp dominate the rural wetland portions of the county.

NATIONAL WETLAND INVENTORY & CONSERVATION LAND

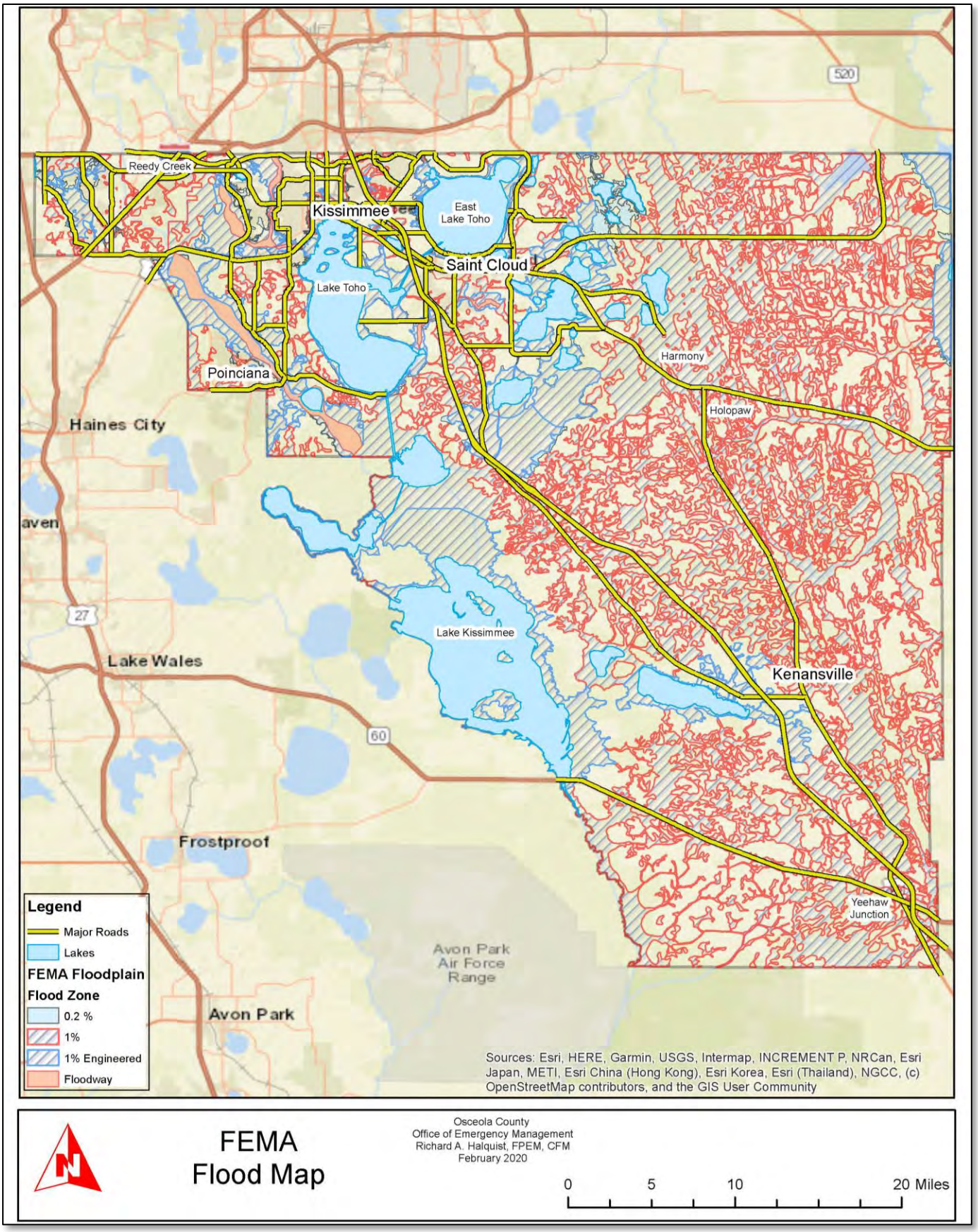


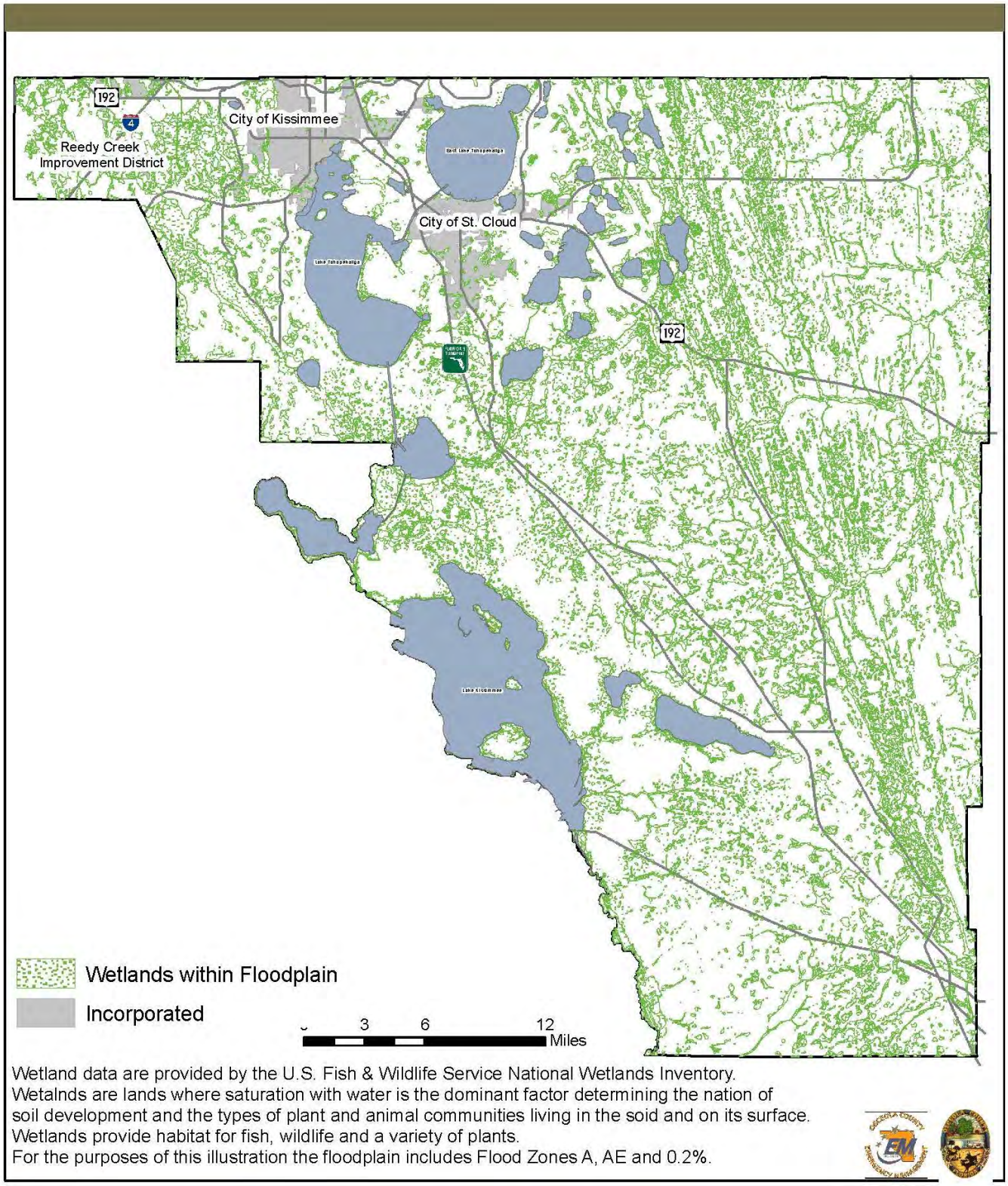
Flood Zones

The Federal Emergency Management Agency (FEMA) provides the County every ten years with an official Flood Insurance Rate Map (FIRM) that delineates the geography based on the level of flood risk. According to FEMA FIRM data, approximately 47% of the County's land area lays within Flood Zone X, 32% within Zone A, 20% within Zone AE and 1% within the 0.2% change of an annual flood. Further descriptions of Flood Zones are provided in the Appendix K – Hazard Identification and Risk Assessment (HIRA) section of the Plan.

FEMA Flood Zones (Source: FEMA, 2019)

FEMA Flood Zone Determination	
Annual Chance Zone	**Description**
1% (A)	1% or "A" equates to a 1% annual chance of flooding within 100 years and a 26% chance of flooding over the life of a 30-year mortgage. Because no detailed analysis exists within these areas, no depths or base flood elevations are shown within this zone. Flood insurance is required on federally insured mortgaged property.
1% Engineered (AE)	Areas within a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown as selected intervals within this zone. Flood insurance is required on federally insured mortgaged property.
AE Floodway	A "Floodway" means the channel of a river or other watercourse. If it is a "Regulatory Floodway" development must be regulated to prevent any restricted rise within the adjacent flood zone.
.2% (X-Shaded)	.2 % annual chance is a moderate flood hazard area located just outside a 1% annual chance and the area known as "X". It is sometimes termed "X – Shaded" and equates to the 500 year flood event. Flood insurance is generally not required in this area.
X	Areas outside the 0.2% and 1% chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than one foot, areas of 1% annual stream flooding where the contributing drainage area is less than one square mile, or areas protected from the 1% annual chance flood by levee. No base flood elevations or depths are shown within this zone. Insurance purchase is not required in this zone.
D	Areas with possible undetermined flood hazards and no flood analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.


520
Reedy Creek
Kissimmee
East
Lake Toho
Saint Cloud
Lake Toho
Harmony
Poinciana
Holopaw
Haines City
aven
27
Lake Kissimmee
Lake Wales
Kenansville
60
Frostproof
Yeehaw
Junction
Avon Park
Air Force
Range
Avon Park
Legend
Major Roads
Lakes
FEMA Floodplain
Flood Zone
0.2 %
1%
1% Engineered
Floodway
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
FEMA
Flood Map
Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
February 2020
0
5
10
20 Miles



Wetland data are provided by the U.S. Fish & Wildlife Service National Wetlands Inventory.
Wetalnds are lands where saturation with water is the dominant factor determining the nation of soil development and the types of plant and animal communities living in the soid and on its surface.
Wetlands provide habitat for fish, wildlife and a variety of plants.
For the purposes of this illustration the floodplain includes Flood Zones A, AE and 0.2%.

Osceola County Office of Emergency Management

Wetlands within the Floodplain
Osceola County, Florida

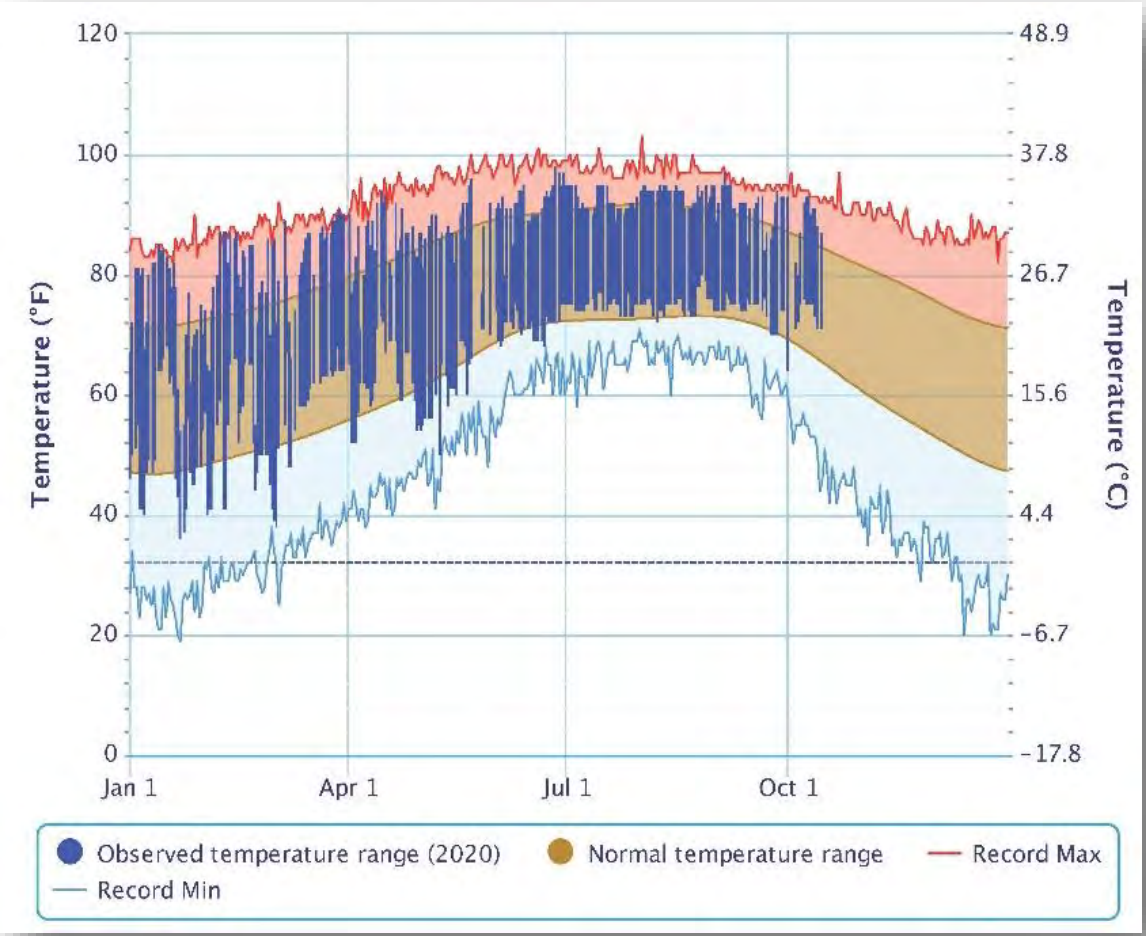
Climate

The average annual temperature of Osceola County is 72 degrees Fahrenheit. Due to the large amount of inland bodies of water, the county experiences high relative humidity throughout the year.

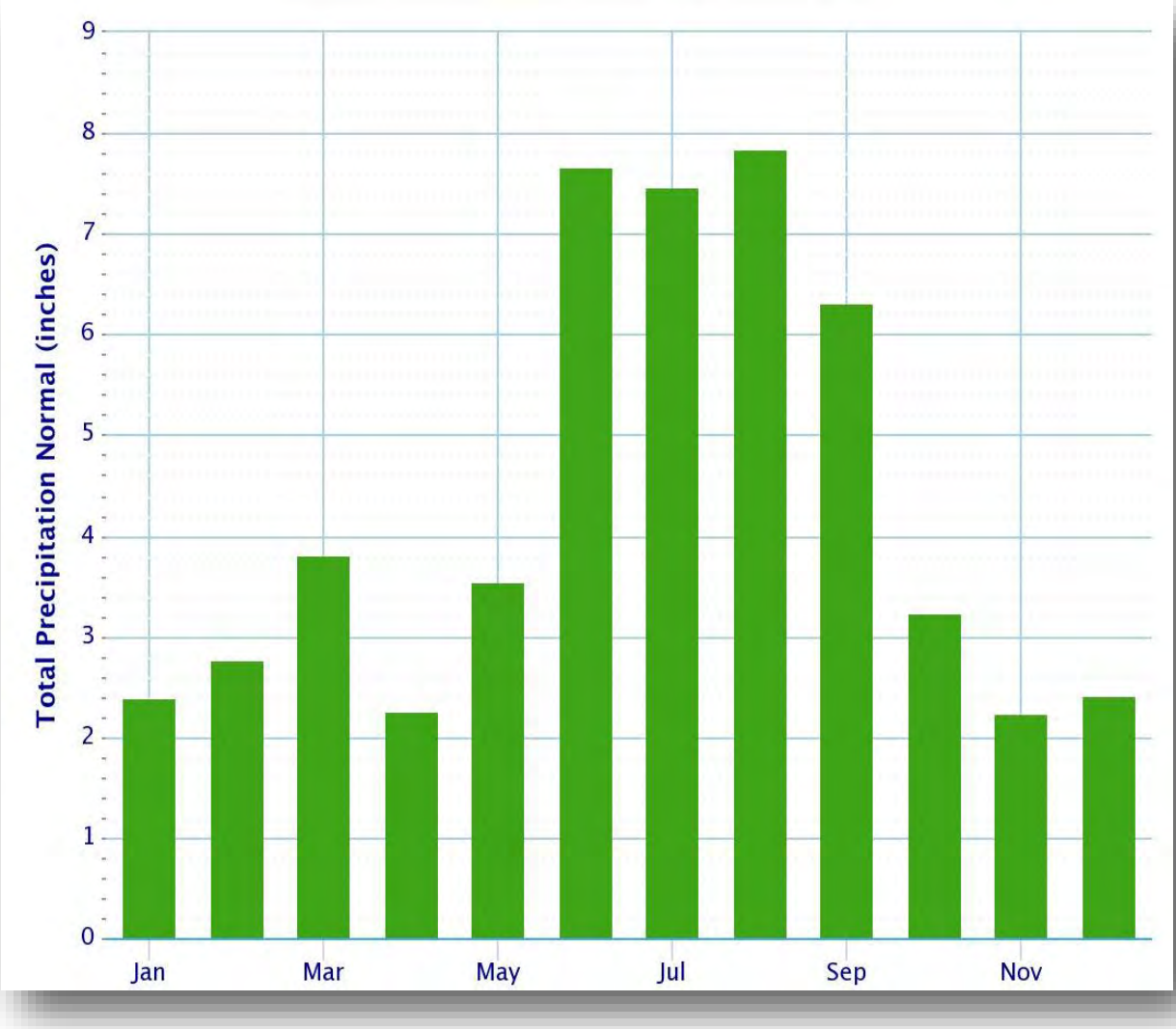
Lying between the Gulf of Mexico and Atlantic Ocean causes daily sea breezes. These sea breezes enhance convective activity providing regular afternoon showers and thunderstorms. This occurs mainly in May through October. The Florida dry season extends from November through April where the County is subject to frontal boundaries bringing cooler, dry air.

The climate is generally subtropical. The average January temperature is 59 degrees F, and the average August temperature is 82 degrees F. The average annual rainfall is 52 inches.

Daily Temperature Data
(Source: NWS Melbourne- Station Kissimmee 2)
Period of Record- 1959-2020. Normals period: 1981-2010



Monthly Precipitation Normals
(Source: NWS Melbourne - Station Kissimmee 2)
Normals period: 1981-2010



DEMOGRAPHIC PROFILE

***Total Population*:** The total population of Osceola County, including the incorporated Cities of Kissimmee and Saint Cloud, is 375,751 which is an increase of 39.8% since 2010 and 117.8% since 2000 (US Census Bureau). This trend of growth is expected to continue, with projections indicating that the County's population may double again by 2045 (BEBR, 2020).

Total Population/Population Change (Source: US Census Bureau)

Total Population 2019	*Total Population 2010*	*Population Change*
375,751	268,685	39.8%

***Population Density*:** The majority of the population resides within the Urban Growth Boundary, an area where urban scale development is concentrated and where public facilities, such as utilities, schools, transit and other public facilities are provided. This area consists of only 26% of the County's total land area. Most of the developed and developing communities lay within the Urban Growth Boundary, including the Cities of Kissimmee, St. Cloud, Poinciana, Buenaventura Lakes, Celebration, Harmony, Campbell City, and Intercession City. While the majority of the population resides within unincorporated Osceola County the City limits of Kissimmee and St. Cloud include a substantial percentage.

Jurisdictional Distribution of Population (Source: US Census Bureau)

Jurisdiction	*Population 2019*	*Population 2010*
City of Kissimmee	72,701	59,682
City of St. Cloud	49,108	35,183
Unincorporated	253,942	173,820
Total Population	375,751	268,685

Median Age (Years) (Source: US Census Bureau)

Median Age 2019	*Median Age 2015*
36.0	35.7

Age Distribution (Percentage) of Population (Source: US Census Bureau)

Age Cohort	*Population 2019*	*Population 2015*
0-17	24.1	25.4
18-44	39.2	37.9
45-64	23.2	24.5
65+	13.5	12.2

Language Breakdown: Among people at least five years old living in Osceola County, 52.9 % speak a language other than English at home, up from 47.8% in 2015 (US Census Bureau). This includes 46.8% that speak Spanish, 4.3% that speak other Indo-European languages, 1.1% that speak Asian and Pacific Island languages, and 0.7% that speak other languages.

Race & Ethnicity: Among all 67 counties within the State of Florida, Osceola County ranks third highest in Hispanic population percentage. Osceola County's Hispanic population comprises 47.4%, an increase from 42% in 2010. Twenty-percent of the people living in Osceola County are considered foreign born, also an increase from 19% in 2010.

Race Distribution (Source: US Census Bureau)

Race	***Percentage 2019***	***Percentage 2015***
White	74.0	78.3
Black	14.2	13.0
American Indian/Alaska Native	0.8	0.7
Asian	3.2	3.6
Native Hawaiian/Other Pacific Islander	--	0.5
Other	11.0	7.7
Hispanic	55.8	49.0
Non-Hispanic	44.2	51.0

Transient & Visitor Populations - Osceola County contains approximately 50,000 accommodations (hotels/motels, vacation rental homes, condos, timeshares, & campgrounds) for the tourist population. Tourist Development Tax (TDT) revenues have increased annually from $34.2million in 2011/2012 to $58.4 million in 2017/2018 (Experience Kissimmee, 2019).

Osceola County welcomed over 8.6 million overnight visitors in 2017. The majority of the tourist population resides in the northwestern portion of the county where Osceola Parkway and State Road 535 provide easy access to tourism attractions in both Osceola and neighboring Orange County.

Canada remains the top overnight international market of visitors to Osceola County, providing over 300,000 visitors. UK, Brazil, Colombia, Mexico and Argentina follow ranking second through sixth in visitation.

Osceola County has a large homeless population, with estimates of over 5,000 individuals. The School District of Osceola County reported a total of 3,500 homeless children enrolled in school for the 2018/2019 school year, including those that live in hotels. Many of these individuals congregate along the west US Highway 192 corridor in the many hotels, with larger populations also located within the city centers of both Kissimmee and Saint Cloud where there is easier access to various social services.

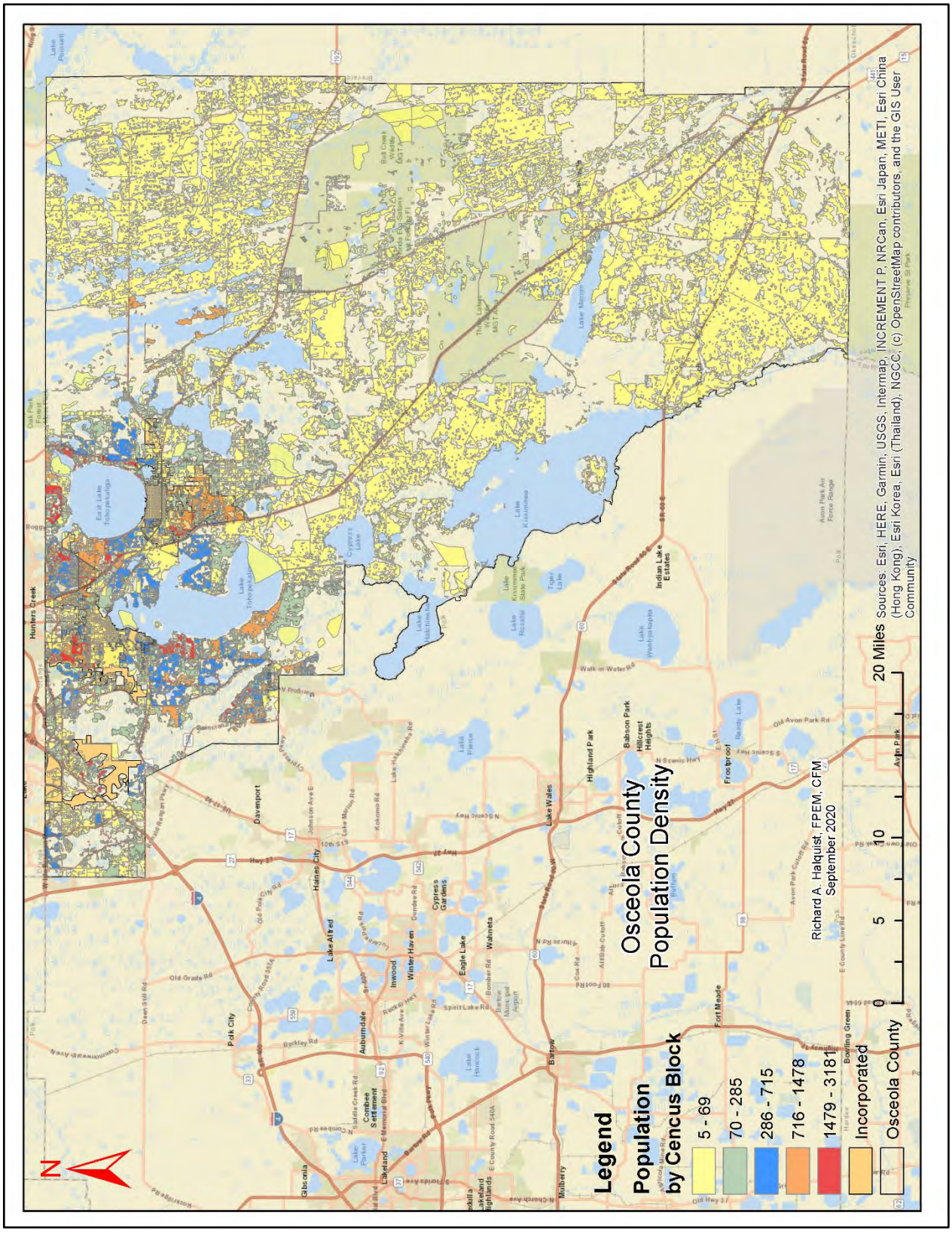
Mobile Home Population - Of 162,677 residential units, approximately 11,093 are mobile homes located throughout the county.

Inmate Population - The Osceola County Correctional Facility has a design capacity of 919, with an average daily population in 2019 of 870 inmates. This number fluctuates based on a number of factors.

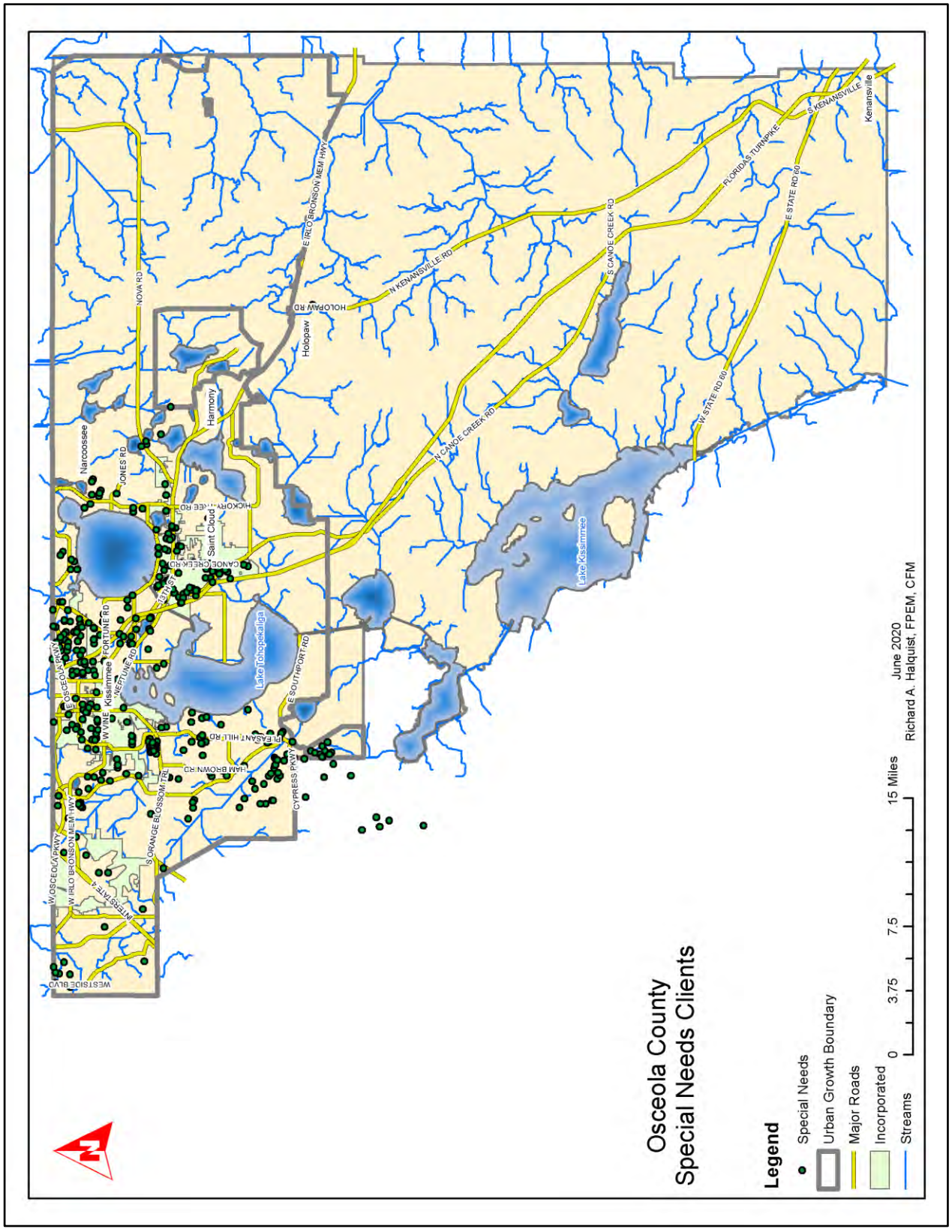
Seasonal Population - Osceola County has 34,452 housing units that are classified for seasonal or recreational use. This includes second homes and vacation rentals, but does not include any type of timeshare property.

Special Needs Populations: As of 2018, there are 57,681 individuals with a self-reported disability, including hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and/or independent living difficulty (US Census Bureau). The county has 639 individuals that have registered with the Office of Emergency Management's Special Needs Program in order to receive assistance during emergency situations that may require transportation assistance, power provision, or other accommodations.

POPULATION DENSITY BY CENSUS BLOCK



SPECIAL NEEDS POPULATION



ECONOMIC PROFILE

Osceola County (including the Cities of Kissimmee and Saint Cloud)

Income per Capita: $23,392

Median Household Income: $51,760

Residential Properties
Single Family: 88,835 parcels
Mobile/Modular/Manufactured: 11,093 parcels
Condominium: 12,966 parcels
Timeshare: 323 parcels
Multi-Family >10 du: 87 parcels
Multi-Family <10 du: 958 parcels

Other Properties
Retirement Home: 14 parcels
Improved Commercial: 5,151 parcels
Improved Industrial: 362 parcels

Average Property Values: According to the Property Appraiser's office, the average market or appraised (just) value of property in Osceola County is $248,032; the average assessed value, before exemptions is $228,599. The average market of appraised (just) value of improved commercial properties in Osceola County is $905,306; the average assessed value of improved commercial properties before exemptions is $905,306.

Housing Characteristics:

Housing Occupancy (Source: US Census Bureau)

Total Housing Units	162,677 units
Occupied Housing Units	111,539 units
Owner -Occupied	69,399 units
Renter-Occupied	42,140 units
Vacant Housing Units	51,138 units

Employment Sectors: Among the most common occupations within the major industries in Osceola County are trade, transportation and utilities occupations (23%), professional and business services occupations (18%), leisure and hospitality occupations (13%), financial occupations (11%), education and health service occupations (10%), and construction occupations (10%).

Major Employers: Osceola County serves as the south/central boundary of the greater Central Florida metropolitan area and has a diversified and rapidly growing population and labor force. Osceola County's central location positions well for manufacturing, distribution, and corporate headquarters operations. A listing of Osceola County's major employers is provided below.

Listing of Major Employers

Employer	Employment Type	Number Employed
School District of Osceola County	Public Employer- Government	8,832
Holiday Inn Club Vacations	Vacation Timeshare/Resort	4,500
Walt Disney Company	Osceola County Offices	3,700
Wal-Mart Stores, Inc.	Retail Stores	2,730
Osceola Regional Medical Center	Healthcare Provider	2,200
Florida Hospital-Celebration	Healthcare Provider	1,658
Gaylord Palms Resort & Convention Center	Resort & Hotel	1,594
Osceola County Board of County Commission	Public Employer-Government	1,407
Publix Supermarkets, Inc.	Grocery Stores	1,350
McLane / Suneast, Incorporated	Distribution Center	900
Omni ChampionsGate Resort	Resort & Hotel	750
City of Kissimmee	Public Employer-Government	700
Lowes RDC	Distribution Center	607
Valencia Community College	Junior College	506
City of St. Cloud	Public Employer-Government	500
St. Cloud Regional Medical Center	Healthcare Provider	450
Florida Hospital – Kissimmee	Healthcare Provider	450
Good Samaritan Village	Retirement Community	350
Tupperware Corporation	World Headquarters	300
Toho Water Authority	Public Employer-Government	250
Quaker Oats / PepsiCo	Manufacturing	200

TRANSPORTATION PROFILE

Based on growth projections, it is possible that the county could triple in population by 2060. This requires the provision of innovative transportation options to invigorate existing and future economic centers, reduce travel costs, decrease vehicular miles of travel, shorten commute times, promote new transportation choices and increase quality of life.

Osceola County is a multi-modal community, offering a variety of modes of transportation. An illustration of the Osceola Expressway Authority 2040 Master Plan is provided on the next page. Even through this significant evolution, much of Osceola County remains available for agriculture and ranching.

TRN 1A: Roadway Network - 2040

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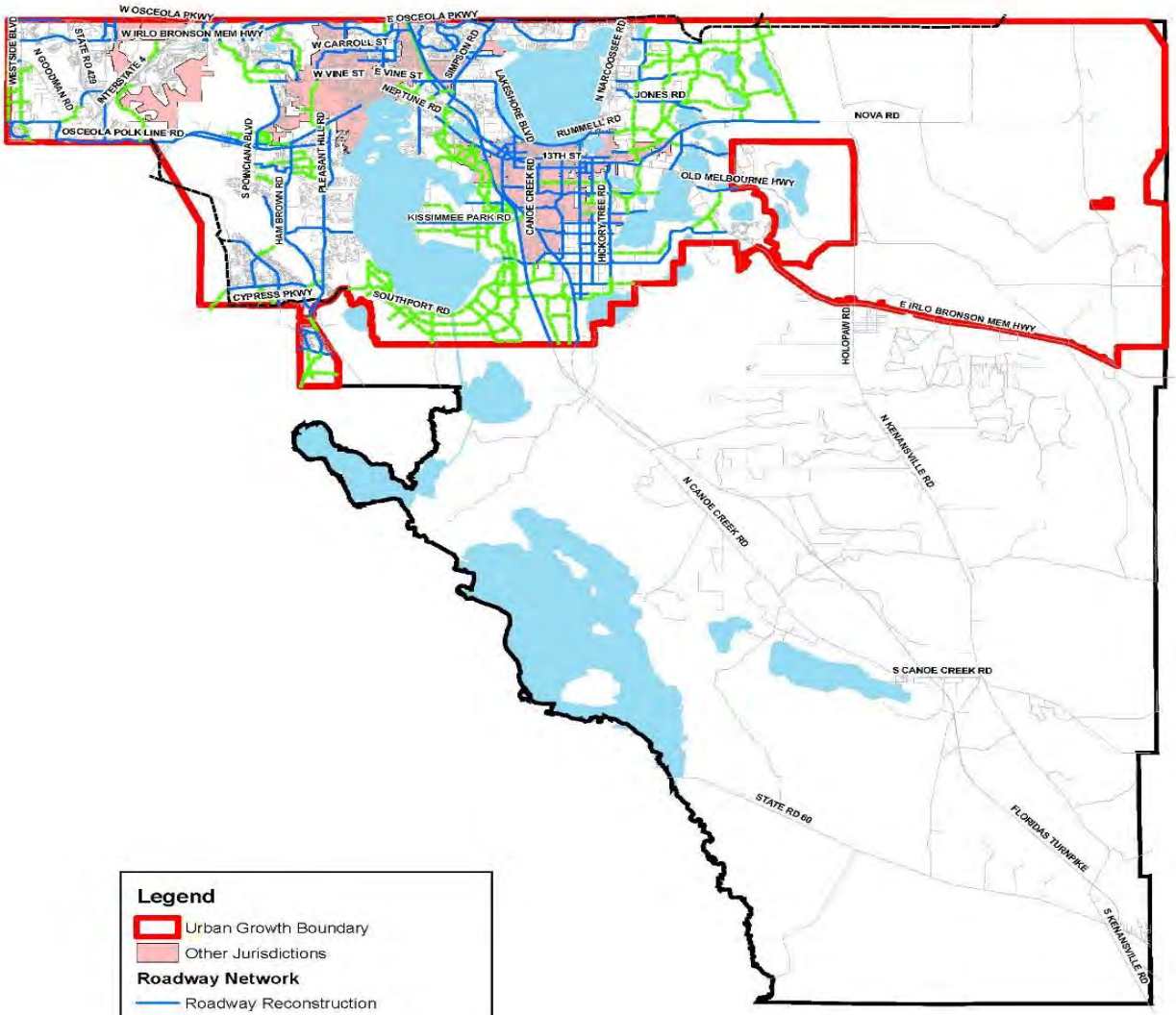


Legend

- Urban Growth Boundary
- Other Jurisdictions

Roadway Network

- Roadway Reconstruction
- Planned Limited Access Expressways
- Planned Roadway Network

List of Map Amendments		
Ordinance	CPA Index	Date
13-14	CPA 13-0004	08-19-13
16-38	CPA 15-0014	04-18-16
16-96	CPA 15-0004	11-24-16
17-46	CPA 16-0010	08-31-17

Disclaimer: Future new roadways as shown on this map are strictly conceptual in nature and the proposed alignments and actual construction of the roadways are subject to change.

MAP PRODUCED BY
OSCEOLA COUNTY
TRANSPORTATION & TRANSIT
06 MAY 2019

0 2 4 6 8 10 Miles

DISCLAIMER: The County specifically disclaims any warranty, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular use. The entire risk as to quality and performance is with the requestor. In no event will the County or its staff be liable for any direct, indirect, incidental, special, consequential, or other damages, including loss of profit, arising out of the use of this data even if the County has been advised of the possibility of such damages. The requestor acknowledges and accepts the limitations of the Data, including the fact that the Data is dynamic and is in a constant state of maintenance, correction and update.

Public Transit

In 2017, Osceola County began operating SunRail Phase II, including three SunRail Stations: 1) Osceola Parkway 2) Downtown Kissimmee 3) Poinciana.

LYNX, the Central Florida Regional Transportation Authority, serves Osceola County residents and commuters with Fixed Bus service, Vanpool, FastLink, ACCESS LYNX, Road Rangers, and NeighborhoodLink.

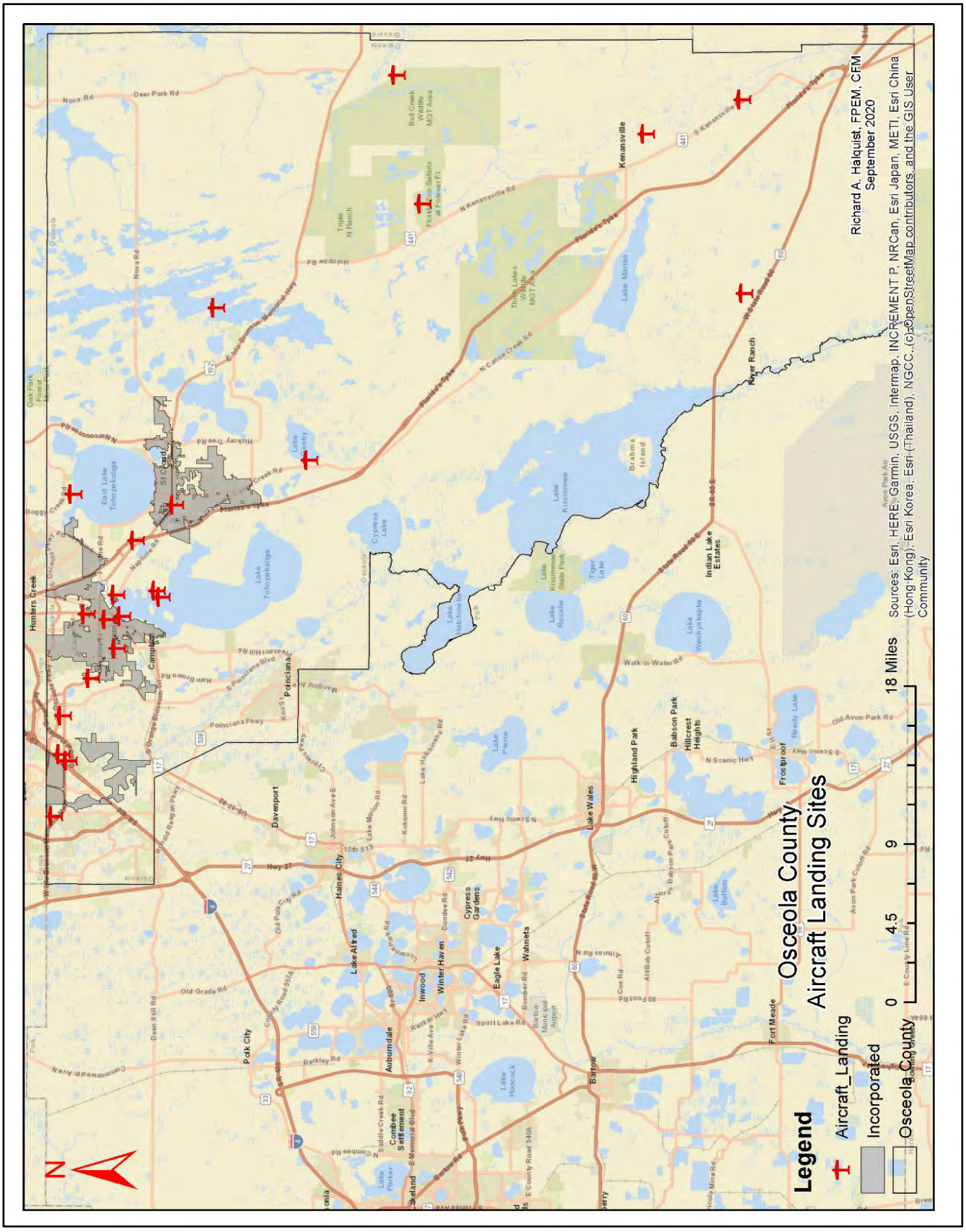
LYNX provides Osceola County with seven Fixed Bus routes daily. FastLink is a commuter bus service that serves commuters between Poinciana and Disney, as well as Kissimmee Intermodal Station to the Sand Lake Road SunRail Station. There are a total of four NeighborhoodLink routes throughout the County that serve Poinciana, Intercession/Campbell Cities, Kissimmee, and Buenaventura Lakes.

Public and Private Air

A complete list of airfields and landing areas in Osceola County is provided below. The Orlando International Airport is located just 6 miles north of the Osceola County line.

Name	Location	Facility Usage
Celebration Health Hospital Heliport - 77FL	Celebration, Florida	Private
Escape Ranch Airport - 4FL1	Kenansville, Florida	Private
Flying S Ranch Airport - 33FL	Kenansville, Florida	Private
Mills Ranch South Airport - 3FL5	Kenansville, Florida	Private
Americas Chopper Pilots Heliport - 1FL1	Kissimmee, Florida	Private
Coles Seaplane Base - 43FD	Kissimmee, Florida	Private
Florida Hospital Kissimmee Heliport - 85FD	Kissimmee, Florida	Private
Four Points Sheraton Lakeside Heliport - FA48	Kissimmee, Florida	Private
Gold Eagle Helicopters, Inc. Heliport - FD54	Kissimmee, Florida	Private
Kissimmee Seaplane Base - FA17	Kissimmee, Florida	Private
Hawkeye Heliport - 36FA	Kissimmee, Florida	Private
Orlando Hyatt House Heliport - 6FA8	Kissimmee, Florida	Private
Osceola Regional Hospital Heliport - 12FD	Kissimmee, Florida	Private
Osceola Sheriffs Ofc - Bronson Hwy Heliport - 19FD	Kissimmee, Florida	Private
Stout Airport - FD83	Kissimmee, Florida	Private
Toho Seaplane Base - FD12	Kissimmee, Florida	Private
Hollywood Ultra-light - 44FD	Lake Buena Vista, Florida	Private
Forever FL Airport - 31FL	St. Cloud, Florida	Private
Kissimmee Gateway Airport - ISM	Kissimmee, Florida	Public
Southfork Heliport - 3FA3	St. Cloud, Florida	Private
Gator Airpark Airport - 72FL	St. Cloud, Florida	Private
Gentry Airport - FD37	St. Cloud, Florida	Private
Lake X Airport - 57FA	St. Cloud, Florida	Private
St Cloud Hospital Heliport - FD52	St. Cloud, Florida	Private
Gamebird Groves Airstrip Airport - FD74	St. Cloud, Florida	Private
Blanket Bay Airport - 6FD5	Yeehaw Junction, Florida	Private

Aircraft Landing Sites



LMS PLANNING PROCESS

The planning process used by Osceola County is very flexible in meeting the analysis and documentation needs of the planning participants. It allows the planning participants to include data and information unique to their communities and planning capabilities into the Plan. The process assists the Working Group by utilizing a full range of information in technical analysis and the formulation of proposed mitigation initiatives for incorporation into the Plan.

This section of the Plan discusses the organizational structure used to complete the planning process. It also provides a summary of the current status of planning activities by the participants, documenting the level of participation by the jurisdictions making up the Working Group. The Working Group's bylaws and operating procedures, located in Appendix C, further define how participation in the planning process is determined.

PLANNING PROCESS OVERVIEW

Planning efforts are conducted by a variety of methods in addition to the formal committee meetings documented, e.g., through phone contacts and electronic mail contacts among jurisdiction representatives, support staff, and the Working Group chair and vice-chair. All jurisdictions have provided planning data for the Plan and are considered to have participated in plan development.

The planning process involves both a technical approach and an organizational methodology for incorporating mitigation initiatives into the Plan, and is an ongoing function of the Working Group. The planning work relies heavily on the expertise and authorities of the participating agencies and organizations, rather than just on detailed scientific or engineering studies.

The Working Group is confident that the best judgment of the participating individuals and agencies, because of their role in and familiarity with the community, can achieve a level of detail in the analysis that is more than adequate for the purposes of local mitigation planning. As the planning process continues, more detailed and costly scientific studies of the mitigation needs of the community can be defined as initiatives for incorporation into the Plan and implemented as resources become available.

The Working Group strives to make the best use of any relevant data and information available throughout the planning process, such as other plans, technical reports, or mitigation studies. During the 2020 revision process, the following references were used to develop a more complete and accurate plan:

- United States Census Bureau estimates and reports
    - Community profile development
    - Hazard impact projections
- Jurisdictional land use plans
    - Risk assesments
    - Project prioritization

- FEMA's Hazus tool
    - Hazard modeling
    - Risk assessment
    - Damage estimates
- FEMA's Flood Insurance Rate Maps
    - Flood hazard identification
    - Flooding impact determinations

Data and reports from the following provided historical references and aided in the profiling of hazards that may impact Osceola County:

- National Weather Service
- National Oceanic and Atmospheric Administration
- Storm Prediction Center
- National Hurricane Center
- Florida Geological Service
- Federal Emergency Management Agency
- National Interagency Fire Center
- Florida Forest Service
- Florida Department of Health
- Florida Department of Agriculture and Consumer Services
- United States Environmental Protection Agency
- Florida Department of Transportation
- Experience Kissimmee
- Local water management districts
- University of Florida Institute of Food and Agricultural Sciences
- United States Department of Agriculture
- United States Geological Survey

The County continues to re-engage any organization that has not been active participants in the planning process. An ongoing goal of the Working Group is to ensure that the number of participating organizations and groups continues to grow.

The effort begins with developing a community profile of Osceola County to document the basic characteristics of the community relevant to controlling the impacts of events. LMS Working Group Members are asked to submit mitigation initiatives that may be implemented if resources to do so became available.

Once the proposed initiatives are reviewed and coordinated, the Working Group can then decide to formally approve them by vote in order to strategically incorporate them into the Plan. As soon as the Working Group approves a proposed mitigation initiative, it is considered to be officially a part of the Plan and expected to be implemented by the sponsoring organization as soon as the resources and/or opportunity to do so become available.

LOCAL MITIGATION STRATEGY WORKING GROUP

As a prerequisite for participating in the Hazard Mitigation Grant Program (HMGP), Osceola County has established a formal Local Mitigation Strategy Working Group. Every January, the Chairperson of the Board of County Commissioners will submit a list of the members and the designated chairperson and vice-chairperson to the Florida Division of Emergency Management.

The purpose of the Working Group is to decrease the vulnerability of the citizens, governments, businesses and institutions of Osceola County, Florida, to the future human, economic and environmental costs of disasters. The Working Group develops, monitors, and maintains a local strategy for hazard mitigation and post-disaster redevelopment. Participation in the planning process requires a consistent and active membership within the Working Group.

In accordance with 27P-22, Florida Administrative Code, the Working Group must include at a minimum:

- Representation from Planning and Zoning, Public Works, Emergency Management, Water Management Districts;
- Representation from all Interested Municipalities within the county;
- Representation from interested Independent Special Districts, Non-Profit Organizations, Native American Tribes or Authorized Tribal Organizations; and
- The Public

The Working Group meets in a duly-noticed public meetings. Notice is provided in compliance with the Osceola County *"Due Public Notice"* ordinance. Meeting times and dates are subject to the approval of the Working Group Chairperson.

Role of the LMS Working Group

The role of the Working Group as defined by Article 27P-22 of the Florida Administrative Code states that it is the responsibility of the Working Group to maintain a local mitigation plan. Specifically, the Working Group is responsible for "the development and revision of the Plan, coordination of all mitigation activities, setting and order of priority for local mitigation projects, and to submit the annual update to the Florida Division of Emergency Management by the last working day of each January. Annual updates shall at a minimum address any revisions to the following:

- Changes to the hazard assessment;
- Changes to the project priority list;
- Changes to the critical facilities list;
- Changes to the repetitive loss property list; and
- Revisions to any maps.

LMS Working Group Participating Entities

Participation in the Working Group is voluntary by all participating entities. Membership is open to all jurisdictions, organizations and individuals supporting its purposes. Osceola County does not have an established jurisdictional body of Native Americans within its jurisdiction. No representation on the Working Group is required. The agencies and organizations currently represented in the planning process are listed in the table below entitled "Osceola County LMS Working Group Membership".

Osceola County LMS Working Group Membership

Entity	*Contributing Department*
Public Representation	Citizen
Osceola County	Office of Emergency Management
Osceola County	Community Development
Osceola County	Public Works
Osceola County	Grants
City of Kissimmee	Development Services
City of Kissimmee	Public Works
City of St. Cloud	Public Works
City of St. Cloud	Emergency Management
City of St. Cloud	Fire/Rescue/EMS
City of St. Cloud	Grants
City of St. Cloud	Planning
South Florida Water Management District	Intergovernmental/Outreach Relations
School District of Osceola County	Facilities/Planning Services
Reedy Creek Improvement District	Emergency Management
Reedy Creek Improvement District	Planning/Engineering
American Red Cross	Disaster Services
Osceola REDI	Board of Directors

LMS Working Group Operating Procedures

The process described in the procedures mainly addresses how hazard mitigation initiatives are to be developed, processed, and prioritized. These procedures involve both a technical approach to the planning and an organizational methodology for incorporating mitigation initiatives into the Plan.

The planning process is an ongoing function of the Working Group. The planning work conducted to develop the Plan relies heavily on the expertise and authorities of the participating agencies and organizations, rather than on detailed scientific or engineering studies.

The Working Group is confident that the best judgment of the participating individuals, because of their role in the community, can achieve a level of detail in the analysis that is more than adequate for the purposes of local mitigation planning. As the planning process described herein continues, more detailed and costly scientific studies of the mitigation needs of the community can be defined as initiatives for incorporation into the Plan and implemented as resources become available.

The planning process used by the Working Group is based on the following concepts:

- A multi-organizational, multi-jurisdictional planning group establishes specific goals and objectives to address the community's vulnerabilities to all types of hazards.
- The planning procedure utilizes a logical process of hazard identification, risk evaluation and vulnerability assessment, as well as review of past events, that is consistently applied by all participants through the use of common evaluation criteria.
- Mitigation initiatives are proposed for incorporation into the Plan only by those jurisdictions or organizations with the authorities and responsibilities for implementation. Although, anyone can request an initiative or idea.
- The process encourages participants to propose specific mitigation initiatives that are feasible to implement and clearly directed at reducing specific vulnerabilities to future events.
- Proposed mitigation initiatives are characterized and prioritized in a substantive manner to assure cost effectiveness and technical merit as well as mitigating an identified vulnerability. Initiatives are also coordinated among jurisdictions through a peer review process to assure that conflicts or duplications are avoided.
- All mitigation initiatives to be incorporated into the plan are prioritized.
- The Plan is periodically reviewed and adopted by the participating jurisdictions' governing bodies to ensure that the mitigation actions taken by their organizations are consistent with each community's larger vision and goals, as well as any unique needs and circumstances. The adoption process includes instructing the jurisdictions' agencies and organizations to continue to refine, expand and implement the Plan.

LMS Working Group Bylaws

The Working Group has adopted bylaws to establish purpose and responsibility, to create a structure for the organization, and to establish the other fundamental characteristics of the Working Group as a community organization. The current edition of the bylaws is enclosed in Appendix C.

PUBLIC INVOLVEMENT

Public participation is an important part of the Local Mitigation Strategy and will continue to be fostered. The Working Group is committed to engaging the public in the planning process. Public participation is encouraged through the issuance of media releases, public hearings, and outreach efforts. Public notices are issued at least 15 days prior to a public meeting. These notices are posted on the Osceola County Events Calendar, the Osceola County Public Notices webpage and posted on each of the Public Notice Bulletin Boards in the County's Administration Building.

All Working Group public meetings are noticed and open to the public. Representatives from the public participate as voting members of the Working Group. From the very beginning of the planning process, the Working Group engages the public in decisions that outline the framework of the Plan.

A special public meeting was held on November 12, 2020 to provide the Working Group and members of the public an additional opportunity to review the draft Plan and provide feedback. Although the public was represented on the Working Group, there was no feedback received from the public at-large. Attendees at the meeting did not offer any additional input for consideration with the revision of the Plan. Had any items been raised to the Working Group for consideration, those items would be discussed by the Working Group accordingly. As directed by the Working Group through general parliamentary procedures, any approved revisions would be incorporated into the Plan draft.

Copies of all public meeting documentation, including review of the Plan update can be viewed in Appendix D.

HAZARD IDENTIFICATION AND RISK ESTIMATION

The Working Group recognizes hazards that threaten the community and uses information to estimate the relative risk for each hazard as an additional method to focus analysis and planning efforts. The Working Group compares the likelihood or probability that a hazard will impact an area, as well as the consequences of that impact to public health and safety, property, the economy, government and the environment. The comparison of the consequences of an event with the probability of occurrence is a measure of the risk posed by that hazard to the community. The complete Hazard Identification and Risk Assessment (HIRA) is available as a part of the Plan found in Appendix K.

The HIRA is completely revised for the current version of the Local Mitigation Strategy. In the new HIRA, all hazards have been assessed and scored. Civil Unrest and Mass Migration have been separated and scored independently as opposed to the previous version where the two were combined and not scored.

The HIRA does not specifically include drought and extreme temperatures, both hot and cold. While these may impact the entire County, the Local Mitigation Strategy Working Group does not believe the hazard rises to the level of specific successful mitigation activities. The Office of Emergency Management maintains the hazards as a recognizable risk within the Comprehensive Emergency Management Plan, but they generally fall within the normal course of preparedness activity.

VULNERABILITY ASSESSMENT

Estimating the relative risk of different hazards is followed by the assessment of the vulnerabilities in the likely areas of impact to the types of physical or operational impacts potentially resulting from a hazard event. The table on the following page relates the recognized hazards to the community assets providing an impact rating based on each hazard.

The Plan states that changes in the community, such as growth and development, increase or change the vulnerability. This is true in that as the population increases, there is generally a greater exposure to hazards listed in the assessment. The Working Group strives to ensure that development does not occur within areas of recognizable risk

including the Special Flood Hazard Areas. It is also true that as the demographics and business profiles change within the community, there is naturally greater vulnerability simply by increased demand for service, as is the case for population sheltering.

The most recent shelter survey by the Florida Division of Emergency Management shows a shelter-space surplus in the county. This surplus could be quickly depleted if the Working Group did not maintain a watchful eye on items like this for future mitigation efforts. This is an example of keeping up with changes in the community.

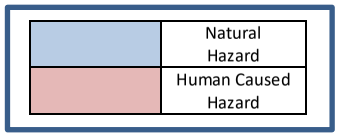
A methodical, qualitative examination of the vulnerabilities from future events within Osceola County occurs at least annually or, on an as needed basis, at the request of the Working Group. The process typically results in the identification of specific vulnerabilities that are addressed by specific mitigation initiatives which can be incorporated into the Plan. As an associated process, the Working Group also reviews experiences with past events to see if those events highlighted the need for specific mitigation initiatives. These experiences can also result in the recommendation of mitigation initiatives for incorporation into the Plan as well as re-prioritization of existing projects.

The second avenue for assessment of community vulnerabilities involves comparison of the existing policy, program and regulatory framework promulgated by local jurisdictions to control growth, development and facility operations in a manner that minimizes vulnerability to future events.

The Working Group can assess the individual jurisdictions' existing codes, plans, and programs to compare provisions and requirements against the hazards posing the greatest risk to that community. If indicated, the participating jurisdiction can then propose development of additional codes, plans or policies as mitigation initiatives for incorporation into the Plan for future implementation when it is appropriate to do so.

HAZARD RISK SCORE TABLE

Hazard	Overall Score	Likelihood of Occurrence	Capacity to Cause Damage	Geographic Impact	Speed of Onset	Population Affected	Potential for Casualties	Potential for Negative Economic Impact	Duration of Event	Seasonal Pattern	Environment Impact	Predictability	Mitigation Potential	Warning System Capability	Corollary Effects
Tropical Cyclone	43	5	4	3	2	3	2	3	4	3	3	5	2	0	4
Flooding	40	5	4	3	3	3	1	1	4	3	2	5	1	1	4
Tornado	37	5	4	2	2	2	2	2	2	3	3	3	3	3	1
Wildfire	37	5	3	3	3	2	2	2	2	3	4	3	1	3	1
Severe Thunderstorm	34	5	2	2	4	4	1	0	1	4	1	3	4	0	3
Pandemic	32	2	1	4	1	2	2	3	5	2	1	2	3	3	1
Agriculture/ Livestock Disease	31	2	3	3	2	1	1	4	3	1	4	0	3	1	3
Geomagnetic Storm	28	3	4	4	4	4	0	3	1	1	0	1	0	0	3
Sinkhole	21	1	1	1	4	1	1	1	2	0	1	0	3	4	1
Climate Change	19	1	1	3	0	2	0	1	2	3	2	1	1	0	2
Cyber Attack	39	5	3	3	4	3	1	5	1	0	2	4	1	3	4
Terrorism	37	1	5	3	3	4	5	5	3	0	3	1	1	2	1
Nuclear Facility Incident	36	1	2	2	4	4	3	3	3	0	4	1	4	0	5
Civil Unrest	33	2	3	1	4	2	1	4	2	1	1	3	3	4	2
Mass Migration	30	2	2	3	3	2	1	1	5	1	1	2	3	1	3
Transportation Incident	28	3	2	2	5	2	3	2	1	0	1	1	1	3	2
Hazardous Material Release	27	2	3	1	4	2	2	1	3	0	2	0	2	3	2



2020 Impact Extent of Natural & Man Made Hazards	
Hazard	**Extent**
Tropical Cyclone	According to National Oceanic & Atmospheric Administration (NOAA), all of Central Florida, including Osceola County, has a 50% probability of impact by a named storm. Recent history indicates the population can expect a storm to affect Osceola County every 2-3 years, and the most likely event will be a Saffir Simpson Scale - Category 3 or lesser storm. Even though the probability is for a Category 3 event, Osceola County is still at an increased risk due to its location in the center of the State of Florida, which has been impacted by a Category 5 storm in the past. Although Osceola County is susceptible to this type of storm, it is unlikely that the full force of a Category 5 storm would directly impact the County due of its location inland from the coast and away from Storm Surge zones. It is more likely that the County would be impacted by severe rain, and winds, which would still cause significant damage and the potential for loss of life. This hazard is assessed as equal across all jurisdictions.
Flooding	Osceola County uses the Federal Emergency Management Agency's Flood Insurance Rate Maps to determine flooding hazards and impacts. The FIRM maps use historic, meteorological, and hydraulic data as well as open-space conditions, flood-control works, and development to show areas that are prone to flooding. Osceola County also uses the HAZUS flood model in detailing potential flood events. The current standard is the 100 YR of 1% annual chance. Based on the models, the greatest depth experienced in Osceola County during a 100-Year event would be < 8 feet. The total economic loss, including buildings, Business interruption, loss of use and temporary housing is estimated at $491,000,000.00. This hazard is assessed as equal across all jurisdictions.
Tornado	Osceola County uses the Enhanced Fujita Scale to measure impacts from a tornado event. Since 1960, there have been 40 reported tornadoes in Osceola County. While most of these tornados are considered small in nature, Osceola County does experience strong tornadoes every few years. In 1998, an EF3 Tornado killed 25 people and injured more than 145 when it struck northern Osceola County. This was the most powerful tornado in the recorded history of Osceola County still holding the record as the deadliest tornado in Florida history. This hazard is assessed as equal across all jurisdictions.
Wildfire	The National Interagency Fire Center website rates Florida in the low fire damage class. However, the Florida Division of Forestry website indicates that much of Osceola County remains in the high to moderate probability category for wildfires. This is largely due to the abundance of rural and agricultural land within Osceola County. Wildland fires have become particularly dangerous over the years as the population in Osceola County has extended outwards into the urban interface where wildlands and the population meet. Wildfires that were once a threat to wooded areas may now impact homes and businesses. Since 1981, there have been over 2,000 classified wildfires within Osceola County. In 1998 the County, along with many others in the State, experienced a wildfire outbreak that consumed more than 29,000 acres and caused millions of dollars in damage. Due to the rural nature of most of the county, an event of this magnitude could easily reoccur. This hazard is greater in the unincorporated County due primarily to geographical extent.

Severe Thunderstorm	The National Weather Service has defined a severe weather event as an event where winds reach a speed of greater than 58 miles an hour and/or a tornado of EF0 to EF2 Strength and/or hail with a diameter of at least 1 inch. The intensity of a hailstorm is measured in the size of the hail that it forms. A storm must produce hail 1 inch in diameter to be considered severe. The largest hail event for Osceola County occurred on Feb 22, 1998 and resulted in $65,00.00 (adjusted for inflation) in property damage from hail 0.75 inches and larger. Severe thunderstorms have taken the lives of 5 people in Osceola County since 1950 including lightning, but excluding tornado deaths. This hazard is assessed as equal across all jurisdictions.
Geomagnetic Storms	A geomagnetic storm is a temporary or otherwise disruption of the magnetosphere caused by intense energy directed toward the earth from the sun. The storm influence can result in a wide variety of events ranging from abnormal rotation to increases ultraviolet light intensity and up to disruptive waves of solar winds with potentially catastrophic results. The highest impact potential is that loss of communication, electric power and rising civil unrest related to the "unknown" cause. Storms occur frequently during the high point of the sun's solar-cycle, but generally have little impact. NOAA rates storm activity on two scales, the R-scale and the G-scale. Five is the highest and represents potentially significant damage on both scales. Osceola County could expect significant impact in the form of electric power transformer damage exceeding $30,000,000.00. This hazard is assessed as equal across all jurisdictions.
Sinkholes	According to the USGS website, Osceola County sinkholes are uncommon, but naturally are a occurring geologic phenomenon and a predominant landform in Florida. Osceola County, like most of the State of Florida is located on a limestone surface. Unlike many areas in the State where limestone and other Karst formations are near the surface, limestone bedrock, in the majority of the County is relatively deep under a sand and soil layer. This results in a relatively low risk for catastrophic sinkhole formation except on the extreme northwestern edge adjacent to the Lake Wales Ridge. Hydrologic conditions including lack of rainfall, lowered water levels, or conversely, excessive rainfall in a short period, can contribute to sinkhole development. Sinkholes are geologic hazards, sometimes causing extensive damage to structures and roads. Sinkholes may also threaten water supplies by draining unfiltered surface water directly into the aquifer. Most of the sinkholes within Osceola County are few, shallow, small diameter and form gradually over time. Despite this, it would be possible for a sinkhole to develop rapidly due to heavy rains or collapse of the Limestone beneath the surface. A collapse such as this could potentially cause a sinkhole several feet (4-5 feet) deep and a maximum diameter of around 30 feet. Damage estimates can exceed several million dollars should a sinkhole occur under or around costly infrastructure or buildings. This hazard extent is greater in the extreme west portion of the County.
Climate Change	Climate change refers to long-term fluctuations in climate patterns that can disrupt the delicate balance of natural ecosystems. Conditions on Earth are never in equilibrium, and as such, climate change has always existed and will continue to always exist. Various contributing factors relate to changes in climate patterns including: solar irradiance, changes in the earth's reflectivity, and contributions to the earth's greenhouse effect. It is difficult to quantify a direct impact, but the corollary effects of climate change, regardless of cause, are most detrimental. The adverse effect include: sea level rise, increased extremes in temperatures, reduction in air quality, and the predominance of climate-enhanced weather hazards such as flooding and severe storms. Rising sea levels may impact Osceola County's natural underground drinking water source due to saltwater intrusion and also may increase risk of flooding by decreasing the natural flow of the eastern sections of the County. According to NOAA, the expected rate of impact may equate to an increased in temperature of 1.4 degrees over the next 100 years and a sea level rise of 0.04 to 0.10 inches over the next 120 years. This hazard is assessed as equal across all jurisdictions.
Storm Surge	Osceola County is an inland county and therefore not directly subject to storm surge hazards; therefore, an assessment will be excluded.
Terrorism	There are no specific reportable terror incidents in Osceola County in the past 5 years. There is an abundance of evidence that terror support activity exists within the jurisdiction. Several of the individuals responsible for the September 11, 2001 terror attacks on the nation trained in Florida and at least two, here in Osceola County. Even as recent as the Boston Bombing Attack of April 15, 2013, at least one of the perpetrators resided locally.

Pandemic	Pandemic is the widespread propagation of a contagious disease in the human population. Further, it means extending beyond regional boundaries including across continents. Generally, a pandemic is an epidemic spreading to the far reaches of the globe. In considering pandemic, many diseases are capable of reaching this threshold. Most notable are the influenza viruses because they mutate so rapidly and are easily spread amongst humans. Osceola County was impacted by the COVID-19 pandemic starting in 2020, with a total of 13,250 cases and 174 deaths at the time of this publication. This hazard is assessed as equal across all jurisdictions.
Agriculture & Livestock Disease	From livestock to citrus to honeybees, Osceola County farms a wide variety of agricultural products. According to the 2017 Census of Agriculture, Osceola has over 525,000 acres of land in farm production, nearly 60% of the County's land area, including cattle, sod, citrus, peach, blueberry, vegetable and bee farming. There are currently 392 operational farms in Osceola County, 188 of which (48%) manage livestock operations, and 204 (52%) producing crops. This hazard exists primarily in the unincorporated County.
Hazardous Material Release	A hazardous material (HAZMAT) is any item or agent (biological, chemical, and physical) which has the potential to cause harm to humans, animals, or the environment, by itself or through interaction with other factors. Chemical manufacturers are one source of hazardous materials, but there are others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released from transportation accidents or because of chemical plant accidents. There is a recent phenomenon known as chemical suicide whereby the subject mixes two household chemicals together in an enclosed space, such as a vehicle. These incidents have rapid effective results and pose a threat to responders .
Transportation Incident	A transportation incident is any incident that occurs outside the normal operational role or ability of the modality. The most common types of incidents relate to crashes such as an aircraft crash or a train vs. vehicle at rail crossings. Osceola County chose to group transportation incidents into a single category encompassing all potential modes of travel. This analysis includes bus, aircraft/airline, and rail. While each of these may have separate outcomes, each provides a similar impact and subsequent mitigation strategy. A different example for a train incident is a derailment. Trains derail for different reasons, but most occur because of a track obstruction such as a vehicle or other equipment. The commuter service known as SunRail, will be begin in the next year or so and with its advent, a larger population risk. There have been 41 incidents along the SunRail corridor since service began in 2014.
Civil Unrest	Although included in the previous version of the HIRA, Civil Unrest was not rated (scored) until the most recent update (2020). Osceola County views Civil Unrest as a corollary event as opposed to the causative agent. The community must be prepared and take mitigating actions, but the causes are the central focus for resources.
Mass Migration	This is another hazard that was previously identified, but not rated (scored), until the most recent update to the HIRA (2020). Osceola County adopts the State of Florida's position and methodology for mitigation. Most recently, Osceola County received an influx of individuals and families from Puerto Rico and the US Virgin Islands following the impacts of Hurricane Maria in 2017. The impact was felt most by the School District of Osceola County which received over 2,500 new student enrollees from the islands.
Cyber Attack	To date, there are no known attacks specific to Osceola County other than nuisance attacks, typically aimed at Denial of Service (DOS). The DOS aims specifically at overloading an information system to prevent legitimate requests for service from reaching a target. Small scale malware and viruses attack data systems daily, but are generally intercepted by programs specifically designed to do so. Larger scale companies operating in the jurisdiction have succumbed to successful attacks, including enormous theft of personal information. These companies include, Bank of America, Home Depot and Target.

Special Events	Osceola County is the home to the Silver Spurs Rodeo Association with a minimum of three professional events per year, as well as Osceola Heritage Park (OHP) which houses many events throughout the year. These include dignitary visits, religious gatherings, concerts, sporting events and sales extravaganzas. Of these events, the 3 largest are the Mecum Collector Car Show and Auction, which is a 10 day event every January, the Osceola County Fair, which is also a 10 day event every February, and the Country Thunder Music Fest, which is a 4 day event every March. The venue also serves as the home training facility for the Orlando City Lions, a Major League Soccer team. Osceola County does not see special events as a hazard and therefore has not done a complete profile on them.

Blue	Natural Hazard
Red	Manmade Hazard

HAZARD/ASSET IMPACT TABLE

Community Asset / Hazard	General Population	Special Need Population	Critical Facilities	Critical Infrastructure	Natural Resources – Rivers, Lakes, Streams	Residential Buildings	Commercial Buildings	Agriculture & Livestock	Tourism	Business Industry Commerce	Environment	Public Confidence	Transportation Systems	Public Safety Services	Medical Healthcare	General Government Services
Tropical Cyclone	4	4	4	4	3	4	3	3	4	4	2	2	3	2	3	4
Flooding	4	3	1	2	4	4	3	3	3	3	2	2	3	3	3	4
Tornado	4	4	4	4	2	5	4	2	3	4	2	2	2	3	4	3
Wildfire	2	2	2	3	3	2	2	3	1	1	2	3	2	3	2	2
Severe Thunderstorm	3	3	3	3	3	3	3	2	2	2	1	1	1	2	2	1
Pandemic	4	5	2	1	1	1	1	2	4	4	2	3	2	5	5	4
Agriculture/ Livestock Disease	2	1	1	1	2	1	1	5	4	4	2	2	1	1	1	1
Geomagnetic Storm	2	2	3	2	1	1	3	1	2	3	1	3	2	3	3	2
Sinkhole	1	1	2	3	1	3	3	1	2	2	1	3	2	2	2	1
Climate Change	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1
Cyber Attack	4	4	5	5	1	3	4	1	4	4	1	5	4	5	5	5
Terrorism	5	5	4	3	3	2	2	2	4	4	3	3	4	3	4	3
Nuclear Facility Incident	2	2	2	2	4	2	2	5	4	4	5	3	2	2	3	2
Civil Unrest	3	3	4	4	1	4	4	2	4	4	2	4	4	3	3	3
Mass Migration	1	1	2	1	1	2	1	3	3	1	2	2	4	4	4	2
Transportation Incident	2	2	1	2	1	1	1	1	3	3	3	2	5	3	3	1
Hazardous Material Release	3	3	3	2	4	3	3	4	3	4	5	2	4	3	4	2

1 = Little or no impact – no loss of service
2 = Small impact, rare service interruptions, some small inconveniences throughout the asset categories with slight increase in response efforts
3 = Moderate impact, scattered service interruptions, increased demand for assistance, road closures, businesses interrupted, longer response times, some personnel missing from work, decreased productivity, buildings damaged
4 = High impact, widespread services loss, heavy demand for assistance, major road closures, many business halted, delayed emergency response, personnel absent, heavy damage, outside assistance required, shelters required
5 = Significant impact, most services down, overwhelming demand for assistance, buildings destroyed or compromised, response halted or deterred, personnel cannot travel, significant roads and infrastructure compromised, widespread geographical impact

MITIGATION STRATEGIES

This section of the Plan identifies mitigation strategies to reduce the community's risk from natural and man-made disasters. The Working Group establishes the following goals and objectives to guide mitigation efforts and activities within the County to reduce the loss of life and property by lessening the impact of disasters. The goals and objectives are multi-hazard in scope and are written to meet the needs and capabilities of all communities within Osceola County.

Each goal provides objectives that define specific mitigation results that guide the development and implementation of proposed mitigation initiatives.

Goals & Objectives

1. **To establish and continue local government capabilities for developing, implementing and maintaining effective mitigation programs by:**
   - Making collected data and information needed for defining hazards, risk areas, and vulnerabilities readily available
   - Helping emergency services organizations develop preplanning capability to promptly initiate emergency response operations
   - Supporting effective use of data and information related to hazard mitigation planning and program development
   - Measuring and documenting the effectiveness of hazard mitigation initiatives implemented in the community
   - Deriving and utilizing mitigation "lessons learned" from each significant disaster event occurring in or near the community
   - Making community mitigation planning and programming assistance available to the community

2. **To build toward a disaster resilient community with all sectors of the community working together by:**
   - Advocating for resources to establish and implement a business continuity and recovery program in the community for key community organizations
   - Establishing and maintaining interagency agreements for local agencies and organizations, where possible, for the development and implementation of mitigation-related projects and programs
   - Having governing bodies endorse and implement the Local Hazard Mitigation Plan and support community mitigation programming
   - Establishing and continuing successful outreach programs, where possible, to gain participation in mitigation programs from key business, industry, institutions and community groups
   - Periodically updating the community regarding local efforts in mitigation planning

3. **To maximize capabilities for initiating and sustaining emergency response operations during and after a disaster by:**
   - Establishing and maintaining policies concerning the relocation, retrofitting or modification of evacuation routes

- Determining evacuation shelter priorities for the funding of shelter retrofit or relocation needed to ensure their operability during and after disaster events
- Retrofitting or relocating local emergency services facilities to withstand the structural impacts of disasters, as funding becomes available
- Providing response capabilities necessary to protect visitors, special needs individuals, and the homeless from a disaster's health and safety impacts as resources permit
- Retrofitting or relocating shelters or structures for vehicles and equipment needed for emergency services operations to withstand the impacts of disasters as funds become available
- Retrofitting or relocating utility and communications systems supporting emergency services operations to withstand the impacts of disasters as funds become available
- Prioritizing routes to and from key critical facilities and evacuation routes for accessibility

4. **To minimize disruption to the continuity of local government operations by:**
   - Retrofitting or relocating buildings and other facilities used for the routine operations of government, where possible, to withstand the impacts of disasters
   - Preparing community redevelopment plans to guide decision-making and resource allocation by local government in the aftermath of a disaster
   - Working to protect important local government records and documents from the impacts of disasters
   - Updating plans and identifying resources to facilitate reestablishing local government operations after a disaster
   - Obtaining redundant equipment, facilities, and/or supplies, as needed funding becomes available, to facilitate reestablishing local government operations after a disaster

5. **To minimize threats of disasters to the health, safety and welfare of the community's residents and visitors by:**
   - Establishing and maintaining systems for notifying the public at risk and providing emergency instruction during disasters
   - Supporting effective structural measures to protect residential areas from the physical impacts of disasters
   - Seeking to reduce the vulnerability of facilities in the community posing an extra health or safety risk when damaged or disrupted by the impact of a disaster
   - Encouraging the retrofit or relocation of public and private medical and health care facilities in the community to withstand the impact of disasters
   - Removing or relocating residential structures from defined hazard areas where feasible
   - Encouraging the retrofit of residential structures by their owners to withstand the physical impacts of disasters
   - Reducing the vulnerability of structures, facilities and systems serving visitors to the community in order to meet their immediate health and safety needs

- Providing resources, equipment and supplies to meet community health and safety needs after a disaster

6. To support effective hazard mitigation programming through establishment and implementation of applicable local government policies and regulations by:

- Identifying local government facilities that could be enhanced by mitigation techniques to minimize physical or operational vulnerability to disasters
- Reviewing and where appropriate, revising land use policies, plans and regulations in order to discourage or prohibit inappropriate location of structures or infrastructure components in areas of higher risk
- Ensuring that hazard mitigation needs and programs are given appropriate emphasis in resource allocation and decision-making
- Establishing and enforcing building and land development codes that are effective in addressing the hazards threatening the community
- Avoiding high hazard natural areas for new or continuing development
- Participating in and supporting the National Flood Insurance Program (NFIP) and the associated Community Rating System (CRS)
- Locating new local government facilities outside of identified high hazard areas and/or designing them in a manner that minimizes their vulnerability to the impacts of such hazards
- Encouraging the use of appropriate hazard mitigation techniques in the reconstruction and rehabilitation of structures and utilities in the community
- Promoting private property maintenance that is consistent with minimizing vulnerabilities to disaster

7. To minimize the vulnerability of homes, institutions and places of employment to the effects of disaster by:

- Identifying funding and providing economic incentive programs for the general public, businesses and industry to implement structural and non-structural mitigation measures
- Supporting key employers in the community in the implementation of important mitigation measures for their facilities and systems
- Assisting with the removal, relocation or retrofitting of vulnerable structures and utilities in hazard areas including schools, libraries, museums, and other institutions important to the daily lives of the community

8. To minimize the threat to the economic vitality of the community from a disaster by:

- Strengthening where feasible components of the infrastructure needed by the community's businesses and industries from the impact of disaster
- Developing emergency response and disaster recovery plans that consider the needs of key employers in the community
- Encouraging community businesses and industries to make their facilities and operations more disaster resistant
- Helping to establish and maintain programs, facilities and resources to support the

resumption of business activities by local businesses and industry impacted by disasters
- Educating the public regarding the condition and functioning of the community in the aftermath of a disaster

9. To minimize disruption to the community's infrastructure from a disaster by:
- Encouraging hazard mitigation programming by private sector organizations owning or operating key community utilities including major energy sources, and telecommunications
- Supporting routine maintenance of the community's infrastructure to minimize the potential for system failure
- Strengthening transportation and utility services in the community to reduce failures

10. To promote community awareness and education by:
- Encouraging interested individuals to participate in hazard mitigation planning and training activities
- Providing public education, especially to those living or working in defined hazard areas, about their vulnerability to disasters and effective mitigation techniques
- Offering training to managers of public facilities about hazard mitigation techniques and the components of the community's mitigation plan
- Providing technical training in mitigation planning and programming to appropriate local government employees
- Encouraging information sharing about appropriate hazard mitigation techniques among owners and operators of businesses and industries in the community

Mitigation Projects

The Working Group is responsible for identifying mitigation initiatives/projects that Osceola County and all participating entities that support the mitigation planning program. Mitigation projects are intended to achieve the implementation of associated goals and objectives.

Developing Hazard Mitigation Initiatives enables the Working Group to highlight significant vulnerabilities that exist in Osceola County, and reduce the impacts during future events. Each mitigation initiative proposed for incorporation into the Plan is submitted to the Working Group for consideration by an agency, organization, business or individual that has the authority or responsibility for implementation. This avoids the artificiality of proposing mitigation initiatives when it is unclear who would implement them and if the authority to do so is actually available. A project submission form must be completed in order to be eligible for candidacy.

It is the job of the Working Group to ensure that each proposed mitigation initiative will be cost effective, feasible to implement, acceptable to the community, and technically effective in purpose. The Working Group prioritizes each initiative based on the following criteria:

- Economic benefit
- Protection of public health and safety
- Impact to valuable or irreplaceable environmental or cultural resources

Once the Initiatives have been identified based on the above criteria, a “cost to benefit” analysis is conducted for each initiative by the submitting agency. The purpose of the analysis is to demonstrate the benefit of each initiative to the community based on how much money is required to complete the project. Based on the “cost to benefit” analysis, each proposed mitigation initiative is prioritized in the Plan for future implementation.

The “cost to benefit” analysis is not specifically designed to meet any known or anticipated requirements from the State of Florida or any federal funding agency, due largely to the fact that such requirements can vary with the agency and type of proposal. Therefore, at any point when the organization proposing an initiative is applying for funding from any state or federal agency, or from any other public or private funding source, that organization will then address the specific informational or analytical requirements of the funding agency.

During routine updates of the Plan, each mitigation initiative is evaluated to determine if it is still valid and or should be removed from the Plan. The initiatives are also reviewed to determine if the priority of each initiative still matches the vision of the Working Group. A complete listing of the approved mitigation projects and project submission forms can be viewed in Appendix B.

Prioritization Method

The Local Mitigation Strategy Working Group prioritizes each project based on a method that involves risk, categorization, and consensus. The Working Group has selected nine categories that meet the vision of the mitigation program. The following categories were selected by a majority vote from the Working Group as providing guidance towards alignment with the approved goals and objectives.

The mitigation project categories are prioritized as follows:

1. Lift Station Elevation
2. Stormwater/Drainage Mitigation/Road Elevation
3. Critical Infrastructure/Facility Protection & Mitigation
4. Hardening/Retrofit
5. Floodplain Acquisition
6. Mitigation Planning
7. Mitigation Training, Education & Public Outreach
8. Traffic Signal - Mast Arm
9. Traffic Signal/Lift Station - Permanent Generator/UPS

Candidate projects brought before the Working Group must fall under one of the above categories to be considered. Each project is reviewed with careful consideration. Projects are approved by a majority vote and added to the corresponding category for final prioritization.

The Working Group then reviews the projects within each category to determine their level of priority. This determination is made based upon a combination of factors, including, but not limited to the project's level of impact to the community, cost effectiveness, and feasibility to implement. Once all projects have been prioritized the final mitigation project list is produced and approved by the Working Group by a majority vote.

This discussion-based prioritization method has served the Working Group well, making use of the subject-matter expertise of the members to address those nuances that may exist in comparing similar projects. However, the Working Group has also recognized the value in using a more calculated approach through the use of a scoring system. It is a goal of the Working Group to implement a scoring system that will aid in the prioritization process and tie project rankings to identified hazards and FEMA's Community Lifelines.

Benefit-Cost Summary

It is the responsibility of the Working Group to ensure that each mitigation project is cost effective, feasible to implement acceptable to the community, and technically effective in purpose. The Working Group prioritizes each project based in part on the benefit-cost summary, provided on the project submission form. This summary should cover as many of the following criteria as possible:

- Assesses the impact of one action compared to another
- Shows how one type of action costs more than another to achieve the same benefit
- Shows that funding is available for one type of action but not another

- Demonstrates that the economic goals of the community are better served by one action rather than another

Implementation of Approved Mitigation Initiatives

Once an initiative has been incorporated into the Plan, the agency or organization proposing the initiative becomes responsible for implementation. While the Working Group is responsible for setting the overall goals, strategies and initiatives as set forth in the Plan, only the jurisdiction or organization itself has the authority and responsibility to implement proposed mitigation initiatives. Each initiative must have a budget so that costs may be tracked and accountability managed. Agencies are also responsible for providing applications to state and federal agencies for financial support for implementation.

Mitigation Project Funding Resources

Osceola County, City of Kissimmee, City of Saint Cloud & Member Agency General Funds

The Osceola County Office of Emergency Management with other County departments and other jurisdictions may have funding available in the general fund budget for mitigation actions. Broadly inclusive, each department and agency participating in the Working Group, such as the jurisdictions' Stormwater programs, regularly request funding for projects on the priority list as well as other projects that are not. This often includes the Capital Improvement Project budget list.

Each department or agency that is not part of the Working Group is regularly reminded of potential projects and programs ensuring a focused effort supporting mitigation measures. Funding is only available at the discretion of each agency or department's administrators. In certain cases, the elected officials as well as the executive leadership assist in support of mitigation opportunities and actions.

The Working Group also uses other available mitigation funding to implement projects on the priority list. FEMA's mitigation grant programs provide funding for eligible projects that reduce disaster losses and protect life and property from future disaster damages.

FEMA administers the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) program, the Building Resilient Infrastructure and Community (BRIC) program (formerly Pre-Disaster Mitigation PDM), the Repetitive Flood Claims (RFC) program, and Severe Repetitive Loss (SRL) program. Below is a description of each of the programs.

Pre-Disaster Funding Options

Building Resilient Infrastructure and Community (BRIC) Program

The program provides funds to states, territories, tribal governments, communities and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. The grants are awarded on a nationally competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Flood Mitigation Assistance (FMA) Program

The purpose of the Flood Mitigation Assistance Program is to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program, whether the structures is a repetitive loss or not. Therefore, any insured structure with or without losses is eligible to apply assistance. The program provides funding to states, territories, tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to the occurrence of a disaster event.

The Flood Mitigation Assistance Program was established pursuant to Section 1366 of the National Flood Insurance Act of 1968 (42 US Code 4104c), as amended by the National Flood Insurance Reform Act of 1994 (Public Law 103-325), and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (Public Law 108-264), with the goal of reducing or eliminating claims under the National Flood Insurance Program. The Flood Mitigation Assistance Program regulations are contained in Title 44, Code of Federal Regulations (CFR), Part 78. FMA grants are awarded on a nationally competitive basis.

Repetitive Flood Claims (RFC) Program

The Repetitive Flood Claims program provides funding to states and communities to reduce or eliminate the long-term risk of flood damage to structures insured under the National Flood Insurance Program that have had one or more claims for flood damages, and that cannot meet the requirements of the Flood Mitigation Assistance program for either cost share or capacity to manage the activities.

Severe Repetitive Loss (SRL) Program

The Severe Repetitive Loss program provides funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss structures insured under the National Flood Insurance Program.

Post-Disaster Funding Options

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The program is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

Community Development Block Grant Disaster Recovery Program

The United States Department of Housing and Urban Development provides flexible grants to help states and communities recover from Presidentially declared disasters. The Community Development Block Grant for Disaster Recovery program provides funding to states, local governments, tribal governments, and insular areas designated by the President of the United States as disaster areas. Disaster Recovery grants often

supplement disaster programs of the Federal Emergency Management Agency. The following is a list of mitigation activities eligible under the Disaster Recovery program.

- Purchase of damaged properties located in a floodplain and relocating residents safer areas;
- Rehabilitation of homes and buildings damaged from a disaster;
- Purchasing, constructing, or rehabilitating public facilities such as streets, neighborhood centers, and water, sewer and drainage systems;
- Code enforcement;
- Homeownership activities such as down payment assistance, interest rate subsidies and loan guarantees for disaster victims (if the original property was located in a floodplain); and
- Planning and administration costs.

Public Assistance Program

FEMA's Public Assistance program provides assistance to state, tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from Presidentially declared disasters. The program encourages the protection of damaged facilities from future events by providing assistance for hazard mitigation measures, including protection, repair, replacement or restoration of damaged publicly owned facilities during the recovery process.

Other Available Funding Options

Community Development Block Grant (CDBG)

The Community Development Block Grant program is a flexible program that provides communities with resources to address a wide range of unique community development needs. Beginning in 1974, the CDBG program is one of the longest continuously run programs at HUD.

The program provides annual grants on a formula basis to 1,225 general units of local government and states. Entitlement communities, including Osceola County, are required to prepare and submit a "Consolidated Plan" that establishes goals for the use of CDBG funds. Grantees are also required to hold public meetings to solicit input from the community, ensuring that proposed projects are aligned with the community's most urgent needs.

Stafford Act, Section 404

Section 404 of the Stafford Act authorizes funding for projects that eliminate repetitive losses. Repetitive loss is defined as numerous losses suffered to a particular property over a specific time period. For example, if a home floods three times in six years when there are heavy rains, that home would likely be deemed a repetitive loss structure. Funding for a project to eliminate or significantly reduce the threat of flooding would be eligible under Section 404 of the Stafford Act as long as the project is cost-beneficial; meaning that for every dollar spent for the project a minimum of one dollar is saved through avoiding future disaster assistance for that property.

Legislative Action

Legislative bodies can be called on to intercede when the needs it present. Osceola County will petition the state or federal legislature for funding should the situation warrant such action.

JURISDICTIONS AUTHORITIES, POLICIES & PROGRAMS

Community Listing

Each member and associated jurisdiction provides specific authorities, policies, and programs supporting mitigation activity. The following is a brief list and may also be found in Appendix I.

- Florida Building Code - 2017
- Florida Statute 252
- Florida Administrative Code 27P
- Osceola County Ordinance #11-16
- Osceola County Ordinance #13-36
- Kissimmee Ordinance #2858
- Kissimmee Land Development Code
- Saint Cloud Ordinance #2020-26
- Saint Cloud Land Development Code
- Osceola County Comprehensive Emergency Management Plan
- Osceola County Ordinance – Land Development Code

The listed authorities support specific programs relating to mitigation. In each case, the intent is to direct the effort of building, development, and habitation in a safer manner. Each jurisdiction works to enhance programs supporting a healthier and safer community by continuously reviewing and revising the programs. This includes the ability to expand and improve upon the policies and programs as needed and to align with any new State and Federal directives.

Each jurisdiction uses common processes for implementing any new codes and ordinances, which are guided by the goals and objectives established in the LMS. The organizations will continue to implement the plan, to expand its scope, continue its analysis, and take other such continuing action to maintain the planning process. This includes action by the LMS Working Group to incorporate proposed mitigation initiatives into the plan.

Each participating jurisdiction is committed to incorporating mitigation principles and concepts into their normal operations and activities, including planning and programming processes. The jurisdictions will compare any proposed actions to the initiatives and objectives of the LMS to ensure that all planning activities work toward the common goal. During these planning cycles, each element is reviewed for consistency, assuring that the policies and initiatives of the LMS are considered and addressed.

COMPLETED, DELETED OR DEFERRED MITIGATION INITIATIVES

Projects remaining on the list dated prior to 2020 are the only projects from the previous Plan update than have not been deleted. The Working Group removed all other projects, either because they are complete, or were deemed no longer feasible to implement.

Projects dated prior to 2020 that remain on the list have yet to be implemented due to the lack of funding. A complete listing of mitigation projects that have been removed since the 2010 Plan update can be viewed in Appendix B.

CONFLICT RESOLUTION

At various points in a project's progress, the Working Group will be advised of project status and consulted on future actions. In the event of a conflict, Working Group members will participate in meetings to help reach a compromise. Every effort will be made to reach a compromise before proceeding to the next level of resolution. Progression to the next level will only occur if the Working Group deems it appropriate and necessary.

NON-CONTRACTUAL ISSUES

If any non-contractual issue is opposed by 51 percent or more of the voting Working Group, the item will be deferred and recorded for future planning and evaluation purposes. For any issue that is opposed by less than 51 percent of the voting Working Group, resolution will be attempted utilizing the steps below:

1. A separate meeting/conference call will be scheduled with those opposed to the issue. The meeting will focus on identifying the root cause(s) of the opposition and determine if a compromise is possible.
2. If the first meeting/conference call is unsuccessful, a second attempt will be scheduled. This meeting will include representatives from County administration and the Manager from the municipalities involved. The meeting will focus on confirming whether or not compromise is possible.
3. If a resolution appears possible, but further discussion is needed, a third meeting may be scheduled between the opposing members elected leadership; BOCC Chair and Mayors
4. The last attempt at resolution will be a meeting with the entire County BOCC and Councils/Commissions involved. This step will only be utilized when a very small minority of the Working Group remains opposed to an issue and more than 75 percent of the voting Working Group recommends taking it to this level. Opposition to issues from non-governmental entities will be handled in a similar manner.

CONTRACTUAL ISSUES

If any contractual issue is opposed by any member of the Working Group, they will be provided a copy of the contract requirement. If 51 percent of the voting Working Group requests interpretation of the contract language or intent, the State Contract Coordinator will be contacted to provide clarification to the entire Working Group. If 51 percent of the voting Working Group recommends additional attempts be made, the Director of the Florida Division of Emergency Management will be contacted. Relief from contractual issues can only be approved by the Florida Division of Emergency Management.

LIST OF REVISIONS

A complete list of changes made to the 2015 Plan are provided in Appendix A.

PLAN ADOPTION & MAINTENANCE

The Osceola County Board of County Commissioners and all incorporated jurisdictions included in this multi-jurisdictional plan formally adopt the Plan by resolution. Projects on the proposed project list are executed based on priority and fund availability. Projects are prioritized based on the criteria established by the Working Group as presented in the Plan.

PLAN INTEGRATION

The Plan has been created to integrate seamlessly with other plans at the County and local level. In particular, the Hazard Identification and Risk Assessment (HIRA) and the Community Profile have been created to work cohesively into existing and future plans that are created by any of the partner communities. Incorporated jurisdictions within the County may choose to annex the Local Mitigation Plan's information in the manner that best suits them.

The adoption of the Local Mitigation Plan by each of the municipalities and participating partner agencies ensures cooperative, comprehensive mitigation efforts are prioritized and integrated throughout the entirety of the County. Working Group members are expected to serve as stewards of the Local Mitigation Plan by bringing any guidance and priorities established by the plan back to their agencies, as well as any outcomes of Working Group meetings such as data reports, discussions, and decisions.

This ensures adherence to the guidance is integrated into the design of any other planning mechanisms and considered when proposing new development and identifying potential projects. Recent examples include:

- Osceola County 2020 Comprehensive Plan update
  - Policy 1-1.10.2- land use changes must not conflict with LMS
  - Mitigation emphasis
- City of Kissimmee 2020 Land Development Code update
  - Zoning districts
  - Floodplain management and drainage
  - Public facility impacts and improvements
- City of Kissimmee draft Post-Disaster Redevelopment Plan
  - Emphasis on hazard mitigation opportunities and community improvement
- City of Saint Cloud 2019 Comprehensive Plan update
  - Stormwater management
  - Transportation
  - Future land use

Additionally, the County's Comprehensive Emergency Management Plan, which is built on the current HIRA, is adopted by each municipality. This ensures uniformity in the determination of appropriate mitigation, preparedness, protection, and response priorities and measures among all of the partners.

Community Profile

The Community Profile (Section I) provides a cohesive and comprehensive data set for the updating of demographics information within local communities. The information can be used in planning for the cities of Kissimmee and St. Cloud as well as in the Osceola County Comprehensive Emergency Management Plan (CEMP). As the data is updated in future Census runs, it can be integrated directly into the current formatting in the Local Mitigation Plan.

The Community Profile data is available to multiple agencies within the county including local jurisdictions, utility providers, water management districts, the school district, non-governmental organizations, and most importantly the public. This data provides a stable and comprehensive structure ensuring that consistent data exists across multiple plans, therefore reducing duplication of effort and conflict of information.

Hazard Identification and Risk Assessment

The Hazard Identification and Risk Assessment (HIRA), much like the Community Profile, contribute to a number of planning resources by updating the risk information. Private sector businesses, such as hotels, request hazard information from time to time for their planning efforts. The Plan provides valuable information for the Comprehensive Plans and Land Development Codes.

Additional planning tools, such as future land use maps, conceptual development plans, and other proactive planning and development tools, may also be affected by hazard locations and areas of potential impact. The HIRA provides valuable information in the development of these plans.

Example plans include:

- Osceola County Comprehensive Emergency Management Plan
- Good Samaritan Society Emergency Operations Plan
- Osceola County Flood Response Operations Guide
- Osceola County Emergency Evacuation Plan
- Good Samaritan Society- Evacuation Plan
- School Plans
- Risk Services plans
- Future Land Use Plans
- Hazard Response Plans

PLAN ADOPTION

The Osceola County Board of County Commissioners will adopt the Plan following approval by the Florida Division of Emergency Management (FDEM) and the Federal Emergency Management Agency (FEMA). The two incorporated jurisdictions participating in the Plan adopt the plan as well. Other partner agencies and potential primary applicants for grant funding that may adopt the plan include:

- Toho Water Authority
- Kissimmee Utility Authority
- Orlando Utilities Commission
- Good Samaritan Society (Sanford Health)

The dates of adoption are summarized in the table below. A copy of each resolution may be found in Appendix H.

Jurisdiction	*Date of Adoption*	*Resolution No.*
Osceola County	03/08/2021	21-009R
City of Kissimmee	03/16/2021	RES 06-2021
City of St. Cloud	06/10/2021	2021-116R
School District of Osceola County	04/20/2021	12.1

PLAN MONITORING, MAINTENANCE & UPDATES

After participating governing bodies adopt the Plan, monitoring the process of implementation is essential. It is the responsibility of the Working Group, specifically the Working Group Chair, to monitor and update the Plan according to the Florida Division of Emergency Management (FDEM) and Federal Emergency Management Agency (FEMA) guidelines. As outlined in the by-laws, a formal letter is sent to FDEM on an annual basis, in the month of January, with all updates to the Plan. The letter includes a copy of the List of Revisions found in Appendix A.

The Working Group formally meets a minimum of three times per year. It is the responsibility of the Working Group Chair, as confirmed by the group and outlined in the by-laws, to organize meetings and update the plan and project list. The Chair may appoint a Subcommittee to monitor and modify the plan as appropriate, but at least once every year.

During the meetings, the project priority list will be updated with the addition and removal of mitigation initiatives as necessary. The identification of obstacles to implementation, funding cutbacks, and unsuccessful grant applications will also be addressed. Additionally, the Working Group will assess the effectiveness of the plan at achieving its stated purpose and goals.

The Working Group, along with input from the public, may take action to revise and/or reprioritize existing goals and objectives or establish new items as needed. The intent of this process is to ensure effectiveness of the Plan over time.

Similar to the planning process, public participation is an integral part of the Plan's maintenance. Each Working Group meeting is advertised as a public meeting, inviting all interested parties to participate. Additionally, the Working Group is comprised of members of the public as voting participants.

On a periodic basis, the Plan is presented to the governing body (ies), as an update, to each participating jurisdiction. The principle reason is for review, modification if needed, and any additional approval or adoption.

Following adoption or approval of the Plan by each jurisdiction's governing body, the respective agencies and organizations continue plan implementation, expand the scope, provide analyses, and take other such continuing action in maintaining the planning process and necessary revisions.

It is especially important for each partner to monitor any development within their jurisdiction in order to determine how it may affect any hazard impacts and necessitate any revisions to the Plan, including the adjustment of hazard rankings and/or project prioritizations. There has been continued growth within the county since the 2015 Plan update, especially with the construction of new housing developments. This development has occurred primarily within the designated Urban Growth Boundary and was not deemed to necessitate any changes to the Plan, as this growth was already projected and planned for in the previous analysis of the hazards. There was no change in the vulnerability of the jurisdictions due to this development.

Every five years, it is the responsibility of the Working Group, to prepare, revise, and submit an update of the Plan to the FDEM, FEMA, and to the governing bodies for review and formal adoption or approval. While any necessary updates and revisions to the Plan are completed annually, the process for the complete Plan update begins two years prior to the Plan's expiration.

This starts with an update to the Hazard Identification and Risk Assessment (HIRA), which serves as the Plan's foundation. Input from the Working Group guides the update to the HIRA, which is then presented in whole to the Working Group for approval. The remainder of the Plan is then updated as needed by LMS program staff, prior to being presented to the Working Group for additional input.

After incorporating the input from the Working Group, a public meeting is held to present the LMS draft to the public, highlighting the Basic Plan and HIRA. Any input from the public-at-large is presented to the Working Group for consideration in determining in further revisions that may be needed. Once any additional revisions are made, the Plan is then presented to the Working Group for approval. Following approval, the Plan is adopted by Osceola County and participating partners.

Part of this update includes an assessment of the goals and objectives established in the Plan to determine if any changes are needed, including reprioritization. Such changes may be due to a large event such as a hurricane, a change in leadership directive,

community feedback, or a change in project focus. Since the 2015 update, no changes to the goals and objectives were necessitated.

COMPLETED MITIGATION INITIATIVES

Once mitigation initiatives are completed, it is the duty of the Working Group to ensure proper close-out of the project as outlined in the Planning Process section of The Plan. A formal letter is sent to FDEM on an annual basis, in the month of January, with all updates to The Plan. The letter also includes a list of any mitigation initiatives that have been completed. Annual LMS Update letters are provided in Appendix F.

NFIP PARTICIPATION

INTRODUCTION

The National Flood Insurance Program (NFIP) was created by the Congress of the United States in 1968 through the National Flood Insurance Act of 1968 (P.L. 90-448). It enables property owners in participating communities to purchase insurance protection from the government against losses from flooding. Flood insurance is designed to provide an alternative to disaster assistance in meeting the escalating costs of repairing damage to buildings and their contents caused by floods.

Participation in the NFIP is based on an agreement between local communities and the federal government. The agreement states that, if a community will adopt and enforce a floodplain management ordinance focused on reducing future flood risks for new construction in a Special Flood Hazard Areas (SFHA), the federal government will support flood insurance availability within the community as a financial protection against flood losses.

OSCEOLA COUNTY FLOODPLAIN MANAGEMENT PLAN

The purpose of the Local Mitigation Strategy (the Plan) is to develop a unified approach for dealing with identified hazards, including flooding. The Plan serves as a tool to direct the County in its ongoing efforts to reduce vulnerability from the impacts produced by both natural and man-made hazards. The Plan also helps establish funding priorities for currently proposed mitigation projects. With these goals and purposes in mind, the Plan also serves as the Osceola County Floodplain Management Plan for purposes of maintaining the Community Rating System (CRS).

JURISDICTIONAL PARTICIPATION

Osceola County, Florida

Osceola County joined the NFIP in January of 1975, with its first NFIP map in January of that year and its first FIRM in February 1982. The NFIP is locally administered by the Osceola County Community Development Department. The latest report shows 6,209 policies. The County, including municipalities, has six (6) repetitive loss properties, each of which is residential property. The current effective FIRM for Osceola County is dated June 18, 2013.

Chapter 4 of the County Land Development Code establishes minimum standards for the NFIP Flood Damage Prevention, and Stormwater Management (attached herein as Appendix J). Osceola County is participating in the CRS rating program and is currently rated at a 6, with a 20% savings totaling $543,663 community-wide. The last Community Assistance Visit occurred in 2018.

Osceola County's efforts for continued NFIP compliance include:

1. Informing repetitive loss property owners including, surrounding properties, of mitigation opportunities
2. Extensive NFIP plan integration to the County Comprehensive Plan, Future Land Use Map, and Zoning Regulations
3. Compensating Storage
4. Flood Response Operations Guide (FROG) for flood and flood-fight operations (CEMP Appendix K)*
5. Countywide QL-2 LiDAR available for public and government use* (2015-16 LMS Working Group Project complete)
6. Countywide Flood Alert Notification and annual testing*
7. Provide flood information at both the Good Samaritan Village Hurricane Expo and all community hurricane expos

*Includes both municipal jurisdictions

St. Cloud, Florida

The City of St. Cloud joined the NFIP in 1980 with the program currently administered by the Building Department. The latest report shows 1,099 policies with 42 claims of damage totaling a payout of $245,057. The city has two (2) repetitive loss properties. The current effective map for the City of St. Cloud is dated June 18, 2013.

The current city Floodplain Ordinance (No. 2020-26), adopted on September 24, 2020 is included in Appendix I. It requires that all new and improved structures within Special Flood Hazard Areas to be located a minimum of 24" above the Base Flood Elevation (BFE). St. Cloud is participating in the CRS rating program and is currently rated at a 7. The last Community Assistance Contact was conducted in 2017.

The City of St. Cloud's efforts for continued NFIP compliance include:

1. Maintaining a map of areas that flood frequently and prioritizing those areas for inspection immediately after the next flood or heavy rains.
2. Obtaining FEMA's Substantial Damage Estimator and being prepared to use it when damage occurs.
3. Maintaining supplies of FEMA/NFIP materials to help homeowners evaluate measures to reduce damage.
4. Evaluating higher standards that are proven to reduce flood damage.

Kissimmee, Florida

The City of Kissimmee joined the NFIP in October of 1996. The City administers the NFIP through the Public Works & Engineering Department. The latest report shows 1,141 active policies with 34 claims of damage totaling $514,200.43. The city has one repetitive loss structure with two losses totaling $22,394.93 in damage.

The current effective map for the City of Kissimmee is dated June 18, 2013. The current floodplain management ordinance (14-2-115) is adopted in the city's Land Development Code (LDC) and included here in Appendix E. It requires all structures be elevated a minimum of 18" above the BFE. The City of Kissimmee is participating in the CRS rating program and is currently rated a 7, with a 15% rate reduction. The last Community Assistance Visit occurred in June 2020.

The City of Kissimmee's efforts for continued NFIP compliance include:

1. Application of General Standards mentioned in LDC Chapter 14:
    a. Anchoring of new development and manufactured homes
    b. The use of flood resistant materials in new construction and substantial improvements
    c. New construction and substantial improvements shall be constructed by methods and practices that minimize flood damage
    d. Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities shall be designed and or located so as to prevent water from entering or accumulating within the components during conditions of flooding
    e. Any new principal building shall be served by public water and sewer lines and no existing on-site systems shall be replaced except by public system connections.
2. Regulation of residential, nonresidential, and elevated buildings to meet specific standards above the NFIP outlined in LDC Chapter 14
3. The prohibition of new development within a designated floodway
4. Maintaining supplies of FEMA/NFIP materials to help homeowners evaluate measures to reduce damage

Multi-Jurisdictional Program for Public Information

Osceola County, City of Kissimmee, and City of St. Cloud have joined efforts to produce a unified Multi-Jurisdictional Program for Public Information (MJ-PPI), as a subcommittee to the Working Group. The MJ-PPI subcommittee was formed on September 11, 2014. The MJ-PPI is a collection of public/private participants whose primary goal is to identify targeted outreach activities/messages that follow major topics approved by the NFIP.

These topics target an increase in awareness of the dangers of floods, as well as reducing the human and economic impact of flooding on communities participating in the NFIP's Community Rating System program. The MJ-PPI will result in a unified program for coordinating messages and projects for a cost effective and consistent method for flood hazard outreach across all jurisdictions.

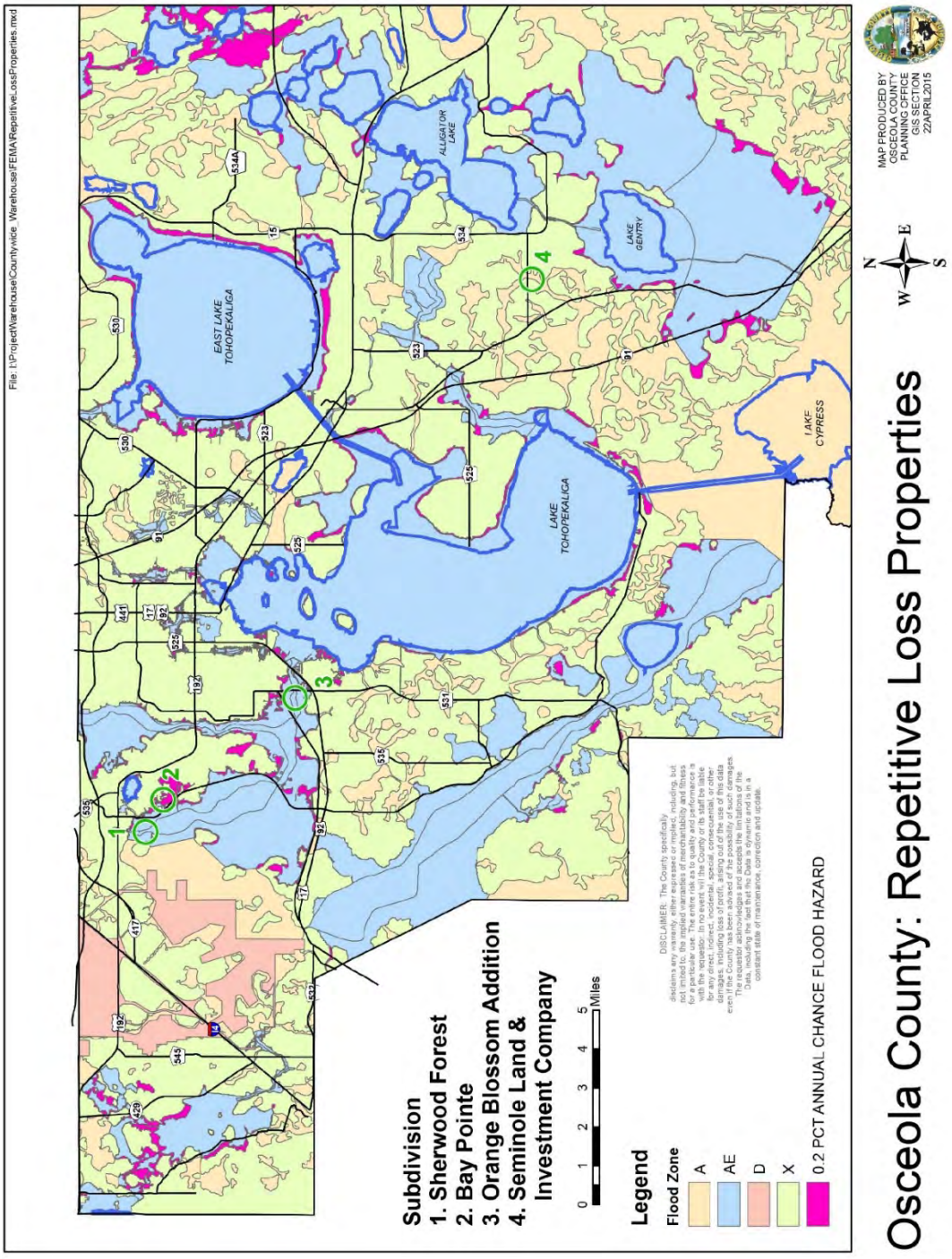
REPETITIVE LOSS PROPERTIES

Repetitive loss properties are another means in identifying flood hazards. The FEMA NFIP defines repetitive loss properties as those with policies having two or more flood insurance claims of $1,000 or more within a 10-year period. Current records show there are 6 such properties in Osceola County, 2 of which are located in St. Cloud, and 1 in Kissimmee. In each case of loss, the property is

residential property. Repetitive loss properties are identified only if the owner has NFIP coverage.

Osceola County purchased one of five repetitive loss properties located on Marsh Road. The remaining four properties are notified annually of mitigation opportunities available to them, but the County has not made offers to purchase them as of yet. The annual mailing includes over 400 surrounding properties

Privacy laws prevent publishing repetitive loss properties addresses. The following map shows the general location of repetitive loss properties.



OSCEOLA COUNTY LOCAL MITIGATION STRATEGY WORKING GROUP

2020
HAZARD IDENTIFICATION RISK ASSESSMENT

OSCEOLA COUNTY OFFICE OF EMERGENCY MANAGEMENT

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

This document is evaluated, maintained and revised annually. Suggested changes are recorded and evaluated for inclusion generally in January. Specific evaluation and revision motivations include real world events, the annual exercise schedule after-actions/improvement plans and include additional input from the Working Group and other partners.

INTRODUCTION

This Hazard Identification and Risk Assessment (HIRA) describes the natural and human induced hazards that threaten Osceola County, including all jurisdictions. The assessment process also relates the potential risk resulting from those hazards.

The 2020 revision brings additional tools and depth to the analysis. Risk areas, areas affected by recent disasters, and newly available data are just some of the motivations for updating the HIRA. The most significant reason is that a community-based emergency management program builds on the foundation of a solid risk analysis.

The purpose of revising the assessment is to gain a better understanding of how various hazards of any subsequent magnitude result in disaster today. The process evaluates risk based on a number of criteria, including the probability and frequency of occurrence of the hazard event.

The assessment further considers the exposure of people, services and property or vulnerability to the hazard and the associated consequences. By understanding the risk and vulnerability, Emergency Management and the Local Mitigation Strategy Working Group can better identify actions to reduce the effect of disasters including economic impact.

The Local Mitigation Strategy Working Group (Working Group), established in 2004, is a team of representatives from all jurisdictions and local agencies responsible for working with others in developing and revising the Local Mitigation Strategy. The Working Group coordinates mitigation actions within the jurisdictions, setting the priority level for specific mitigation projects, and contributes to the annual update process.

The Osceola County Office of Emergency Management (OEM) conducted HIRA revision with the assistance of the Working Group through a subcommittee based upon the most current available data. This document provides a description of each identified hazard, a risk assessment for each hazard, and includes summary of community vulnerability. Specific mitigation measures are also included within each hazard section.

A number of criteria provide a qualitative and quantitative analysis supporting the community risk and vulnerability determination. The risk assessment provides the “whole community” foundation, to include all jurisdictions for the mitigation planning process as well as the Emergency Management program.

The team encountered a number of challenges in the development of the final product. Additionally, there were a number of successes as well. The final submission document is being assembled under the response to the COVID-19 global pandemic. Staff and product are stretched thin and the ability to engage partners is limited to computer exchanges or meetings online.

The 2020 HIRA brought forward a reorganization of ranking resulting from re-evaluation and the current evolution of events. Additionally, two hazards not ranked last assessment have now been ranked with two previously combined hazards broken out as individual hazards. The OEM continues to work at providing address-specific risk presentation through ArcGIS Online as well as community feedback regarding mitigation measures.

Code of Federal Regulations

§201.6(c)(2) *A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:*

(i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;

(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

§201.4(d): *The Plan must be reviewed and revised to reflect changes in development…*

The Federal Emergency Management Agency (FEMA) defines the risk assessment as "the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards by assessing the vulnerability of people, built community, and infrastructure to natural hazards". Our assessment here extends to the human caused hazards as well.

The process of a Hazard Identification and Risk Assessment is:

1. Identify what hazards could affect the community,
2. Profile hazard events and determine what areas and community assets are the most vulnerable to damage from these hazards, and
3. Estimate losses and ultimately prioritize the potential community risks

Methodology

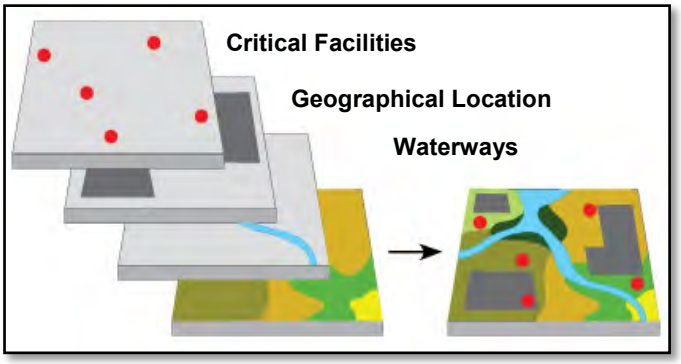
The Working Group also serves as a multi-jurisdictional planning team with a mission to decrease the vulnerability of the citizens, governments, businesses and institutions of Osceola County to the future human, economic and environmental costs of disasters. The Working Group develops, monitors, and maintains a local strategy for hazard mitigation and post-disaster redevelopment.

The Office of Emergency Management (OEM) collaborated with the Working Group through an established sub-committee to identify the hazards most likely to affect Osceola County. OEM and the Working Group analyzed and profiled the hazards identified in this report determining the magnitude of future events, as well as the vulnerability of each community, collectively and severally, to include community assets and critical facilities.

The OEM organized hazard data and protection assets in a geographic information system (GIS) database. The data integration included critical facilities, major disasters, historical occurrences, experienced impacts and costs, all of which provide a realistic indication of people, places and structures at risk. The sub-committee and OEM presented the findings to the Working Group to ensure inclusion of each jurisdiction.

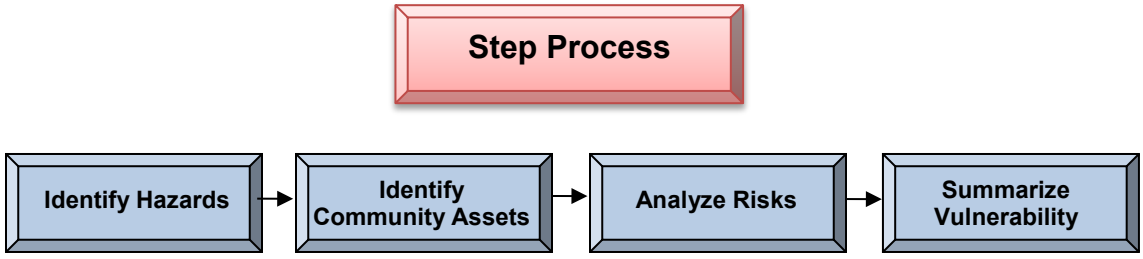
Using GIS improves the analysis accuracy by overlaying data-rich spatial layers of the flooding, transportation lines, evacuation zones, critical facilities, and critical infrastructure. The data used for this assessment reflect the best available data.

As an additional GIS tool, the County uses the FEMA hazard modeling software, known as Hazus, in assessing risk and vulnerability. Using GIS as a platform, Hazus data reports people and structural risk, estimated damage and economic losses. Even though GIS and Hazus illustrate certain vulnerabilities, it only offers minimal mitigation solutions that reduce risk.



The OEM and the Working Group prepared a comprehensive measurement of risk for each hazard. The hazards are rated with a numerical value based on various criteria. Generally, the higher the rating, the higher the community-at-large is at risk across all jurisdictions.

While the Hazard Identification and Risk Assessment provide an assessment of each hazard that could potentially impact Osceola County, the Working Group provides mitigation goals, mitigation actions, and an action plan for implementation. These additional elements are located in the Local Mitigation Strategy document.



IDENTIFICATION & RISK ASSESSMENT

Risk Assessment

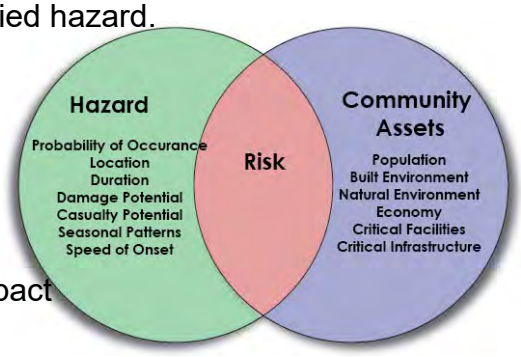
A risk assessment is a process and product that collects information and assigns values to risk for the purpose of establishing priorities, developing or comparing courses of action, and informing decision makers (*FEMA Local Mitigation Planning Handbook, 2013*).

This HIRA is a multi-jurisdictional effort and takes into consideration assets, hazards, vulnerabilities, and overall risk unique within each community. Jurisdictional risk and vulnerability are considered equal unless otherwise specified within the hazard listed.

The probability or frequency of occurrence, nor the severity of impact or destruction it produces can solely measure risk; rather, risk, for the purposes of this process, considers multiple dynamics. These include the severity of the hazard impacts; including the community's vulnerability and capability to protect, mitigate, respond to, including recovering comprehensively, determine the risk of an event. The risk is considered equal, if no differentiation is noted within the hazard specified.

Evaluation Criteria

The Local Mitigation Strategy Working Group determined the following qualitative and quantitative criteria in providing a whole-community, including all jurisdictions, comprehensive measurement of risk for each identified hazard.



- How likely is the hazard to occur
- The capacity to cause damage
- How substantial is the geographic impact
- What is the speed of onset (warning time)
- How much of the population will be affected
- What is the potential for casualties
- What is the potential for negative economic impact
- How long is the duration of the event
- Is it a seasonal pattern
- Does it pose an environmental impact
- How predictable is the hazard
- What is the potential for mitigation impacts
- What is the warning system capability
- Are there corollary effects

Every hazard has been evaluated against the criteria listed above, and is illustrated in an assessment matrix. Every hazard profile contains an assessment matrix depicting a numerical value and supporting written description.

The numerical scale of 0-5 quantifies the impact of each criterion for each hazard. The values are not all expressed the same, but have a generalized weight of Low to High, where the value of '0' is Low and a value of '5' is High. An exception occurs where a reverse rating is noted in the assessment matrix, serving to offset the overall score as these criteria are considered positive values.

Hazard Assessment Matrix

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence	Most	Very	Moderately	Somewhat	Slightly	None
Capacity to Cause Damage	Greatest	High	Moderate	Low	Minimal	None
Geographic Impact	Greatest	Large	Moderate	Low	Small	None
Speed of Onset (warning time) (reverse rating)	None	Low	Minimal	Moderate	High	Highest
Population Affected	Greatest	High	Moderate	Low	Minimal	None
Potential for Casualties	Significant	Very High	High	Moderate	Low	None
Potential for Negative Economic Impact	Significant	Very High	High	Moderate	Low	None
Duration of Event	Years or Greater	<Years	<Months	<Weeks	<Days	None
Seasonal Pattern	Always	Routine	Regular	Semi-regular	Irregular	None
Environmental Impact	Catastrophic	Major	Moderate	Minimal	Low	None
Predictability of Hazard (reverse rating)	None	Low	Minimal	Moderate	High	Highest
Impact Mitigation Potential (reverse rating)	None	Low	Minimal	Moderate	High	Greatest
Warning System Capability (reverse rating)	None	Poor	Some	Moderate	High	Highest
Corollary Effects	Significant Effect	High Effects	Moderate Effects	Low Effects	Minimal Effects	None

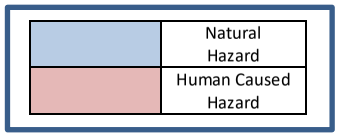
Probability Scale

The following table translates the common word verbiage to a reasonable quantitative value applied to each hazard. Every hazard has a specific matrix and this table provides the relative probability. Certain hazards may not present locally from a historic perspective; however, in these circumstances, the probability may reflect a larger geographical scale including regionally or nationally.

0 or None	Although there may always be some probability, there are no known occurrences of record.
1 or Slightly	Probability is one in 50 – 100 years.
2 or Somewhat	Probability is one in 20 – 50 years.
3 or Moderately	Probability is one in 11 – 20 years.
4 or High	Probability is one in 6 – 10 years.
5 or Most	Probability is one in 1 – 5 years.

HAZARD RISK SCORE TABLE

Hazard	Overall Score	Likelihood of Occurrence	Capacity to Cause Damage	Geographic Impact	Speed of Onset	Population Affected	Potential for Casualties	Potential for Negative Economic Impact	Duration of Event	Seasonal Pattern	Environment Impact	Predictability	Mitigation Potential	Warning System Capability	Corollary Effects
Tropical Cyclone	43	5	4	3	2	3	2	3	4	3	3	5	2	0	4
Flooding	40	5	4	3	3	3	1	1	4	3	2	5	1	1	4
Tornado	37	5	4	2	2	2	2	2	2	3	3	3	3	3	1
Wildfire	37	5	3	3	3	2	2	2	2	3	4	3	1	3	1
Severe Thunderstorm	34	5	2	2	4	4	1	0	1	4	1	3	4	0	3
Pandemic	32	2	1	4	1	2	2	3	5	2	1	2	3	3	1
Agriculture/ Livestock Disease	31	2	3	3	2	1	1	4	3	1	4	0	3	1	3
Geomagnetic Storm	28	3	4	4	4	4	0	3	1	1	0	1	0	0	3
Sinkhole	21	1	1	1	4	1	1	1	2	0	1	0	3	4	1
Climate Change	19	1	1	3	0	2	0	1	2	3	2	1	1	0	2
Cyber Attack	39	5	3	3	4	3	1	5	1	0	2	4	1	3	4
Terrorism	37	1	5	3	3	4	5	5	3	0	3	1	1	2	1
Nuclear Facility Incident	36	1	2	2	4	4	3	3	3	0	4	1	4	0	5
Civil Unrest	33	2	3	1	4	2	1	4	2	1	1	3	3	4	2
Mass Migration	30	2	2	3	3	2	1	1	5	1	1	2	3	1	3
Transportation Incident	28	3	2	2	5	2	3	2	1	0	1	1	1	3	2
Hazardous Material Release	27	2	3	1	4	2	2	1	3	0	2	0	2	3	2



2020 Impact Extent of Natural & Man Made Hazards	
Hazard	**Extent**
Tropical Cyclone	According to National Oceanic & Atmospheric Administration (NOAA), all of Central Florida, including Osceola County, has a 50% probability of impact by a named storm. Recent history indicates the population can expect a storm to affect Osceola County every 2-3 years, and the most likely event will be a Saffir Simpson Scale - Category 3 or lesser storm. Even though the probability is for a Category 3 event, Osceola County is still at an increased risk due to its location in the center of the State of Florida, which has been impacted by a Category 5 storm in the past. Although Osceola County is susceptible to this type of storm, it is unlikely that the full force of a Category 5 storm would directly impact the County due of its location inland from the coast and away from Storm Surge zones. It is more likely that the County would be impacted by severe rain, and winds, which would still cause significant damage and the potential for loss of life. This hazard is assessed as equal across all jurisdictions.
Flooding	Osceola County uses the Federal Emergency Management Agency's Flood Insurance Rate Maps to determine flooding hazards and impacts. The FIRM maps use historic, meteorological, and hydraulic data as well as open-space conditions, flood-control works, and development to show areas that are prone to flooding. Osceola County also uses the HAZUS flood model in detailing potential flood events. The current standard is the 100 YR of 1% annual chance. Based on the models, the greatest depth experienced in Osceola County during a 100-Year event would be < 8 feet. The total economic loss, including buildings, Business interruption, loss of use and temporary housing is estimated at $491,000,000.00. This hazard is assessed as equal across all jurisdictions.
Tornado	Osceola County uses the Enhanced Fujita Scale to measure impacts from a tornado event. Since 1960, there have been 40 reported tornadoes in Osceola County. While most of these tornados are considered small in nature, Osceola County does experience strong tornadoes every few years. In 1998, an EF3 Tornado killed 25 people and injured more than 145 when it struck northern Osceola County. This was the most powerful tornado in the recorded history of Osceola County still holding the record as the deadliest tornado in Florida history. This hazard is assessed as equal across all jurisdictions.
Wildfire	The National Interagency Fire Center website rates Florida in the low fire damage class. However, the Florida Division of Forestry website indicates that much of Osceola County remains in the high to moderate probability category for wildfires. This is largely due to the abundance of rural and agricultural land within Osceola County. Wildland fires have become particularly dangerous over the years as the population in Osceola County has extended outwards into the urban interface where wildlands and the population meet. Wildfires that were once a threat to wooded areas may now impact homes and businesses. Since 1981, there have been over 2,000 classified wildfires within Osceola County. In 1998 the County, along with many others in the State, experienced a wildfire outbreak that consumed more than 29,000 acres and caused millions of dollars in damage. Due to the rural nature of most of the county, an event of this magnitude could easily reoccur. This hazard is greater in the unincorporated County due primarily to geographical extent.

Severe Thunderstorm	The National Weather Service has defined a severe weather event as an event where winds reach a speed of greater than 58 miles an hour and/or a tornado of EF0 to EF2 Strength and/or hail with a diameter of at least 1 inch. The intensity of a hailstorm is measured in the size of the hail that it forms. A storm must produce hail 1 inch in diameter to be considered severe. The largest hail event for Osceola County occurred on Feb 22, 1998 and resulted in $65,00.00 (adjusted for inflation) in property damage from hail 0.75 inches and larger. Severe thunderstorms have taken the lives of 5 people in Osceola County since 1950 including lightning, but excluding tornado deaths. This hazard is assessed as equal across all jurisdictions.
Geomagnetic Storms	A geomagnetic storm is a temporary or otherwise disruption of the magnetosphere caused by intense energy directed toward the earth from the sun. The storm influence can result in a wide variety of events ranging from abnormal rotation to increases ultraviolet light intensity and up to disruptive waves of solar winds with potentially catastrophic results. The highest impact potential is that loss of communication, electric power and rising civil unrest related to the "unknown" cause. Storms occur frequently during the high point of the sun's solar-cycle, but generally have little impact. NOAA rates storm activity on two scales, the R-scale and the G-scale. Five is the highest and represents potentially significant damage on both scales. Osceola County could expect significant impact in the form of electric power transformer damage exceeding $30,000,000.00. This hazard is assessed as equal across all jurisdictions.
Sinkholes	According to the USGS website, Osceola County sinkholes are uncommon, but naturally are a occurring geologic phenomenon and a predominant landform in Florida. Osceola County, like most of the State of Florida is located on a limestone surface. Unlike many areas in the State where limestone and other Karst formations are near the surface, limestone bedrock, in the majority of the County is relatively deep under a sand and soil layer. This results in a relatively low risk for catastrophic sinkhole formation except on the extreme northwestern edge adjacent to the Lake Wales Ridge. Hydrologic conditions including lack of rainfall, lowered water levels, or conversely, excessive rainfall in a short period, can contribute to sinkhole development. Sinkholes are geologic hazards, sometimes causing extensive damage to structures and roads. Sinkholes may also threaten water supplies by draining unfiltered surface water directly into the aquifer. Most of the sinkholes within Osceola County are few, shallow, small diameter and form gradually over time. Despite this, it would be possible for a sinkhole to develop rapidly due to heavy rains or collapse of the Limestone beneath the surface. A collapse such as this could potentially cause a sinkhole several feet (4-5 feet) deep and a maximum diameter of around 30 feet. Damage estimates can exceed several million dollars should a sinkhole occur under or around costly infrastructure or buildings. This hazard extent is greater in the extreme west portion of the County.
Climate Change	Climate change refers to long-term fluctuations in climate patterns that can disrupt the delicate balance of natural ecosystems. Conditions on Earth are never in equilibrium, and as such, climate change has always existed and will continue to always exist. Various contributing factors relate to changes in climate patterns including: solar irradiance, changes in the earth's reflectivity, and contributions to the earth's greenhouse effect. It is difficult to quantify a direct impact, but the corollary effects of climate change, regardless of cause, are most detrimental. The adverse effect include: sea level rise, increased extremes in temperatures, reduction in air quality, and the predominance of climate-enhanced weather hazards such as flooding and severe storms. Rising sea levels may impact Osceola County's natural underground drinking water source due to saltwater intrusion and also may increase risk of flooding by decreasing the natural flow of the eastern sections of the County. According to NOAA, the expected rate of impact may equate to an increased in temperature of 1.4 degrees over the next 100 years and a sea level rise of 0.04 to 0.10 inches over the next 120 years. This hazard is assessed as equal across all jurisdictions.
Storm Surge	Osceola County is an inland county and therefore not directly subject to storm surge hazards; therefore, an assessment will be excluded.
Terrorism	There are no specific reportable terror incidents in Osceola County in the past 5 years. There is an abundance of evidence that terror support activity exists within the jurisdiction. Several of the individuals responsible for the September 11, 2001 terror attacks on the nation trained in Florida and at least two, here in Osceola County. Even as recent as the Boston Bombing Attack of April 15, 2013, at least one of the perpetrators resided locally.

Pandemic	Pandemic is the widespread propagation of a contagious disease in the human population. Further, it means extending beyond regional boundaries including across continents. Generally, a pandemic is an epidemic spreading to the far reaches of the globe. In considering pandemic, many diseases are capable of reaching this threshold. Most notable are the influenza viruses because they mutate so rapidly and are easily spread amongst humans. Osceola County was impacted by the COVID-19 pandemic starting in 2020, with a total of 13,250 cases and 174 deaths at the time of this publication. This hazard is assessed as equal across all jurisdictions.
Agriculture & Livestock Disease	From livestock to citrus to honeybees, Osceola County farms a wide variety of agricultural products. According to the 2017 Census of Agriculture, Osceola has over 525,000 acres of land in farm production, nearly 60% of the County's land area, including cattle, sod, citrus, peach, blueberry, vegetable and bee farming. There are currently 392 operational farms in Osceola County, 188 of which (48%) manage livestock operations, and 204 (52%) producing crops. This hazard exists primarily in the unincorporated County.
Hazardous Material Release	A hazardous material (HAZMAT) is any item or agent (biological, chemical, and physical) which has the potential to cause harm to humans, animals, or the environment, by itself or through interaction with other factors. Chemical manufacturers are one source of hazardous materials, but there are others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released from transportation accidents or because of chemical plant accidents. There is a recent phenomenon known as chemical suicide whereby the subject mixes two household chemicals together in an enclosed space, such as a vehicle. These incidents have rapid effective results and pose a threat to responders .
Transportation Incident	A transportation incident is any incident that occurs outside the normal operational role or ability of the modality. The most common types of incidents relate to crashes such as an aircraft crash or a train vs. vehicle at rail crossings. Osceola County chose to group transportation incidents into a single category encompassing all potential modes of travel. This analysis includes bus, aircraft/airline, and rail. While each of these may have separate outcomes, each provides a similar impact and subsequent mitigation strategy. A different example for a train incident is a derailment. Trains derail for different reasons, but most occur because of a track obstruction such as a vehicle or other equipment. The commuter service known as SunRail, will be begin in the next year or so and with its advent, a larger population risk. There have been 41 incidents along the SunRail corridor since service began in 2014.
Civil Unrest	Although included in the previous version of the HIRA, Civil Unrest was not rated (scored) until the most recent update (2020). Osceola County views Civil Unrest as a corollary event as opposed to the causative agent. The community must be prepared and take mitigating actions, but the causes are the central focus for resources.
Mass Migration	This is another hazard that was previously identified, but not rated (scored), until the most recent update to the HIRA (2020). Osceola County adopts the State of Florida's position and methodology for mitigation. Most recently, Osceola County received an influx of individuals and families from Puerto Rico and the US Virgin Islands following the impacts of Hurricane Maria in 2017. The impact was felt most by the School District of Osceola County which received over 2,500 new student enrollees from the islands.
Cyber Attack	To date, there are no known attacks specific to Osceola County other than nuisance attacks, typically aimed at Denial of Service (DOS). The DOS aims specifically at overloading an information system to prevent legitimate requests for service from reaching a target. Small scale malware and viruses attack data systems daily, but are generally intercepted by programs specifically designed to do so. Larger scale companies operating in the jurisdiction have succumbed to successful attacks, including enormous theft of personal information. These companies include, Bank of America, Home Depot and Target.

Special Events	Osceola County is the home to the Silver Spurs Rodeo Association with a minimum of three professional events per year, as well as Osceola Heritage Park (OHP) which houses many events throughout the year. These include dignitary visits, religious gatherings, concerts, sporting events and sales extravaganzas. Of these events, the 3 largest are the Mecum Collector Car Show and Auction, which is a 10 day event every January, the Osceola County Fair, which is also a 10 day event every February, and the Country Thunder Music Fest, which is a 4 day event every March. The venue also serves as the home training facility for the Orlando City Lions, a Major League Soccer team. Osceola County does not see special events as a hazard and therefore has not done a complete profile on them.

Blue	Natural Hazard
Red	Manmade Hazard

HAZARD/ASSET IMPACT TABLE

Community Asset / Hazard	General Population	Special Need Population	Critical Facilities	Critical Infrastructure	Natural Resources – Rivers, Lakes, Streams	Residential Buildings	Commercial Buildings	Agriculture & Livestock	Tourism	Business Industry Commerce	Environment	Public Confidence	Transportation Systems	Public Safety Services	Medical Healthcare	General Government Services
Tropical Cyclone	4	4	4	4	3	4	3	3	4	4	2	2	3	2	3	4
Flooding	4	3	1	2	4	4	3	3	3	3	2	2	3	3	3	4
Tornado	4	4	4	4	2	5	4	2	3	4	2	2	2	3	4	3
Wildfire	2	2	2	3	3	2	2	3	1	1	2	3	2	3	2	2
Severe Thunderstorm	3	3	3	3	3	3	3	2	2	2	1	1	1	2	2	1
Pandemic	4	5	2	1	1	1	1	2	4	4	2	3	2	5	5	4
Agriculture/ Livestock Disease	2	1	1	1	2	1	1	5	4	4	2	2	1	1	1	1
Geomagnetic Storm	2	2	3	2	1	1	3	1	2	3	1	3	2	3	3	2
Sinkhole	1	1	2	3	1	3	3	1	2	2	1	3	2	2	2	1
Climate Change	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1
Cyber Attack	4	4	5	5	1	3	4	1	4	4	1	5	4	5	5	5
Terrorism	5	5	4	3	3	2	2	2	4	4	3	3	4	3	4	3
Nuclear Facility Incident	2	2	2	2	4	2	2	5	4	4	5	3	2	2	3	2
Civil Unrest	3	3	4	4	1	4	4	2	4	4	2	4	4	3	3	3
Mass Migration	1	1	2	1	1	2	1	3	3	1	2	2	4	4	4	2
Transportation Incident	2	2	1	2	1	1	1	1	3	3	3	2	5	3	3	1
Hazardous Material Release	3	3	3	2	4	3	3	4	3	4	5	2	4	3	4	2

1 = Little or no impact – no loss of service
2 = Small impact, rare service interruptions, some small inconveniences throughout the asset categories with slight increase in response efforts
3 = Moderate impact, scattered service interruptions, increased demand for assistance, road closures, businesses interrupted, longer response times, some personnel missing from work, decreased productivity, buildings damaged
4 = High impact, widespread services loss, heavy demand for assistance, major road closures, many business halted, delayed emergency response, personnel absent, heavy damage, outside assistance required, shelters required
5 = Significant impact, most services down, overwhelming demand for assistance, buildings destroyed or compromised, response halted or deterred, personnel cannot travel, significant roads and infrastructure compromised, widespread geographical impact

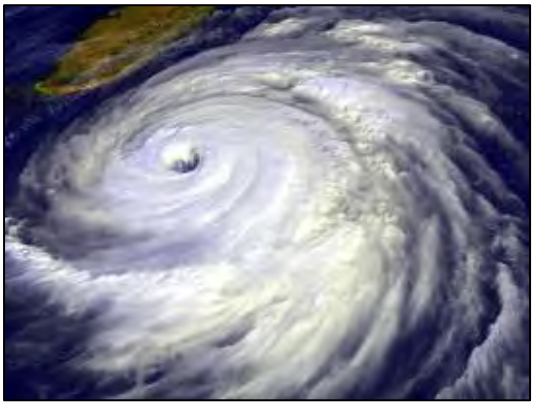
2020

Natural Hazard

Tropical Cyclone

Risk and Vulnerability Rating: 43

TROPICAL CYCLONE *(HIGH RATING: 43)*



According to the National Hurricane Center, a tropical cyclone is an organized rotating system of thunderstorms originating over tropical or subtropical waters with a closed, low-level circulation and a warm core.

The strength of the tropical cyclone results in the various classifications, including tropical depressions, tropical storms and hurricanes. Tropical cyclones involve both atmospheric and hydrologic characteristics, such as severe winds, storm surge, flooding, high waves, erosion, extreme rainfall, thunderstorms, lightning, and in many cases, tornadoes.

The tropical cyclone associated tornado threat is generally higher in the cyclonic rainbands extending out from the center. The principle reason for this is the propensity for the associated thunderstorms to rotate. The rotating thunderstorms in a tropical cyclone are termed TC Mesocyclones with the same characteristics of a general mesocyclone, although generally smaller in both horizontal and vertical extent (Sharp et al 1997).

Tropical Depression: A tropical depression is a tropical cyclone with maximum sustained winds of 38 mph or less. While they are not as strong as a tropical storm or hurricane, they are capable of producing a tremendous amount of rainfall and subsequent flooding.

Tropical Storm: A tropical storm is a tropical cyclone with sustained winds of 39-73 mph. They yield enough wind sufficient to cause property damage and intense rainfall, including waves causing beach erosion.

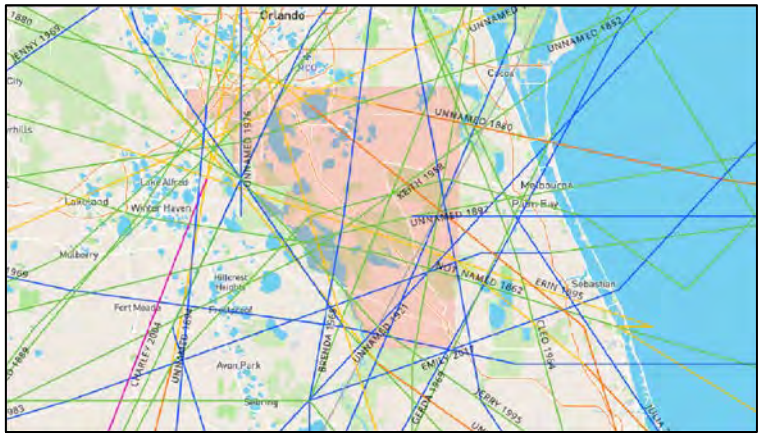
Hurricane: A hurricane is a tropical cyclone with sustained winds of 74 mph or greater. They are the most intense of all tropical systems. Hurricane strength equates to a wind and damage scale known as the Saffir-Simpson Scale

Extra Tropical Cyclone: An extra tropical cyclone is a storm that has a cold core and is associated with a larger scale weather system, such as a cold front or other low-pressure system. Often, tropical storms lose their tropical characteristics merging with such systems and thus become extra tropical storms. The transition from tropical storm to extra tropical storm does not diminish the risk associated with the storm including gale force winds and heavy rain.

Subtropical Storm: A subtropical storm is a storm that has characteristics of both a tropical storm and an extra tropical cyclone. A subtropical storm has a warm core with its strongest winds and heaviest rain in a band at least 100 miles out from the center of circulation, as opposed to tightly wrapped around the center of circulation in a tropical storm.

Hazard History

The following graphic provided by the National Oceanic and Atmospheric Administration (NOAA) represents all tropical systems passing through at least some portion of Osceola County. The represented data dates back to 1852, even prior to the creation of Osceola, formerly mosquito, as a County in 1887.



The graphic to the left clearly represents a myriad of tracks owing greatly to the geographical location of the County in a pendant peninsula.

Tropical cyclones do not need to pass through a community to affect it. Since 1950, 38 tropical systems have affected Osceola County. Most notably, the 2004 hurricane season resulted in substantial impact by three hurricanes.

The 2016 and 2017 hurricane seasons brought additional impact to the jurisdiction. In 2016 hurricane Matthew followed a classic track bringing it just off the east coast of Florida and while inflicting significant coastal erosion impact, on provided minimal wind impacts to the county.

During the event, a mandatory evacuation order was issued for manufactured homes as well as low-lying areas due to the forecast track. Fortunately, the storm track remained off-shore with the highest wind and rain east of the center alleviating impact potential; however, the evacuation re-entry required a high degree of resources returning the population to their homes.

The 2017 hurricane Irma track stayed to the west of the county. This path provided typical right-sided heavier rainfall across the county. Rainfall across the area totaled an average of 7” with higher isolated amounts. Wind damage was widespread and yet there was never sustained hurricane force winds (>74mph); however, gusts exceeded the threshold.

Most notably is the flooding in multiple areas in the northwest portion of the county. Of greatest significance is the record flooding in the local retirement community of Good Samaritan Village, requiring the evacuation of over 1100 people, one skilled nursing facility and one assisted living facility. Nearly 400 people remained displaced for the months it required to clean-up. The event was well documented allowing to better issue timely flood forecasting. The following is an abbreviated table of tropical cyclones impacting Osceola County since 1950.

Tropical Cyclone Events	
Year & Storm Name	**Impact**
1950 Hurricane King	Local winds in the 40-60 MPH reported
1950 Hurricane Easy	Unknown or no effects reported
1953 Tropical Storm Hazel	Historic Kissimmee flooding
1959 Extratropical Storm #3	Unknown or no effects reported
1960 Hurricane Donna	Historic downtown Kissimmee flooding from lake rise and heavy rain with moderate wind damage
1960 Tropical Storm Florence	Unknown or no effects reported
1962 Hurricane Alma	Unknown or no effects reported
1964 Hurricane Cleo	Unknown or no effects reported
1968 Hurricane Gladys	Unknown or no effects reported
1968 Tropical Depression #6	Unknown or no effects reported
1968 Hurricane Abby	Unknown or no effects reported
1968 Tropical Storm Brenda	Unknown
1969 Tropical Storm Jenny	Unknown or no effects reported
1971 Tropical Depression #7	Unknown or no effects reported
1974 Subtropical Storm #2	Unknown or no effects reported
1976 Subtropical Storm #14	Unknown or no effects reported
1979 Hurricane David	Minor street flooding – light roof damage
1981 Hurricane Dennis	Unknown or no effects reported
1983 Hurricane Barry	Unknown or no effects reported
1984 Tropical Storm Isadora	Unknown or no effects reported
1988 Extratropical Storm Jerry	Minor flooding
1995 Hurricane Erin	Minor wind damage to mobile and temporary facilities
2001 Hurricane Gabrielle	Low-lying areal and street flooding
2003 Tropical Storm Henri	Low-lying areal and street flooding
2004 Hurricane Charley	Extensive power outages & wind damage in the northwest and central County >$50,000,000 (estimate)
2004 Hurricane Frances	Extensive power outages & wind damage in the southeast and central County. Retirement center flooding evacuation. >$30,000,000 (est)
2004 Hurricane Jeanne	Excessive flooding and moderate wind damage >$15,000,000 (est)
2008 Tropical Storm Fay	Minor flooding
2010 Tropical Storm Bonnie	No effects reported
2010 Tropical Storm Sandy	Severe weather threat – heavy rainfall
2012 Tropical Storm Isaac	Isolated tornadoes – 1 unoccupied mobile home destroyed
2013 Tropical Storm Andrea	No effects reported
2014 Tropical Storm Arthur	No effects reported
2015 Tropical Wave Erika	Triggered moderate flooding threat – see Flooding
2016 Hurricane Matthew	Mandatory evacuation order, shelters and no damage reported
2017 Hurricane Irma	Emergency evacuation Good Samaritan Village post impact, extensive flooding, damage est. $30 million

Vulnerability Analysis

Atlantic tropical cyclone activity occurs seasonally, June 1 through November 30th each year, with a peak season of mid-August through October. It is not uncommon for tropical cyclone formation in both the pre and post season. The 2005 storm season provides the example in that storms extended beyond November. New formations continued into the month of December and exhausted the name list extending into the Greek alphabet. The current 2020 storm season exhausted the name list earlier than 2005 and at the time of this writing, Delta was on the verge of hurricane status.

Coastal communities are generally at higher risk for wind and storm surge impact than inland communities; however, all of Osceola County is at equal risk from tropical cyclone impact, excluding storm surge. Tropical cyclones diminish in strength after reaching landfall, but inland communities, like all of Osceola County, may still receive extensive damage to the built and natural environment, the local economy, posing serious risks to life. The most significant local corollary affect is that of excessive rainfall and flooding. Preparation and mitigation efforts can reduce the effects of impact from a tropical system and potentially save lives.

While Osceola County is primarily rural geographically with an abundance of vegetation, each of the municipal jurisdictions are also are subject to the same impacts and needs. High winds all the areas and result in large quantities of debris. The wind-borne debris subjects various facets of infrastructure and assets to widespread damage.

Overall assets include infrastructure like, aerial electric utility lines, roadways, traffic control devices, bridges, structures – particularly with un-shuttered glass, external powered equipment like pumps and piping, climate control systems and ducting. Communications equipment is also extremely vulnerable. These include communications towers, aerial lines and fiber optic lines.

Impacts to the Population

Osceola County is home to over 380,000 residents, and host to five million visitors annually. Depending on storm magnitude, the local community plight may be exacerbated by an overwhelming demand for emergency services, also Osceola County provides host sheltering for evacuees from threatened coastal communities.

Populations residing in manufactured or mobile homes (pre1976) are at highest wind risk, as these homes are more susceptible to wind damage. Also included, as causative threats, are floodwaters, especially in areas developed prior to Flood Insurance Rate Mapping (1989). Residents residing in these structures should plan to seek shelter in a more secure and sound structure.

With one of the largest tourist populations in the United States, Osceola County must coordinate evacuation efforts and/or sheltering of this transient population in a safe and timely manner. The tourist community is especially vulnerable to the impact of a tropical system, as they are not familiar with the hazards that threaten Osceola County, and are less prepared when a disaster strikes.

Impacts to the Built Environment

Secondary hazards from a tropical cyclone include flooding and tornadoes. These hazards can produce extensive damage to the county and cities infrastructure and built environment. Damaged infrastructure including; roadways, bridges and power lines place additional strain on the community and emergency response services. Roadways become impassable due to flooding or blockage from debris. Strong winds impact structures and may also be compromised by floodwaters.

Impact to Critical Facilities

Critical facilities within Osceola County and its incorporated areas are vulnerable to the effects of tropical cyclones. Critical facilities are structures that provide an essential function or service for survival, continuation of public safety/service actions, and disaster recovery. Critical infrastructure is those community features providing specific service such as roadways, bridges and electrical and communications distribution.

An abstract listing of the County's critical facilities is located in the Local Mitigation Strategy Appendix "G". Osceola County considers critical facilities, in a single list, as protected information and are not listed within this document. The reader may discuss obtaining a current copy by contacting the Office of Emergency Management.

Economic Impacts

Tropical cyclones are destructive to property and infrastructure, posing an initial strain on emergency response staff and equipment. Damaged bridges and roadways delay emergency response and cleanup efforts. Depending on the severity of the damage, businesses may be slow getting back up and running. Alternate methods of operations may need to occur, slowing processes. Government processing may be slower than usual depending on the demand for services and status of operating systems.

Environment Impacts

The natural environment provides protective functions that reduce hazard impacts and increase resiliency. Wetland and riparian areas help to absorb flood waters, soils and landscaping contribute to stormwater management, and vegetation provides erosion control and reduces runoff. When the effects of a tropical cyclone impact the natural environment, resilience is reduced. Strong winds and debris are damaging to natural vegetation. Rainfall eventually makes its way into the large waterways, which may still be flooding for days after the storm has passed. High winds can also induce erosion along waterfronts. Hazards can also be human induced when fuel and other contaminants are released into the environment.

Duration

The duration of impact for a tropical cyclone is calculates from the point in which as watch or warning is given for Osceola County or a neighboring coastal county (Indian River, Brevard) to its termination. The duration can vary greatly upon the size, speed, and direction of the system. On average, the duration of actual storm force winds and rain that impact the county will generally last between 12 and 24 hours (National Hurricane Center). Depending on the severity of the events, a proper recovery and

return to normal operation could take a few days for a minor event, and months to years for a major event.

Intensity

The intensity of a tropical cyclone is measured by the Saffir-Simpson Scale. The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating scale that estimates potential property damage, based on a hurricane's sustained wind speed. Hurricanes that reach a Category 3 or higher are considered major hurricanes due to their potential for significant loss of life and damage.

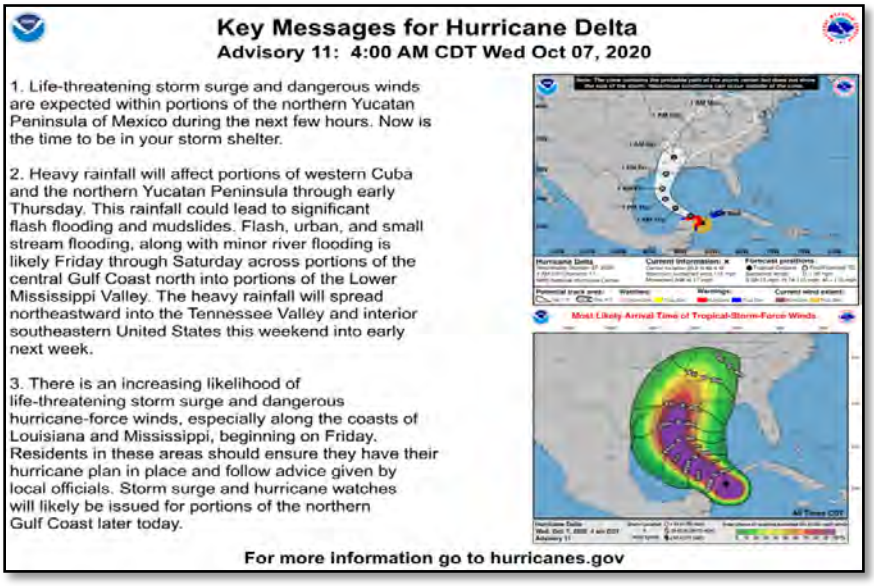
Scale # (Category)	**Sustained Winds** (MPH)	**Types of Damage**	**Examples**
1	74-95	Some damage	
2	96-110	Extensive Damage	Frances (2004)
3	111-129	Devastating Damage	Ivan (2004)
4	131-156	Catastrophic Damage	Charley (2004)
5	>156	Catastrophic Damage	Michael (2018)

Most tropical cyclones impacting Osceola County are less than hurricane strength. Historically, the Okeechobee Hurricane and others from the late 1800's through the 1900's have produced hurricane force winds.

Over the last 30 years, hurricanes Erin, Charley, Frances and Jeanne all produced hurricane winds in Osceola County. Erin, Frances and Jeanne were category 1 and Charley struck with category 3 wind speeds. Both hurricanes Matthew and Irma did not achieve sustained hurricane forces winds, but did product hurricane force gusts.

Predictability

The National Hurricane Center monitors all potential and active tropical cyclone activity within the northern Atlantic Ocean. It is possible to predict the formation and movement of tropical cyclones days before they make landfall. Locally, the National Weather Service Melbourne office provides inland impact forecast information.



Risk Assessment

Risk is the estimated impact to people, services, facilities, and structures within the County and its jurisdictions as well as the likelihood of a tropical cyclone to result in adverse conditions that would cause injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated to determine the level of risk tropical cyclones have on Osceola County. This analysis includes all the cities as well.

Tropical Cyclones (Rating: 43)

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence	5					
Capacity to cause damage		4				
Geographic Impact			3			
Speed of onset (warning time)				2		
Percent of population affected			3			
Potential for causing casualties				2		
Potential for causing negative economic impact			3			
Duration of event		4				
Seasonal pattern			3			
Environmental impact			3			
Predictability of hazard	5					
Impact mitigation potential (reverse rating)				2		
Warning system capability						0
Corollary effects		4				
TOTAL	10	12	15	6	0	0

=43

Tropical cyclones form every year in the Atlantic. Based on historical records, Osceola County is impacted by tropical cyclones every couple years. The capacity for these events to cause damage to the community is great. While 80% percent of the county is undeveloped, the probability of impacting populated areas is lower than that of more densely populated communities.

The initial tropical cyclone impact is relatively quick, but generally provides enough time for preparation before it makes landfall. Outer rainband squalls and sometimes tornado formation, mark the beginning of an extended period of increasing winds and rainfall.

While tropical cyclones can be fatal, precautions can prevent injury and loss of life. Osceola County's Office of Emergency Management regularly prepares and presents public service announcements and presentations to the community, informing the population on how to prepare.

Depending on the intensity, the impact of the storm can last hours, sometimes days. Ardent preparation is crucial as populations can be without electricity, water and other essential resources. With the assistance of the National Hurricane Center and the National Weather Service, Osceola County can warn the community well in advance of impact.

While we can anticipate tropical cyclones to form during the storm season, it is difficult to accurately predict their formation and where they may make landfall. Corollary effects produced by tropical cyclones, include strong wind, torrential rain, flooding, and tornadoes.

HAZUS Model Analysis

HAZUS is a regional multi-hazard loss estimation model developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard impacts at a regional scale. These loss estimates are used primarily by officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

For the purpose of this analysis, the team chose a 1% probabilistic scenario. The hurricane Irma forecast and subsequent storm track provided the basis for the model run. This storm was chosen based on the 2017 impact to all the jurisdictions.

While the HAZUS software has the capability to model the potential flood impact from a hurricane, planners chose not run that element, as the flood model alone was employed in the Flooding hazard section of this document.

1% Probabilistic HAZUS Impact Analysis

Building Damage & Economic Loss

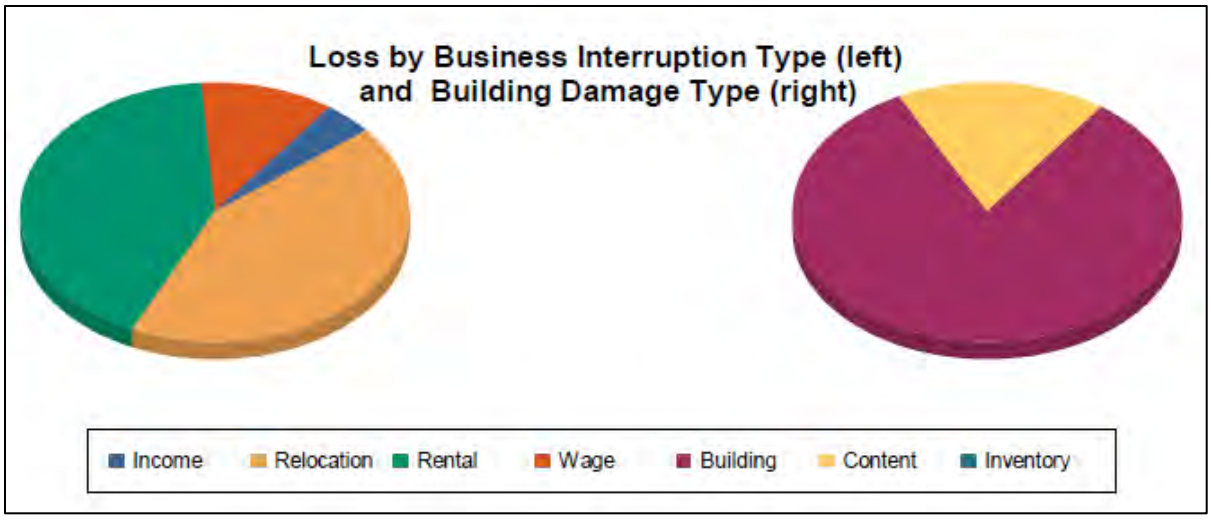
Hazus estimates that about 8,160 buildings will be at least moderately damaged. This is over 6% of the total number of buildings in the region. There are an estimated 114 buildings that will be completely destroyed.

	None		Minor		Moderate		Severe		Destruction	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	608.09	85.89	70.04	9.89	19.95	2.82	8.92	1.26	1.00	0.14
Commercial	2,338.99	73.28	558.80	17.51	254.53	7.97	37.97	1.19	1.71	0.05
Education	298.13	75.67	67.19	17.05	25.66	6.51	3.02	0.77	0.00	0.00
Government	364.00	75.52	80.07	16.61	33.56	6.96	4.37	0.91	0.00	0.00
Industrial	526.69	75.24	119.74	17.11	47.57	6.80	5.96	0.85	0.04	0.01
Religion	307.90	75.84	74.52	18.35	21.36	5.26	2.22	0.55	0.00	0.00
Residential	88,406.82	73.43	24,295.47	20.18	7,183.79	5.97	396.84	0.33	111.09	0.09
Total	**92,850.62**		**25,265.82**		**7,586.42**		**459.31**		**113.84**	

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents.

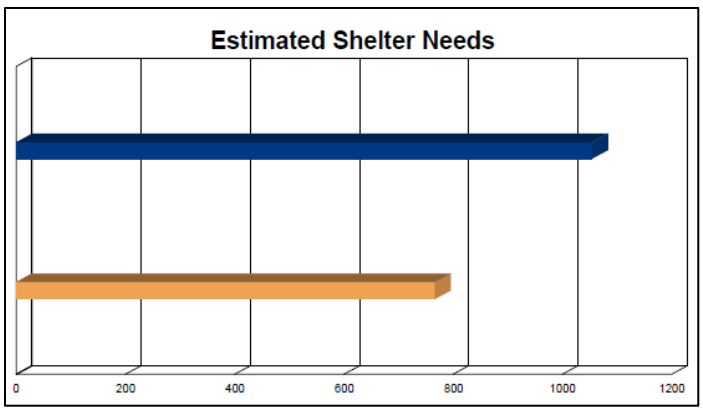
The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were $1.5 billion dollars. Thirteen percent of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 92% of the total loss.



Shelter & Short Term Housing Requirements

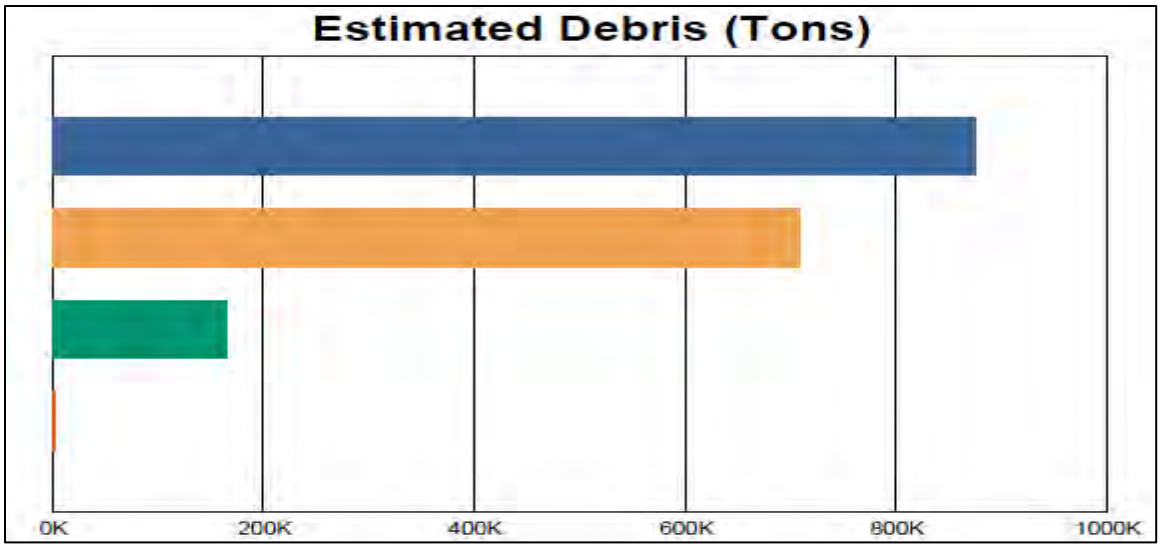
The model estimates 1,055 households to be displaced due to the hurricane. Of these, 767 people will seek temporary shelter in public shelters.



Debris Generation

The model estimates that a total of 875,045 tons of debris will be generated. Of the total amount, 619,440 tons (71%) is Other Tree Debris. Of the remaining 255,605 tons, brick/wood comprises 65% of the total, Reinforced Concrete/Steel comprises of 1% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 6656 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane.

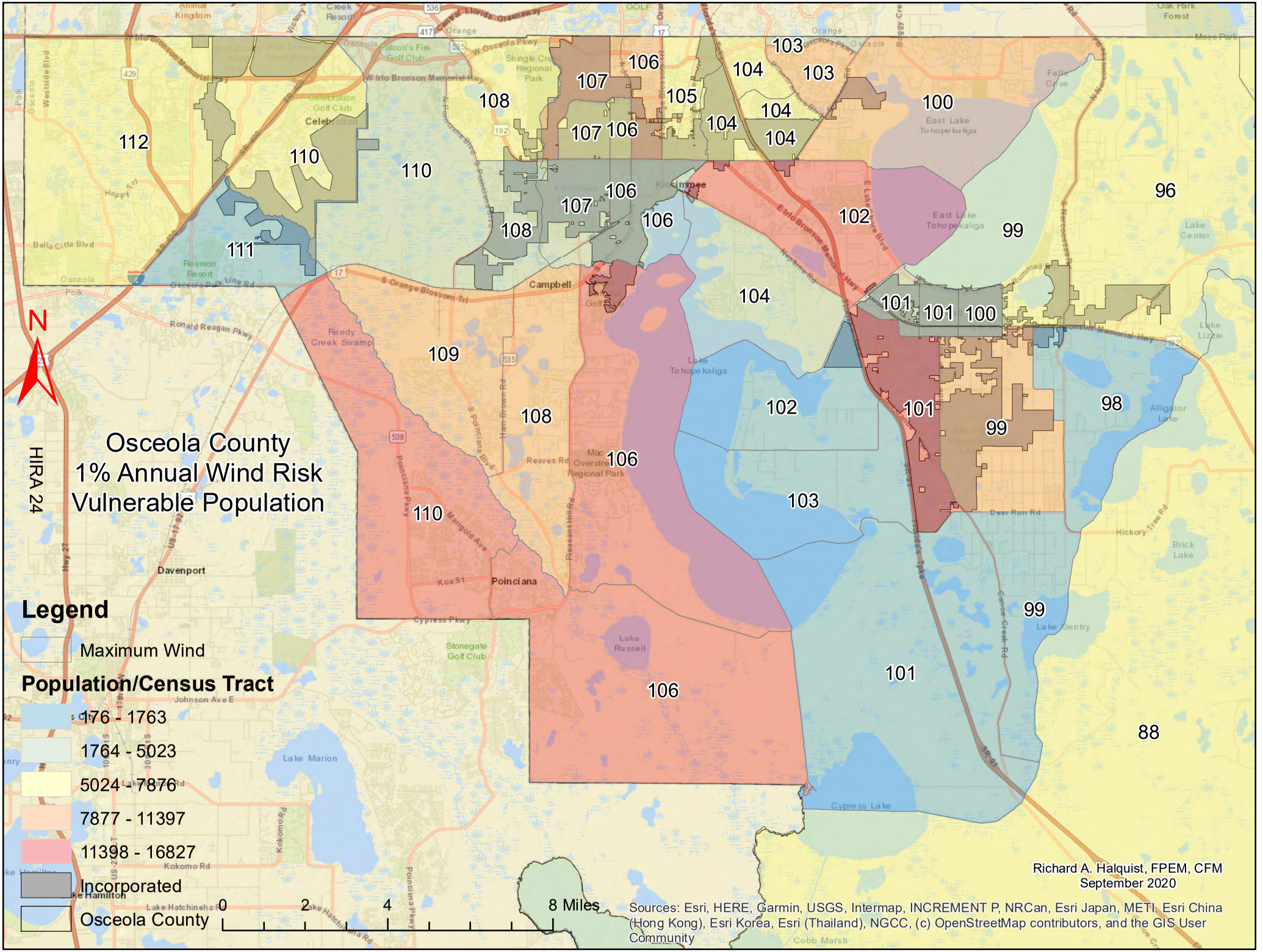
Eligible Tree Debris is estimated at 89,207 tons.

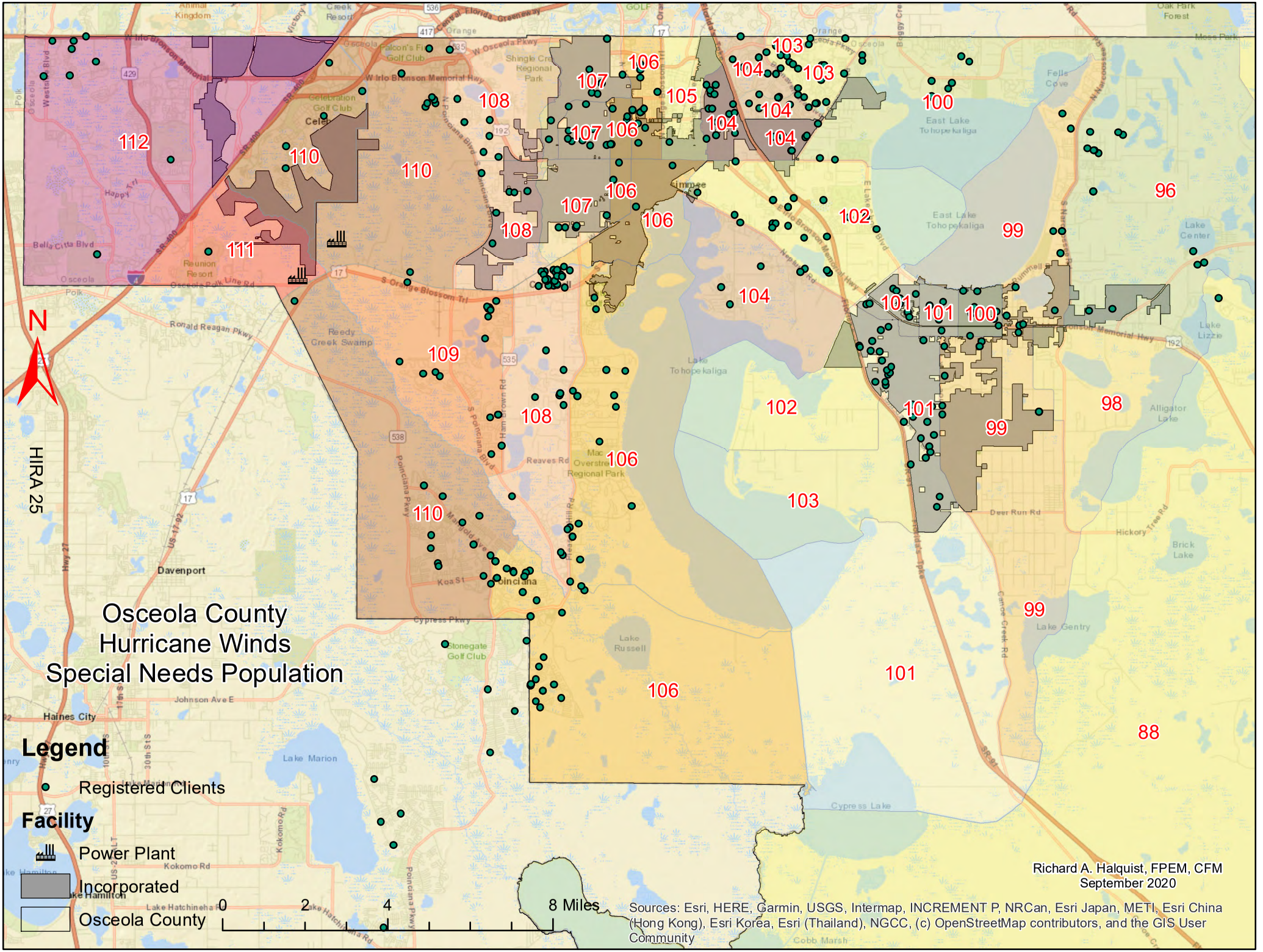


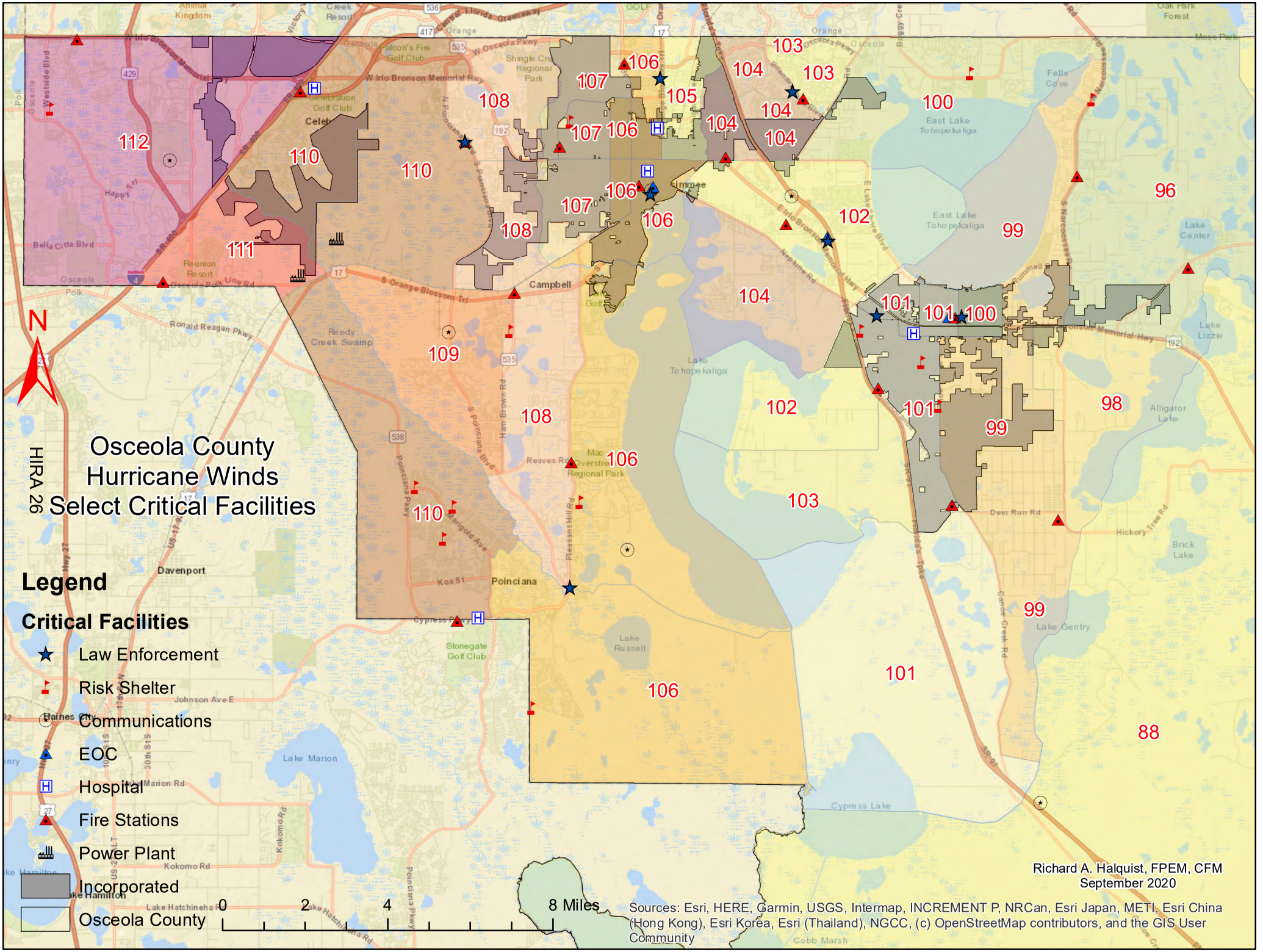
Geographical Impact Resource Maps

The following resource or risk maps depict vulnerability, including:

- Population Density Wind Risk
- Special Needs Clients Wind Risk
- Select Critical Facilities Wind Risk


Osceola County
1% Annual Wind Risk
Vulnerable Population
HIRA 24
N
Legend
Maximum Wind
Population/Census Tract
176 - 1763
1764 - 5023
5024 - 7876
7877 - 11397
11398 - 16827
Incorporated
Osceola County
0
2
4
8 Miles
Richard A. Halquist, FPEM, CFM
September 2020
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community


Osceola County
Hurricane Winds
Special Needs Population
HIRA 25
N
Legend
Registered Clients
Facility
Power Plant
Incorporated
Osceola County
0
2
4
8 Miles
112
111
110
109
108
107
106
105
104
103
102
101
100
99
98
96
88
Richard A. Halquist, FPEM, CFM
September 2020
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community


Osceola County
Hurricane Winds
HIRA 26 Select Critical Facilities
N
Legend
Critical Facilities
Law Enforcement
Risk Shelter
Communications
EOC
Hospital
Fire Stations
Power Plant
Incorporated
Osceola County
0
2
4
8 Miles
112
110
111
108
107
106
105
104
103
102
101
100
99
98
96
88
109
Richard A. Halquist, FPEM, CFM
September 2020
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Mitigation Measures

Mitigation measures are strategies focused on reducing the short and long term impact from a disaster. This section of the report provides mitigation measures for tropical cyclones. Some of the mitigation measure ideas provided in this section references the guidance FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. Tropical Cyclones produce a number of corollary effects including, but not limited to, flooding, tornado, subsidence, civil unrest and mass migration. Please also review the mitigation measures located within these chapters specific to those hazards.

Assess Community Risk

Understanding community vulnerability and level of risk is important to identify and prioritize mitigation alternatives. Improve risk assessment through the following:

- Obtaining local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis.
- Developing and maintaining a database to track community vulnerability (i.e., exposure in known hazard areas).
- Establishing a process to coordinate with state and Federal agencies to maintain up-to-date hazard data, maps, and assessments.
- Keeping aerial photography current, especially in rapidly developing areas.
- Identifying the most at-risk critical facilities and evaluating potential mitigation techniques.

Prevent Development in Hazard Areas

Limit or prohibit development in high-hazard areas through the following types of actions:

- Encouraging clustering of residential lots outside of hazard areas in subdivision design/review.
- Prohibiting or limiting public expenditures for capital improvements in known hazard areas.
- Organizing a managed retreat from very high-risk areas.
- Purchasing the “right of first refusal” for hazard-prone parcels targeted for public acquisition.
- Purchasing land and title in the name of a local governing body to remove structures and enforce permanent restrictions on development.
- Acquiring and using easements (e.g., conservation) to prevent development in known hazard areas.
- Using conservation easements to protect environmentally significant portions of parcels from development.
- Acquiring hazardous areas for conservation or restoring as functional public parks.
- Acquiring safe sites for public facilities (e.g., schools, police/fire stations, etc.).
- Prohibiting new facilities for persons with special needs/mobility concerns in hazard areas.

- Prohibiting animal shelters in known hazard areas.

Adopt Development Regulations in Hazard Areas

Regulate development in hazard areas. Examples include:

- Using subdivision and development regulations to regulate development in hazard-prone areas.
- Evaluating the use of performance/impact zoning to set risk-based standards for land development.
- Requiring setbacks from delineated hazard areas (e.g., shorelines, wetlands, steep slopes, etc.).
- Requiring conditional/special use permits for the development of known hazard areas.
- Offering expanded development rights to developers/businesses for performing mitigation retrofits.
- Incorporating restrictive covenants on properties located in known hazard areas.
- Designating high-risk zones as special assessment districts (to fund necessary hazard mitigation projects).

Strengthen Land Use Regulations

Land use regulations can reduce hazard risk through the following:

- Using bonus/incentive zoning to encourage mitigation measures for private land development.
- Using conditional use zoning to require or exact mitigation measures for private land development.
- Establishing a process to use overlay zones to require mitigation techniques in high-hazard districts.
- Adopting a post-disaster recovery ordinance based on a plan to regulate repair activity, generally depending on property location.
- Adopting environmental review standards.
- Incorporating proper species selection, planting, and maintenance practices into landscape ordinances.

Adopt and Enforce Building Codes

Building codes and inspections help ensure buildings can adequately withstand damage during hazard events. Effective actions include:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Increasing the local Building Code Effectiveness Grading Schedule (BCEGS) classification through higher building code standards and enforcement practices.
- Incorporating higher standards for hazard resistance in local application of the building code.
- Providing advanced training to local building inspectors.

- Considering orientation of new development during design (e.g., subdivisions, buildings, infrastructure, etc.)
- Requiring standard tie-downs of propane tanks.
- Requiring tie-downs for all manufactured housing.
- Establishing moratorium procedures to guide the suspension of post-disaster reconstruction permits.
- Revising fire codes to limit hotel room occupancy to ensure timely evacuation of high-use and multi-floor structures.
- Establishing "value-added" incentives for hazard-resistant construction practices beyond code requirements.

Protect Structures

Damage to structures can be prevented through the following actions:

- Acquiring or relocating structures located in hazard areas.
- Moving vulnerable structures to a less hazardous location.
- Relocating or retrofitting public buildings located in high-hazard areas.
- Relocating or retrofitting endangered public housing units in high hazard areas.
- Retrofitting fire and police stations to become hazard resistant.
- Identifying and strengthening facilities to function as public shelters.

Protect Infrastructure and Critical Facilities

Infrastructure and critical facilities can be protected from damage by the following:

- Incorporating hazard mitigation principles into all aspects of public-funded building.
- Incorporating mitigation retrofits for public facilities into the annual capital improvements program.
- Engineering or retrofitting roads and bridges to withstand hazards.
- Relocating or undergrounding electrical infrastructure.
- Designing and building water tanks or wells for use in times of water outage.
- Installing quick-connect emergency generator hook-ups for critical facilities

Increase Hazard Education and Risk Assessment

Hazard education and awareness activities include:

- Incorporating hazard mitigation principles into all aspects of public-funded building.
- Developing and implementing a multi-hazard public awareness program.
- Providing information on all types of hazards, preparedness and mitigation measures, and responses during hazard events.
- Establishing a "hazard awareness week" in coordination with the media to promote hazard awareness (seasonal).
- Establishing an interactive website for educating the public on hazard mitigation and preparedness measures.

- Annually hosting a public hazards workshop or exposition for all residents.
- Establishing hazard information centers.
- Creating a speakers bureau for disaster-related topics that focus on mitigation and preparedness measures.
- Enhancing hazard awareness of the private sector, particularly lenders, insurance agents, and realtors.
- Scheduling an annual "what's new in mitigation" briefing for the local governing body (possibly with SHMO, etc.).

Improve Household Disaster Preparedness

Educate the public on how to prepare for hazards and disasters, including the following:

- Encouraging property owners to purchase hazard insurance not as an alternative to mitigation, but rather to add financial protection if damage does occur.
- Encouraging residents to prepare by stocking up the necessary items and planning for how family members should respond during a disaster. Publicized information about household preparedness can be found at www.ready.gov.
- Providing hazard vulnerability checklists for homeowners to conduct their own inspections.
- Promoting the purchase and use of NOAA weather radios by residents.
- Encouraging citizens to secure loose items (i.e., patio furniture).
- Participating in Nation Weather Service StormReady Program.
- Purchasing and installing NOAA weather radios in schools, government buildings, parks, etc.
- Storing digital or hard copies of public records in low-risk, offsite locations.

2020

Natural Hazard

Flooding

Risk and Vulnerability Rating: 40

FLOODING *(HIGH RATING: 40)*

A flood occurs when typically dry areas experience a temporary overflow of water, which exceeds the volume capacity, thereby threatening damage or harm to the community. Flooding can occur at any time of the year, with peak times occurring during the central Florida wet season which is generally late spring through the fall.

The Federal Emergency Management Agency (FEMA) provides an official Flood Insurance Rate Map delineating the geography-based level of flood risk to the County every ten years. These map revisions contain areas of high-risk flood potential known as Special Flood Hazard Areas (SFHA).

According to FEMA guidance, Osceola County identifies SFHA as 1% or “A”, “AE” and 0.2% annual chance of flooding, including all water bodies within the County. Federal floodplain management regulations apply within the specific flood zones. Each zone reflects the different risk or type of flooding resulting in the Flood Insurance Rate Map (FIRM). The FIRMs aid in informing property owners of their flood risk and help determine locations suitable for new development.

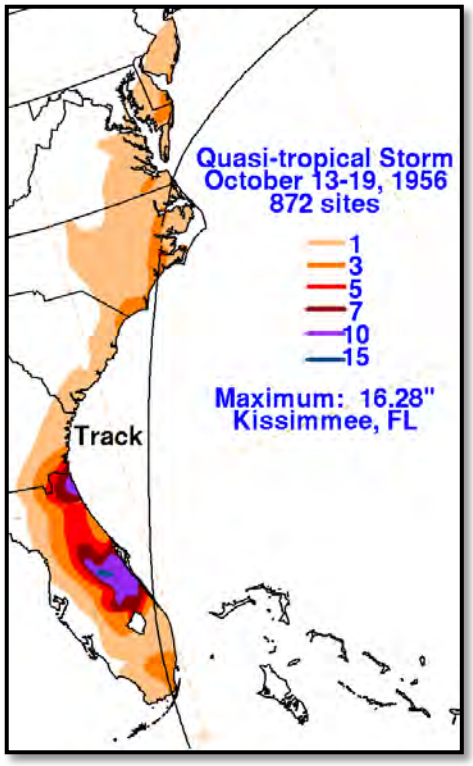
FEMA Flood Zone Determination	
Annual Chance Zone	**Description**
1% (A)	1% or “A” equates to a 1% annual chance of flooding within 100 years and a 26% chance of flooding over the life of a 30-year mortgage. Because no detailed analysis exists within these areas, no depths or base flood elevations are shown within this zone. Flood insurance is required on federally insured mortgaged property.
1% Engineered (AE)	Areas within a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown as selected intervals within this zone. Flood insurance is required on federally insured mortgaged property.
AE Floodway	A “Floodway” means the channel of a river or other watercourse. If it is a "Regulatory Floodway" development must be regulated to prevent any restricted rise within the adjacent flood zone.
.2% (X-Shaded)	.2 % annual chance is a moderate flood hazard area located just outside a 1% annual chance and the area known as “X”. It is sometimes termed “X – Shaded” and equates to the 500 year flood event. Flood insurance is generally not required in this area.
X	Areas outside the 0.2% and 1% chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than one foot, areas of 1% annual stream flooding where the contributing drainage area is less than one square mile, or areas protected from the 1% annual chance flood by levee. No base flood elevations or depths are shown within this zone. Insurance purchase is not required in this zone.
D	Areas with possible undetermined flood hazards and no flood analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

According to FEMA 2012 FIRM data (adopted in June 2013), approximately 53% of the County lies within the SFHA (see Flood Zone Map in the map section of this hazard). While much of the SFHA is outside of the Urban Growth boundary, flooding remains a threat to a number of communities.

It is worthy to note that flood zone determination or SFHA does not mean that only those areas within the zone will flood; however, it does mean that there is a higher determined risk of flooding within those areas.

Hazard History

Water control structures established in the 1960s by the U.S. Army Corps of Engineers and currently maintained by the South Florida Water Management District (SFWMD) regulate the flow of the Kissimmee Chain of Lakes and the Kissimmee River all the way to Lake Okeechobee. As a result, water flow is manageable.



Engineering records indicate that managing the system becomes challenging as the original design was intended for agricultural land use as opposed to the current developing urbanization. Crowded construction, impermeable surfaces, such as driveways, roadways and buildings are some examples of urbanization.

Excluding minor recurring nuisance flooding in some areas during heavy rains, there have been fourteen (14) notable flooding events in Osceola County since 1950. The table below is an abbreviated list of prominent historical flooding events occurring in Osceola County since that time. Although outdated, the FEMA Flood Insurance Study (FIS) provides additional flooding history.

Historic Flood Events		
Date	**Description**	**Impact**
October 1953	Reported as the worst flooding on record with a cumulative total of 47" of rain from June to October (Flood Insurance Study)	Severe impact to livestock and agricultural products, specifically cattle and food products.
October 1956	Tropical Storm (quasi) 16.28" rain over 3 days	Extensive Kissimmee flooding with minimal recorded information about the rest of the county. (U.S. Weather Bureau)
March, 1960	12 inches over 4 days, Hurricane Donna	Historic downtown Kissimmee flooding, no specific records
April 1983	Extensive rainfall 9" – 12 hours in Buenaventura Lakes (BVL) and along Mill Slough, John Young and Central Ave –	23 homes along the Mill Slough with water intrusion – no local records on dollar amount. 1 fatality reported in BVL – waterway mistaken for roadway.
July, 1990	6 inches within 30 minutes	
Dec 1997-Feb 1998	El Nino; 12 inches of rain	Sandbag operations in Jade Isle MHP
December 2003	8 " in two days – west Osceola	Sherwood Forest mobile home park and Jade Isle mobile home parks with < $500,000.00 damage. (Estimate)
July, 2009	6" in 1-hour – fluke afternoon thunderstorm	>$4,000,000 in damages; 181 affected structures in Kissimmee, SBA Declaration.
October, 2011	12 inches over 2 days; .2% or 500-year flood for Upper Kissimmee and Lower Kissimmee Basins; St. Johns and South Florida basins merged.	Sandbag operations in one mobile home community with major road overtopping and damage to Peavine Rd. Mutual aid to Polk County.
September, 2014	6" in 24-hours on saturated ground in the Shingle Creek Basin with Shingle Creek at Action Stage (USGS) –	No damage reported - Flood Alert issued by Emergency Management – September 29, 2014
El Nino August – September, 2015 Tropical System Erika*	Heavy rains through summer – 10 inches over 5 days on saturated grounds. *Erika never made landfall and dissipated near the northeast coast of Cuba spreading abundant tropical moisture across east central Florida.	Preliminary; 15 automobiles and 1-2 unreported structures. Flood Alert issued by Emergency Management on day 2.
June 4-5 2016	Heavy rains caused inundation to the Buenaventura Lakes and Eagle Bay area.	Damages primarily to vehicles, Protective measures included Flood Alert Notification and sand bags distribution.
July 22, 2017	Summer heavy rains threatened Good Samaritan Village	Protective measures: area-specific Flood Alert Notifications
September 11-22, 2017	Hurricane Irma with initial widespread 7"-14" rainfall	Good Samaritan Village, Buenaventura Lakes and Pebble Creek areas flooded significantly. Damages estimated at >$6,000,000, emergency evacuation of 1100 residents.

The map section of this document contains a more in-depth analysis of the Good Samaritan Village Hurricane Irma flood event.

Vulnerability Assessment

Factors such as development, the presence of people and property, flood depth, velocity, elevation, construction type and flood duration all contribute to the community vulnerability in Special Flood Hazard Areas (SFHA). The County may be considered most vulnerable to flooding, but primarily from a geographical perspective.

As the County has over 70% of the land and water masses, the cities, or incorporated areas only account for 30%. This calculation provides the platform for the County to include the largest area of un-engineered (Zone A) SHFA. Given the large geographical area also accounts for the largest population numbers and thereby supports the principal vulnerability. The vulnerability applies to the cities equally with the County.

Impacts to the Population

The most commonly identified population impacts in a flood event are water damage to homes, and injuries or deaths due to fast moving floodwaters. There has been only one fatality known to have occurred in Osceola County and its cities due to flooding. Unrecorded, this fatality was a result of the spring 1983 flooding event.

Flooding often poses significant secondary impacts. During a flood event, floodwater collects harmful waste, such as sewage, chemicals, debris, and toxins as it reaches impervious surfaces and given the specific area of flooding may impact an adjacent city. As a result, floods may threaten the County's water supply and water quality. Additionally, flooding may adversely affect our infrastructure, utilities, roadways, water services and wastewater treatment.

Rising floodwaters make it difficult to gauge the depth and movement of the water, which becomes hazardous for pedestrians and vehicles. Fast moving water can also pose a threat. It only requires six inches of water, moving at a slow to moderate pace to cause a vehicle to lose traction on the ground. The phenomenon may cause a vehicle to impact flood debris or other obstructions, causing injuries or even death to the vehicle occupants.

In Osceola County as well as the cities, many flood prone areas are located along stream-flows and lakes where wildlife and the environment are vulnerable. Just like human populations, the first instinct of an animal that does not live in water will be to find higher ground. This may cause a dangerous situation in which wildlife could become aggressive when confronted in an area with no escape.

Impacts to the Built Environment

Sewer systems rely on gravity and lift stations to function. These systems rely on free flow of material from one location to another. In the event of a flood, standing water makes it impossible for material to flow through a sewage system, primarily through the inundation of floodwater into the closed system.

The results are backups and leeching from the system into the ground and surface waters. Lift stations require electricity that may be lost during a flood, also causing or amplifying effects within the system. The flow of wastewater into groundwater and homes promotes illness due to biological contamination and degradation of water quality in general.

Due to threats of exposure and injury from debris and other contaminants, potentiates a long-term sheltering need, particularly when flooding continues for an extended period. Flash flooding or short notice events require immediate sheltering.

A number of communities in Osceola County, including the cities are located within the SHFA. A list of those most vulnerable communities is provided below.

Communities within Special Flood Hazard Areas

(>40% of a community within a Special Flood Hazard Area)

Jade Isle Mobile Home Park	Happy Trails	The Oaks
Sherwood Forest	Emerald Island Resort	Kissimmee Isles
Good Samaritan Village	Championsgate	West Kissimmee Park Road
Estancia Circle	Reunion	Emerald Point
South St. Cloud	Lindfields	Lakeside Estates
Wyndham Palms	Cumbrian Lakes Report	Cypress Lake
Heather Oaks	Dellwood Park	Great Oak
Mill Run	Villa Sol	Semoran Farms
Lake Ajay	Majestic Oaks	Tapestry
Blackberry Creek	Poinciana	Espirit

Impact to Critical Facilities

Flooding events impact the community without jurisdictional boundaries by threatening critical facilities and infrastructure. Critical facilities are structures that provide an essential function or service for survival, continuation of public safety/service actions, and disaster recovery. Critical infrastructure are those community features providing specific service such as sewer, liftstations, roadways, bridges and electrical transmission.

Twenty eight (28) Critical Facilities lie within the designated SFHA. All flood at-risk critical facilities are located in the maps section of this document. This list includes both cities.

An abstract portrayal of the County's critical facilities is located here in the map section. Osceola County considers critical facilities, in a single list or detailed map, as protected information and are not listed within this document. The reader may request a current copy by contacting the Office of Emergency Management for approval.

Critical Facilities within Special Flood Hazard Areas

Good Samaritan Retirement Village	**KUA – Hoagland-Buckley**
Deerwood Park	**FD/EMS Kissimmee St 11**
Oren Brown Park	**KUA – Lakeshore Substation**
Buenaventura Community Center	**Osceola Regional Medical Center**
OUC-North Substation	**Barney Veal Center**
NRG Energy Power Plant	**Oak Leaf Landing**
FD/EMS St Cloud St 32	**Chestnut Elementary School**
FD/EMS Osceola-Holopaw St 55	**Koa Elementary School**
Holopaw HOA Community Center	**Reedy Creek Elementary School**
Radio Tower – Comm Site F	**Parkway Middle School**
Radio Tower – Comm Site B	**KUA – OHP Substation**
Radio Tower – Comm Site G	**Radio Tower – Comm Site C**
Duke Energy Holopaw Substation	**FD/EMS Osceola-Poinciana St 65**
Celebration High School	**AdventHealth Kissimmee**

Economic Impacts

Business interruption is by far the most significant economic impact. Floodwaters slow business traffic and prevent active commerce. The tourism industry suffers as flooding can diminish guest traffic in theme parks as well as hotels and motels. Camping is reduced because of inundation, particularly when campgrounds exist

within the SFHA. Agriculture can succumb to flooding as a result of crop damage and the inability to acquire workers due to accessibility.

Flooding presents a potentially significant impact to government operations, specifically regarding staffing difficulties and safety, regardless of jurisdiction. While the vast majority of government operations function in buildings not within the SFHA, floodwaters on roadways create impassability for commuting staff. Additionally, damage to homes and neighborhoods may prevent employees from working as a result of personal impact.

Employees working in flood prone areas for response, rescue, and recovery operations also face various hazards. Since floodwaters have the potential to damage or destroy road surfaces, power and other underground utilities, downed electric lines, and underwater debris pose a significant hazard to employees reporting to work. Additionally, floodwater contamination pose a significant long-term health risk to crews working within the inundated area.

Environment Impacts

The environmental impact of a flooding event can be extensive and diverse, from the dispersion of low-level household wastes into the aquifer system to contamination of community water supplies and wildlife habitats with extremely toxic substances. A severe flood can destroy buildings that may contain a large array of toxic materials such as paints, pesticides, or gasoline. The resulting destruction can cause the release of these materials into the local environment. Damage is further extended by the material floating to other locations, well beyond the immediate area of the structure.

No matter how destructive the flooding event is to the human landscape, it remains a vital part of the world's natural cycle. It provides benefits to natural ecosystems and can distribute large amounts of water, suspending river sediment over vast areas. In many areas, this sediment helps replenish valuable topsoil components to agricultural lands and can help maintain the elevation of land mass above sea level.

Duration

Due to the unique nature of flooding events, no two are alike. Some floods develop slowly, sometimes over a period of days. Others develop quickly, in just over minutes. Factors that can determine the duration of a flooding event may include drainage of the impact area, amount of rain, water flow and drought conditions, etc. Central Florida has a sandy topography where drainage is adequate in most cases and flooding events rarely last more than a few days except in repetitive events. However, once floodwaters have receded, there are other secondary impacts that could extend the duration of recovery to years for some survivors.

Intensity

Flood intensity relates to the extent, including the horizontal impact area, the vertical depth of floodwaters, and the related probability of occurrence. Flood studies often use historical records, such as stream flow gauges, to determine the probability of occurrence for floods of different magnitudes or intensity.

An additional tool used by emergency management officials is the HAZUS Multi-Hazard, model. This tool provides a modeling analysis capability to assist in determining flood intensity and extent. The key factors provided by this tool in a recent analysis are extent and depth. Refer to the Risk Maps in this section for depth and extent results.

Using the 1% annual chance earlier described in this section, Osceola County can expect floodwater depths ranging from around 15 feet to less than inches in many areas around the county. The highest depth is generally at stream-flow center with simple water cover on the periphery.

Historically, the pre-firm areas flood to a depth of less than four feet, with the exception of certain split-level properties built along Shingle Creek. Floodwater inundation can reach a depth of 5 feet or more, but less than 8 feet.

Factors contributing to the frequency and severity of a flooding event include:

- Rainfall intensity and duration
- Antecedent moisture conditions (drought/soaked)
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation, and density of development
- Changes to landscape resulting from wildfires (loss of moisture-trapping vegetation and increased sediment available for runoff)
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes, and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Flow velocity
- Availability of sediment for transport, and the stability of the bed and banks of the watercourse

Predictability

Forecasters use a wide variety of tools in predicting floods. They use historic records, computer models and knowledge of flood-prone areas, precipitation forecasts, including observation data. Rainfall, water level, and stream flow help predict how high water levels will rise and at what point they will recede. Due to advancements in technologies, historical records, coupled with new and improved local mitigation strategies, it is easier to monitor conditions that cause flooding, monitor river flows, and advise the public on potential flooding events with greater accuracy.

Risk Assessment

A number of criteria provides the foundation in determining the level of risk in a flooding event. Probability ranks highest in this hazard as the jurisdictions expect a flood event at least once in every five years. Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood of a flooding event to result in adverse conditions that would cause injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated to determine the level of risk a flooding event has on Osceola County.

Flooding (Rating: 40)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence	5						
Capacity to cause damage		4					
Geographic Impact			3				
Speed of onset (warning time)			3				
Percent of population affected			3				
Potential for causing casualties					1		
Potential for causing negative economic impact					1		
Duration of event		4					
Seasonal pattern			3				
Environmental impact				2			
Predictability of hazard	5						
Impact mitigation potential (reverse rating)					1		
Warning system capability					1		
Corollary effects		4					
TOTAL	10	12	12	2	4	0	**=40**

With a flat topography and high water table, Osceola County has a high likelihood of flooding during a heavy rain event. Poor drainage in SFHA increases the capacity to cause damage to structures. The geographic impact scores moderately as our FEMA Flood Insurance Rate Maps (FIRM) provide us with an illustration of SFHA that are more prone to flooding.

As previously stated, some flooding events are gradual, while others have little to no warning time. The populations most affected by flooding events are those concentrated in the SFHA with mitigation applied accordingly, minimizing adverse impacts. Flooding events in Osceola County have a very low level potential for causing fatalities, and also a low level potential for causing negative economic impacts to the community.

The duration of the event can be lengthy, incurring continuous damage over the period of a number of days. Flooding events typically occur during the peak seasons of early spring through the fall, but can occur year-round. While the environmental impact is immediate in a flooding event, the longer-term impacts are minimal.

Mitigation efforts impact scores high (an inverse chart rating) as many mitigation opportunities exist. The County uses the mass notification system, including Wireless Emergency Alerts (WEA), Emergency Alert System (EAS), providing immediate warning to the public in the event of a flood threat.

Geographical Impact Resource Maps

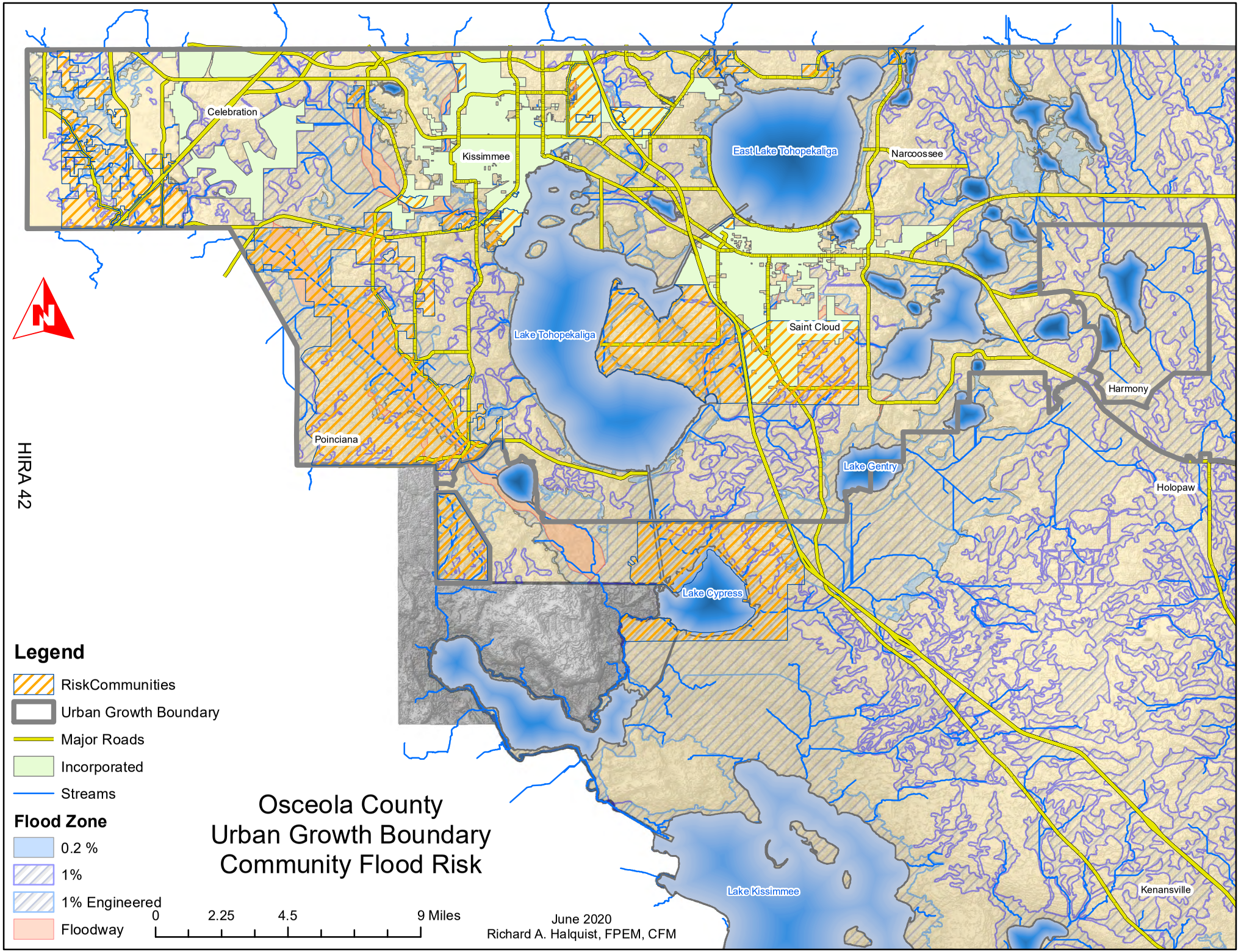
The following graphics and narrative represent flooding impact as demonstrated through the HAZUS model. The model ran against a high resolution LiDAR based Digital Elevation Model (DEM) or 1/9th Arc-Second or 9'. Not all products were able to use the DEM as the affecting watersheds extended far into a lower resolution areas. In general, the output is at 1/3 Arc-Second or a 27' DEM.

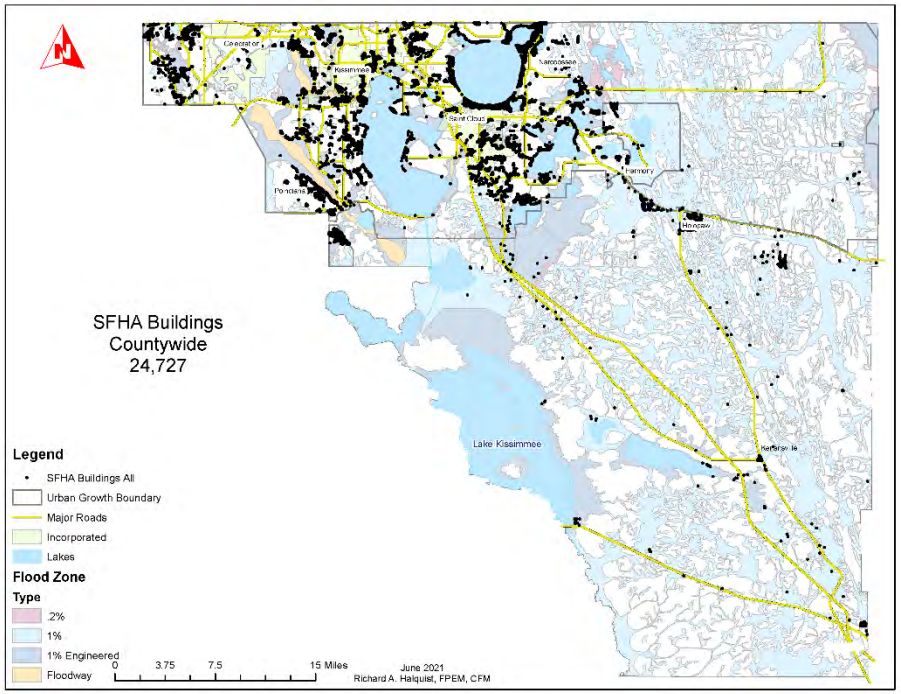
The model runs focused on specific target areas at the community level based on census tract. The team processed different return periods to include 2%, 4% and 10% return periods. The 1% and .2% annual chance return periods will run later at a generalized resolution to accommodate extended watersheds and lower resolution data availability. Partial delays are related due to the COVID-19 response and re-assignment of personnel.

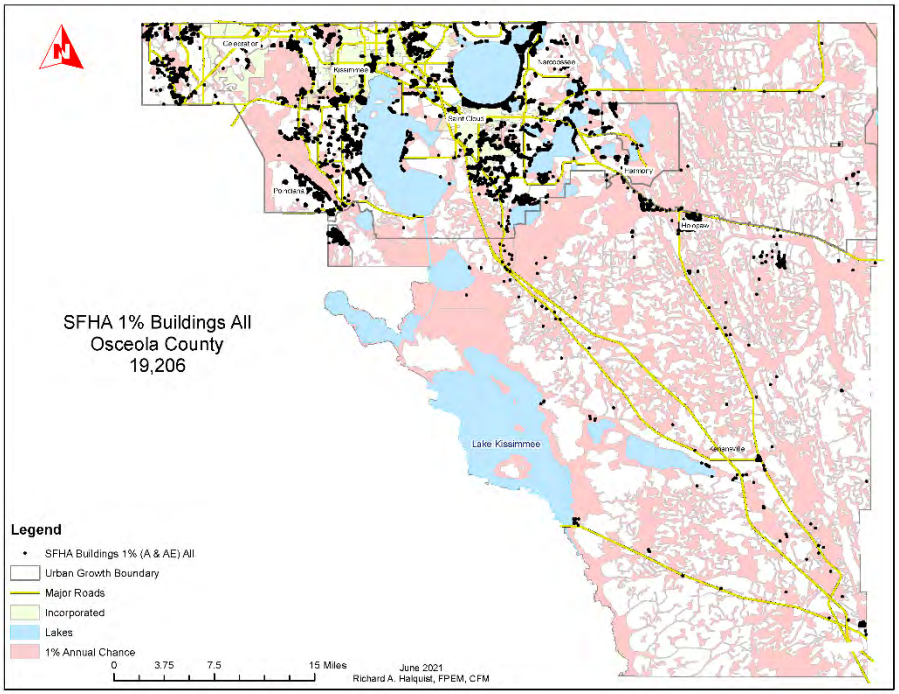
The following maps provide the greatest areal coverage and sufficient data for depth analysis. These analyses differ from the FEMA flood map; however, historically they depict flood-prone areas rather well. The FEMA Flood Insurance Rate Map (FIRM) is also included for reference.

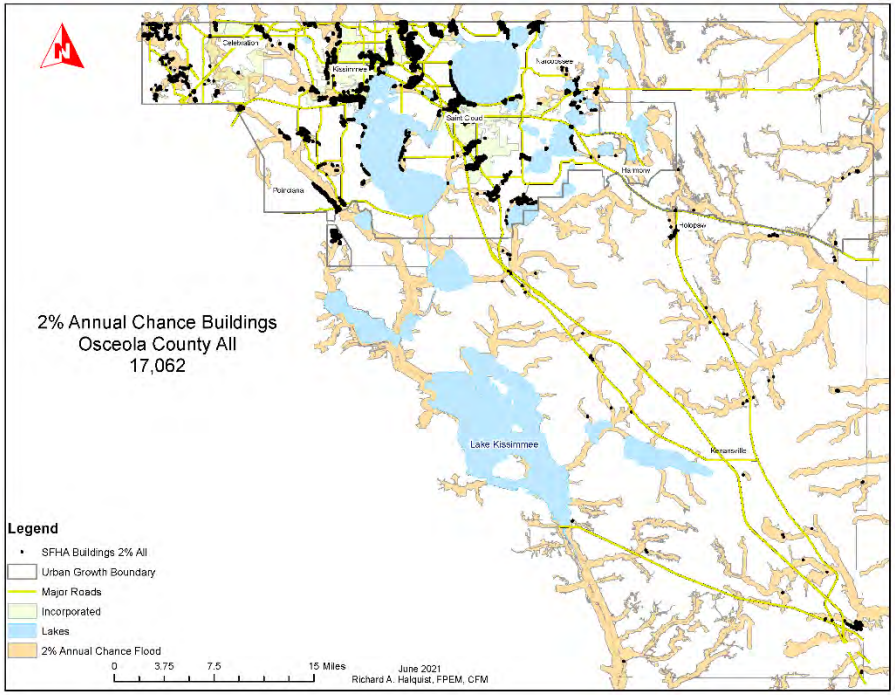
The maps section includes:

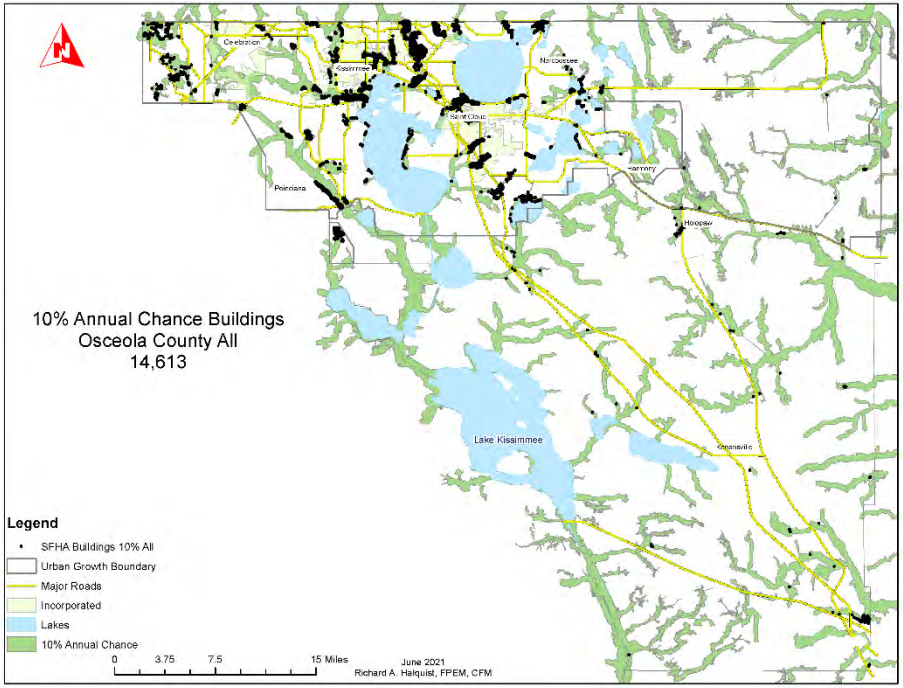
- Communities Maps (abbreviated)
- Urban Growth Boundary Critical Facilities w/Evacuation Zones
- Select City of Kissimmee Critical Facilities
- Select City of Saint Cloud Critical Facilities
- Special Needs At-Risk Population
- FEMA Flood Insurance Rate Map
- Flood Alert Notification Criteria Map

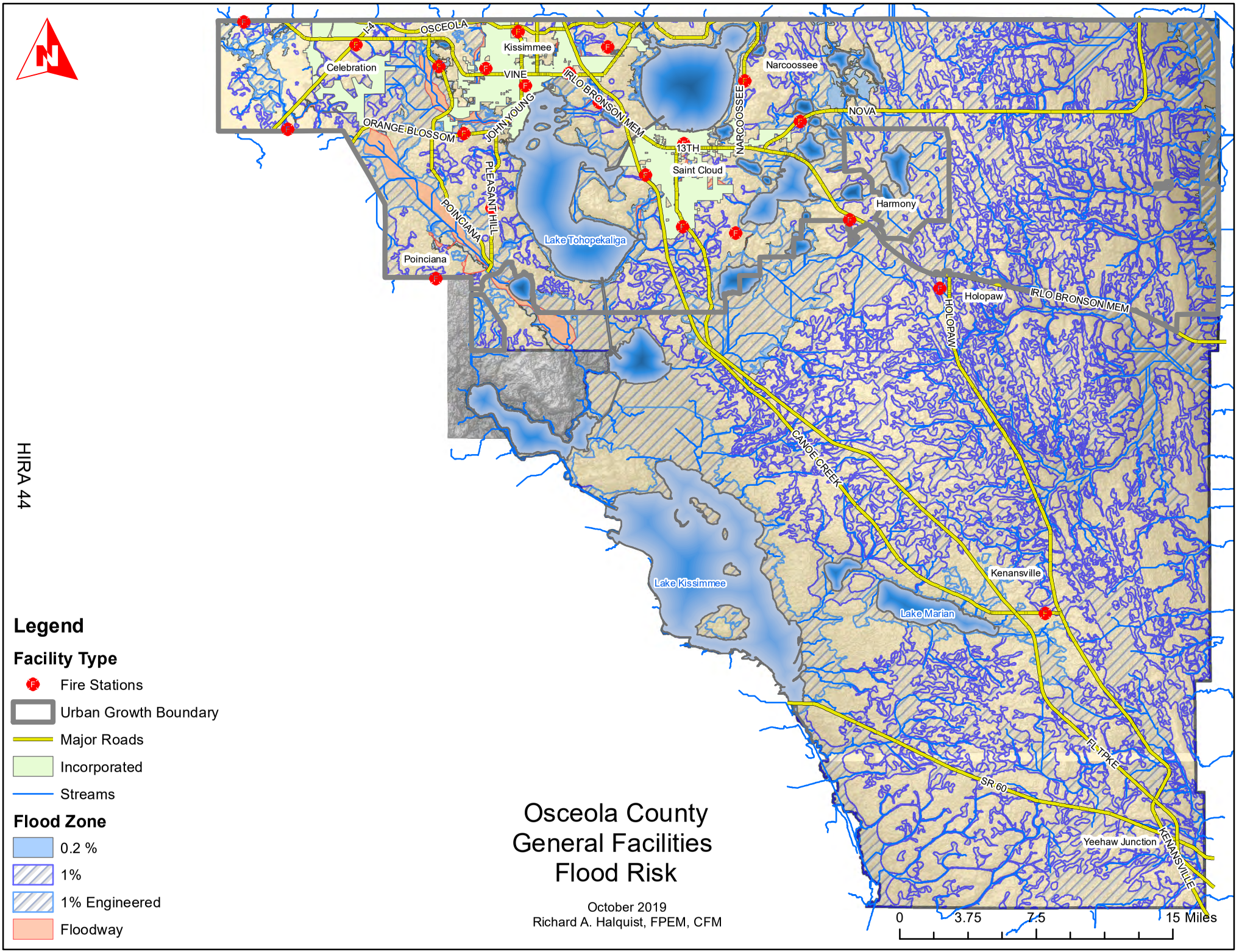

Celebration
Kissimmee
East Lake Tohopekaliga
Narcoossee
Lake Tohopekaliga
Saint Cloud
Harmony
Poinciana
Lake Gentry
Holopaw
Lake Cypress
Lake Kissimmee
Kenansville
HIRA 42
Legend
RiskCommunities
Urban Growth Boundary
Major Roads
Incorporated
Streams
Flood Zone
0.2 %
1%
1% Engineered
Floodway
Osceola County
Urban Growth Boundary
Community Flood Risk
0
2.25
4.5
9 Miles
June 2020
Richard A. Halquist, FPEM, CFM

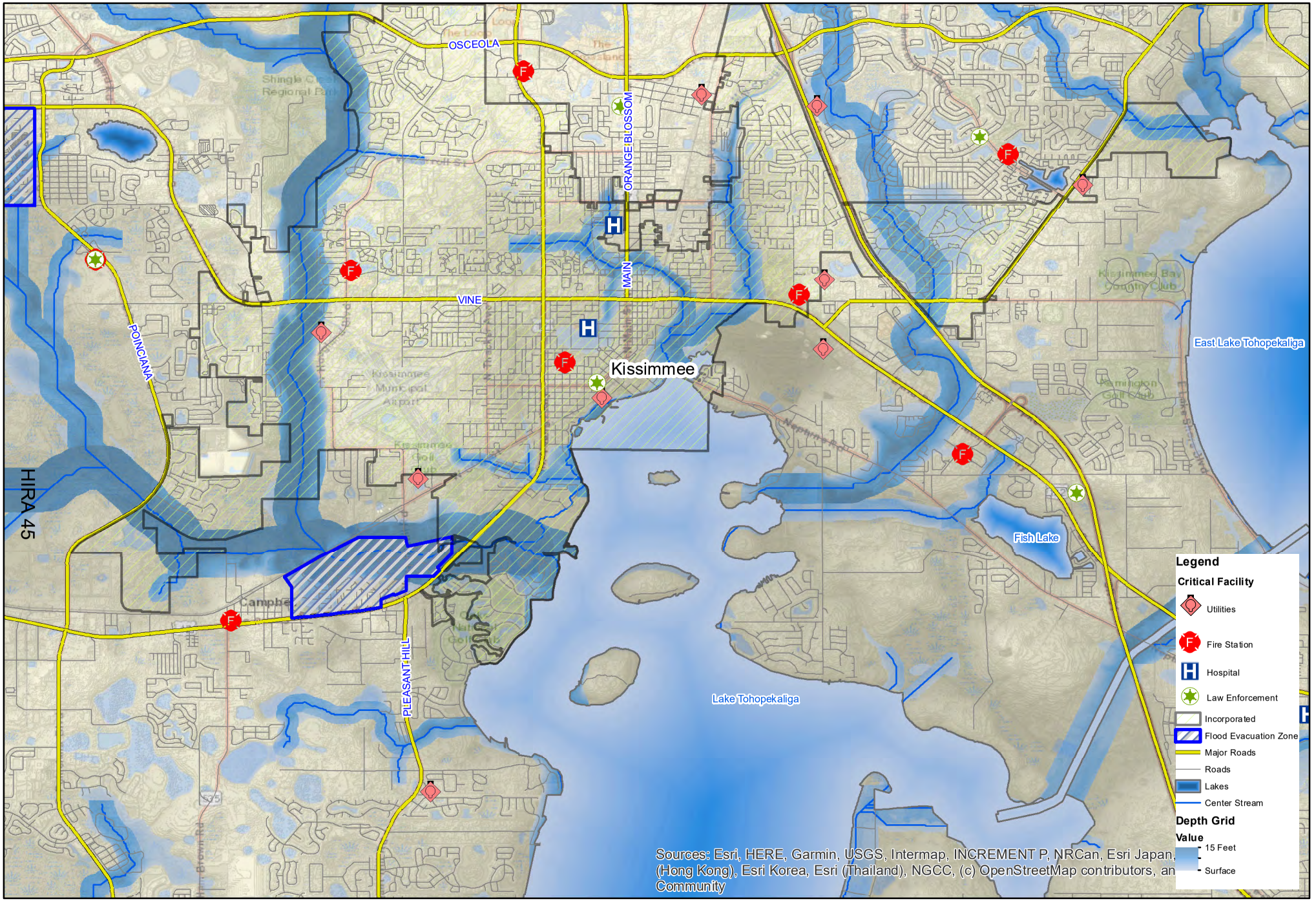

SFHA Buildings
Countywide
24,727
Legend
SFHA Buildings All
Urban Growth Boundary
Major Roads
Incorporated
Lakes
Flood Zone
Type
.2%
1%
1% Engineered
Floodway
0 3.75 7.5 15 Miles
June 2021
Richard A. Halquist, FPEM, CFM


SFHA 1% Buildings All
Osceola County
19,206
Legend
SFHA Buildings 1% (A & AE) All
Urban Growth Boundary
Major Roads
Incorporated
Lakes
1% Annual Chance
0 3.75 7.5 15 Miles
June 2021
Richard A. Halquist, FPEM, CFM


2% Annual Chance Buildings
Osceola County All
17,062
Legend
SFHA Buildings 2% All
Urban Growth Boundary
Major Roads
Incorporated
Lakes
2% Annual Chance Flood
0 3.75 7.5 15 Miles
June 2021
Richard A. Halquist, FPEM, CFM


10% Annual Chance Buildings
Osceola County All
14,613
Legend
SFHA Buildings 10% All
Urban Growth Boundary
Major Roads
Incorporated
Lakes
10% Annual Chance
0 3.75 7.5 15 Miles
June 2021
Richard A. Halquist, FPEM, CFM

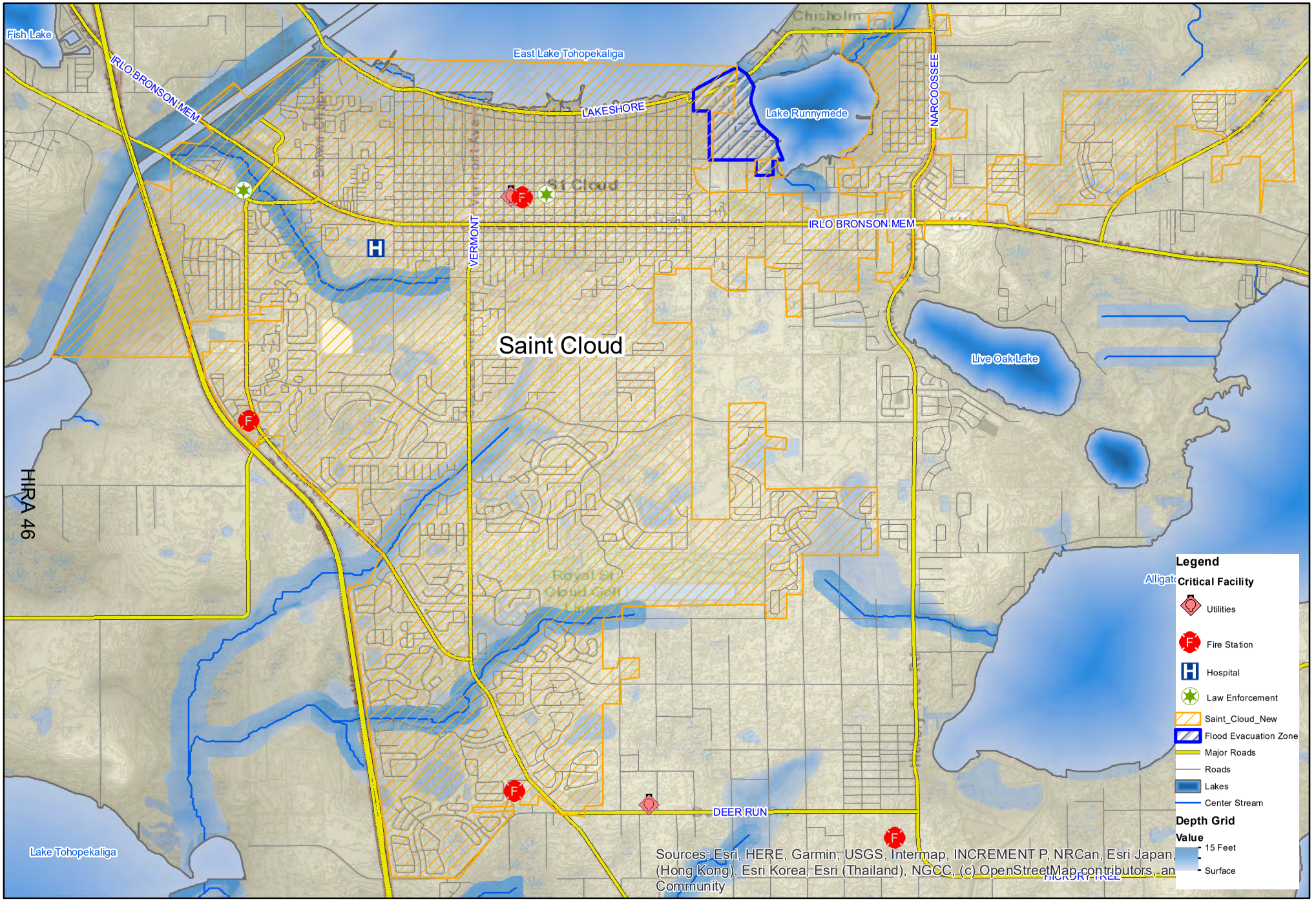

OSCEOLA
Kissimmee
Celebration
VINE
IRLO BRONSON MEM
Narcoossee
NARCOOSSEE
NOVA
ORANGE BLOSSOM
JOHNYOUNG
13TH
Saint Cloud
PLEASANT HILL
POINCIANA
Harmony
Lake Tohopekaliga
Poinciana
Holopaw
IRLO BRONSON MEM
HOLOPAW
CANOE CREEK
Kenansville
Lake Kissimmee
Lake Marian
FL TPKE
SR 60
Yeehaw Junction
KENANSVILLE
0
3.75
7.5
15 Miles
HIRA 44
Legend
Facility Type
Fire Stations
Urban Growth Boundary
Major Roads
Incorporated
Streams
Flood Zone
0.2 %
1%
1% Engineered
Floodway
Osceola County
General Facilities
Flood Risk
October 2019
Richard A. Halquist, FPEM, CFM



City of Kissimmee
Select Critical Facilities
Flood Risk

0 0.75 1.5 3 Miles

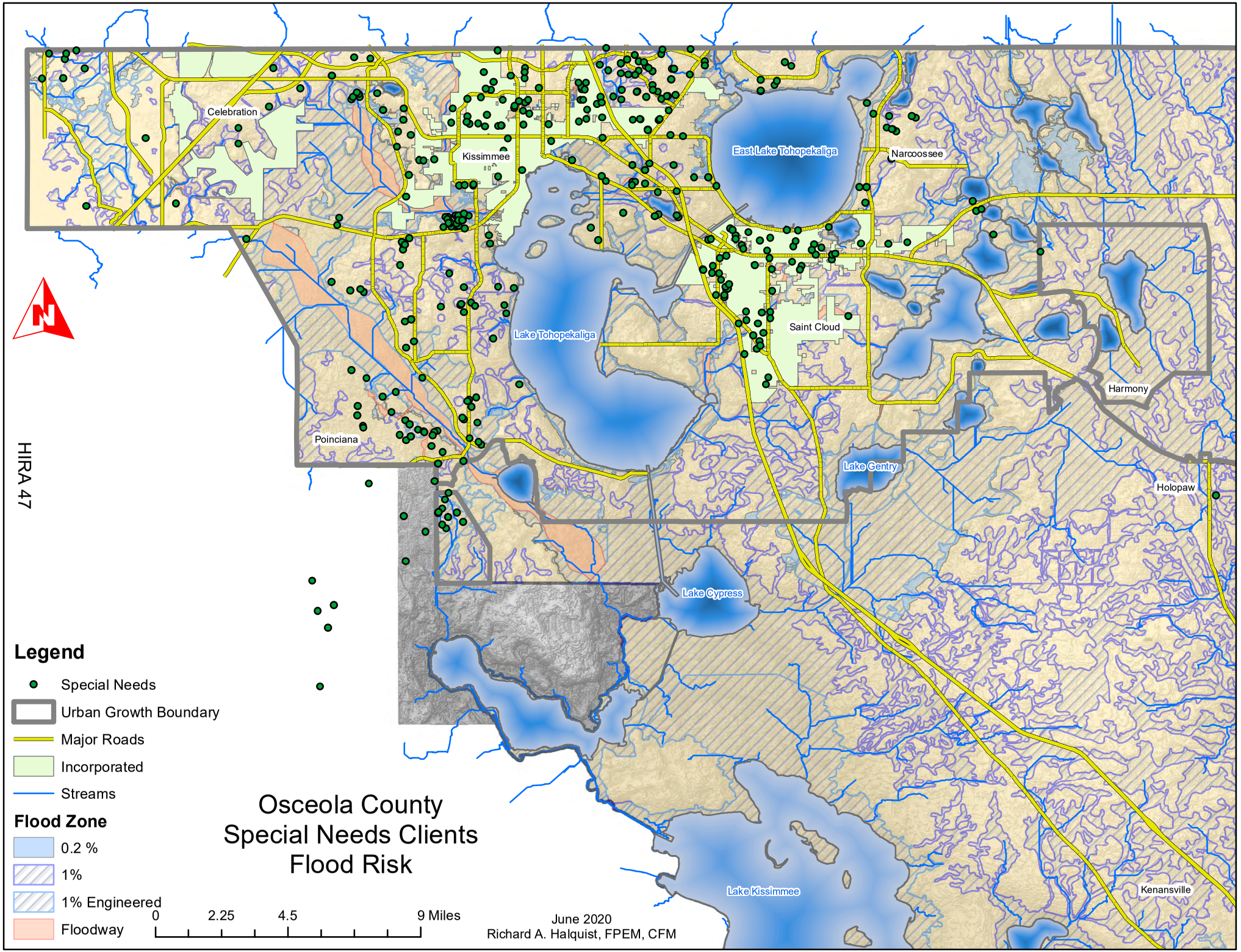
Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
December 2019

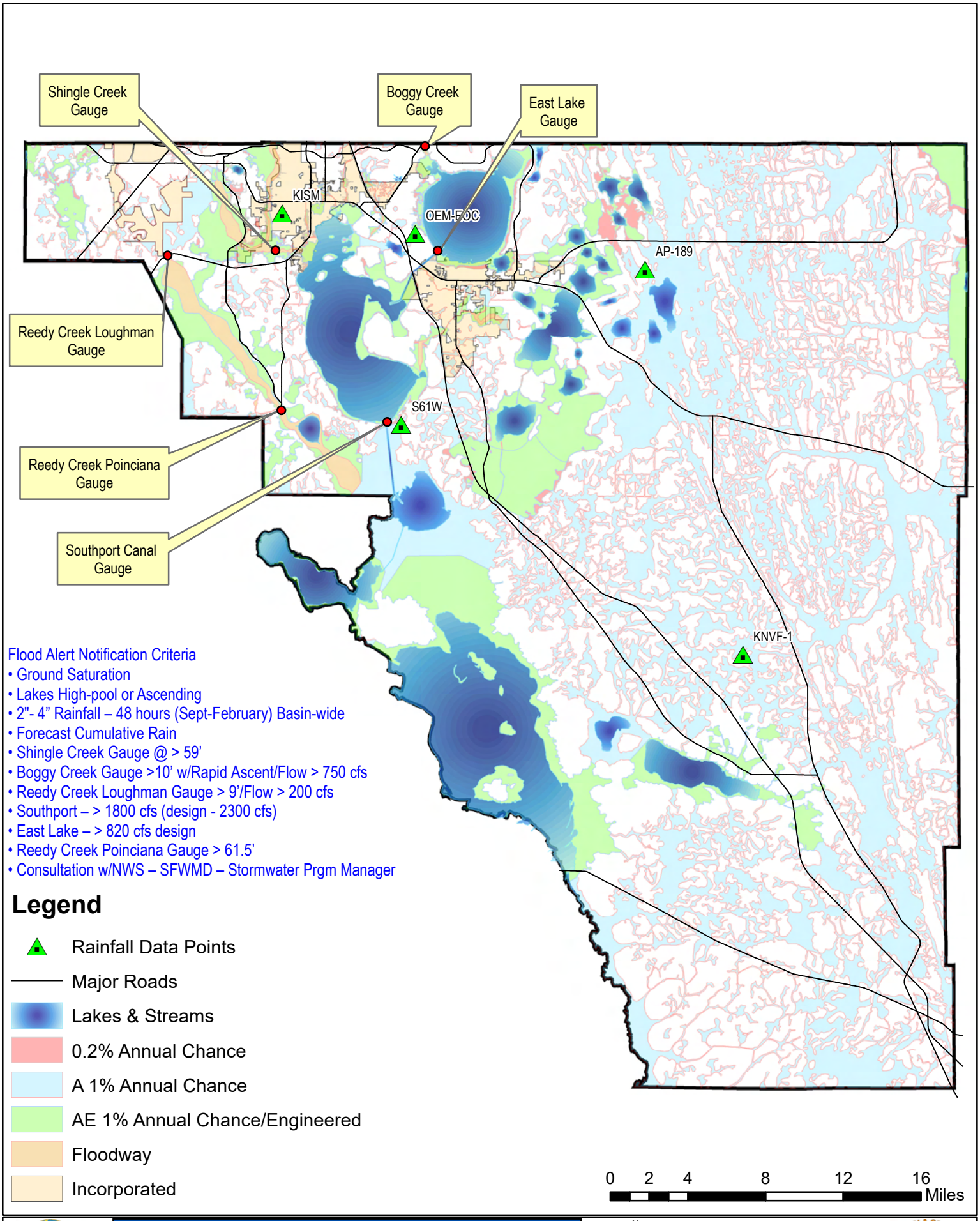


City of Saint Cloud
Select Critical Facilities
Flood Risk

0 0.5 1 2 Miles

Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
June 2020

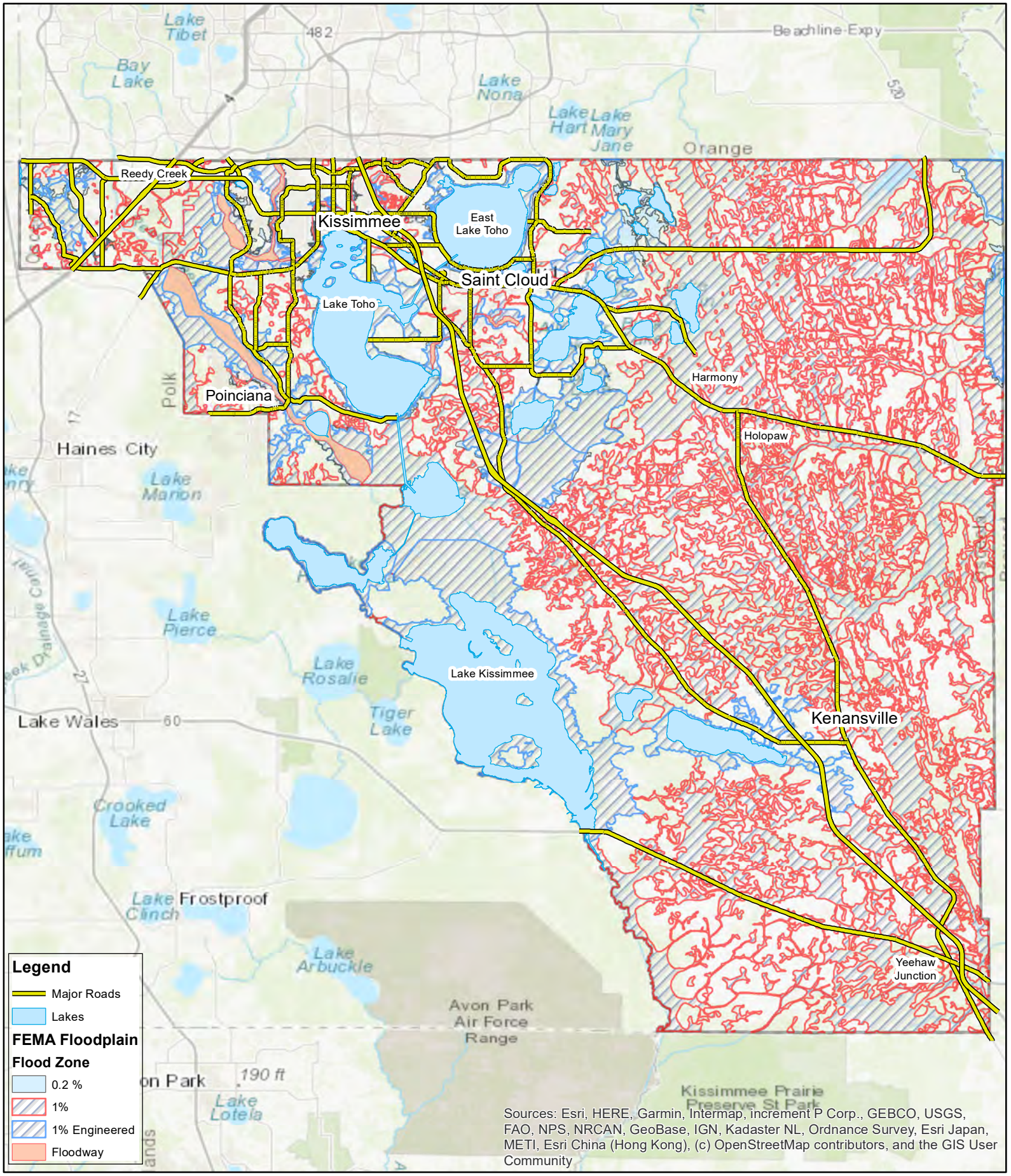

Celebration
Kissimmee
East Lake Tohopekaliga
Narcoossee
Lake Tohopekaliga
Saint Cloud
Harmony
Poinciana
Lake Gentry
Holopaw
Lake Cypress
Lake Kissimmee
Kenansville
HIRA 47
Legend
Special Needs
Urban Growth Boundary
Major Roads
Incorporated
Streams
Flood Zone
0.2 %
1%
1% Engineered
Floodway
Osceola County
Special Needs Clients
Flood Risk
0
2.25
4.5
9 Miles
June 2020
Richard A. Halquist, FPEM, CFM



Flood Alert Notification
Decision Criteria

HIRA 48

Flood Alert Notification Criteria
created in 2015 and updated
June 2020
Richard A. Halquist, FPEM, CFM



FEMA 1% Annual Flood Chance

Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
February 2020

HIRA 49

0 5 10 20 Miles

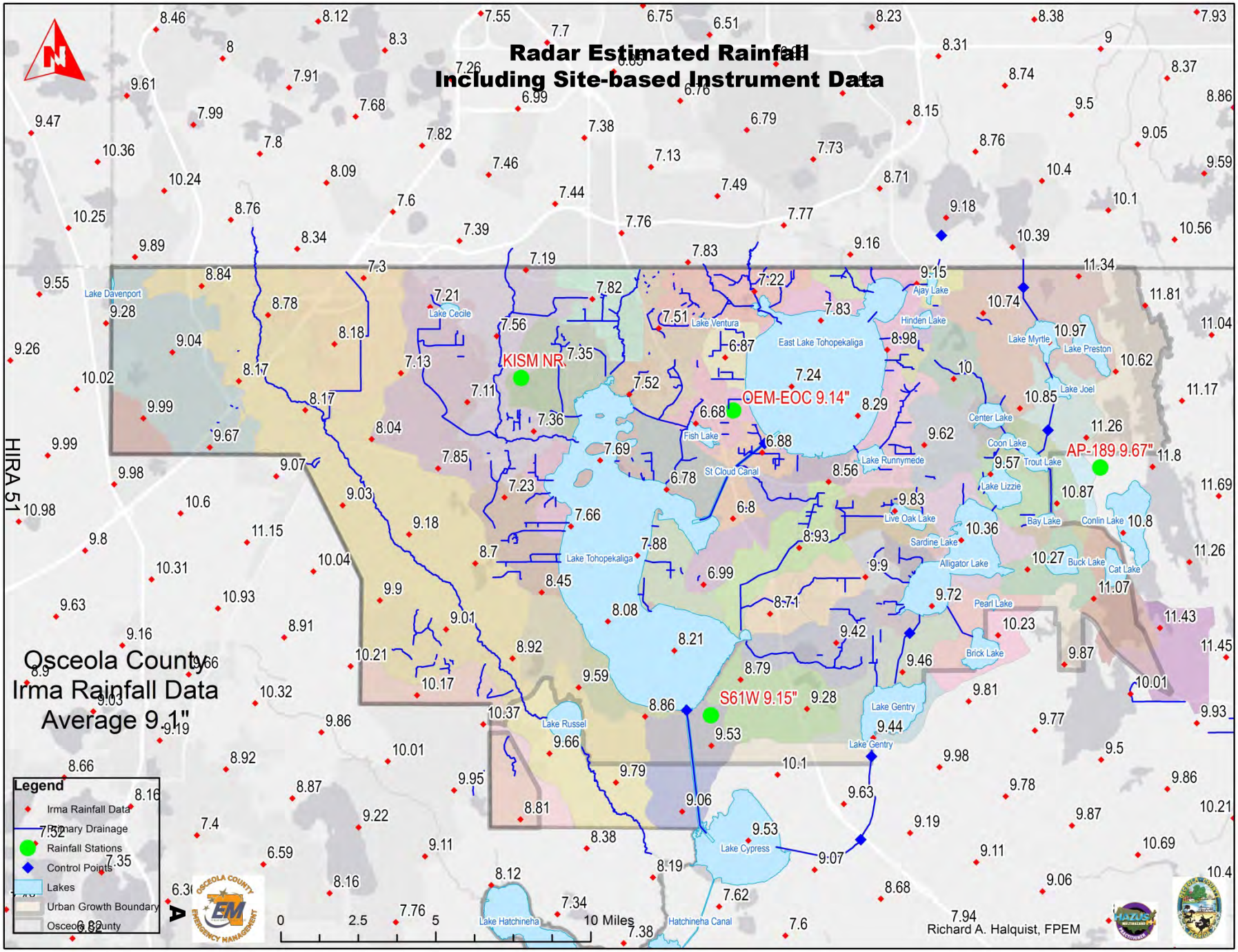
Case Study Summary for 2017 Good Samaritan Village Flood Event

The Good Samaritan Village is a private retirement complex located on Shingle Creek. The complex is a pre-FIRM mix of independent living structures including site-built and mobile/manufactured housing. There are two assisted-living and one skilled nursing facility on the property as well.

The community's electric power is provided by the Kissimmee Utility Authority with drinking water provided by TOHO Water Authority. Wastewater is managed on-site with an operational sewage treatment facility.

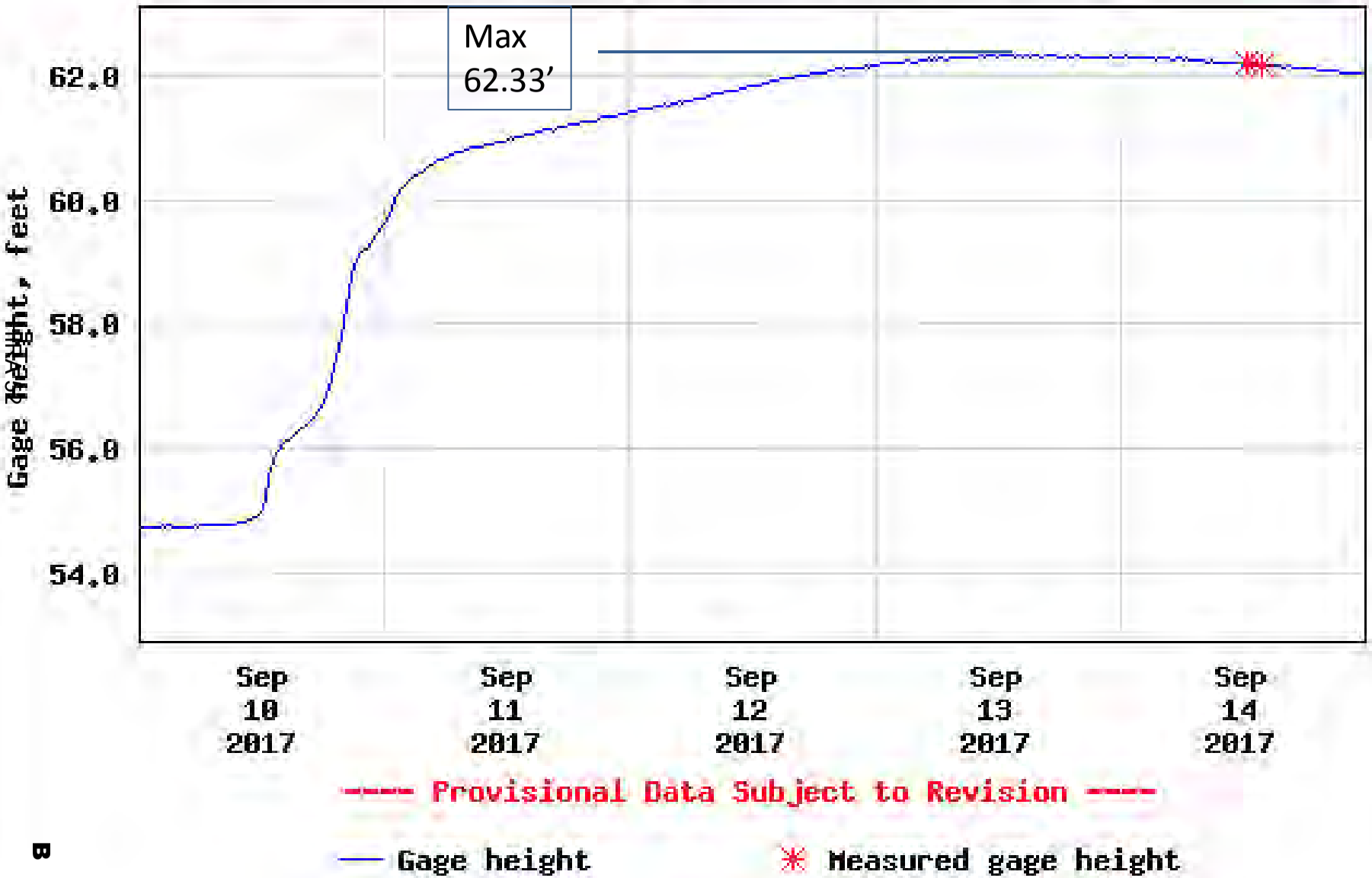
The following series of pages provides a snapshot of conditions resulting from Hurricane Irma in September 2017. The storm made initial impact on September 10th with cumulative rainfall into the 11th.

Contents

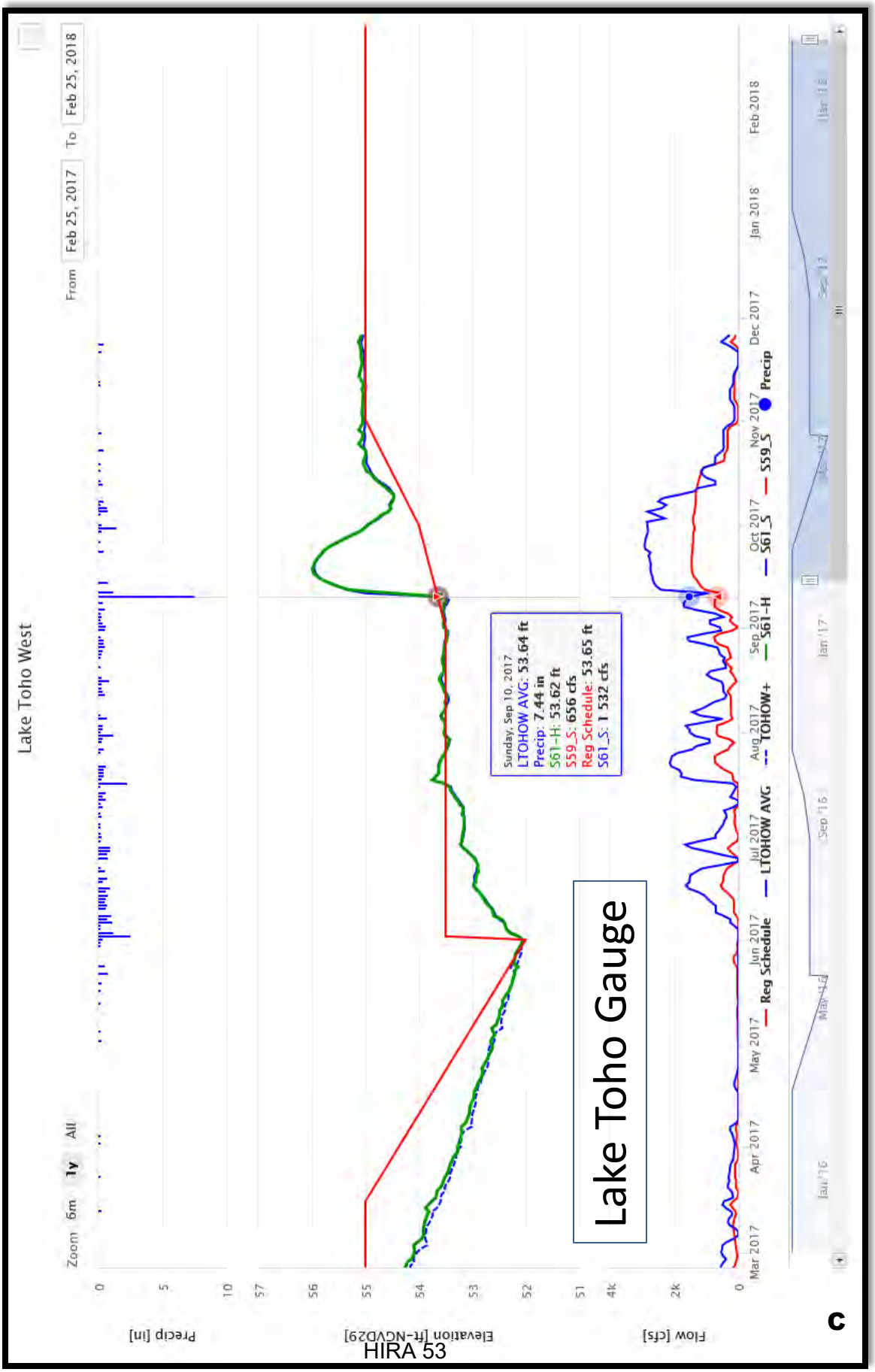

Radar Estimated Rainfall
Including Site-based Instrument Data
KISM NR
OEM-EOC 9.14"
AP-189 9.67"
S61W 9.15"
Osceola County
Irma Rainfall Data
Average 9.1"
HIRA 51
Legend
Irma Rainfall Data
Primary Drainage
Rainfall Stations
Control Points
Lakes
Urban Growth Boundary
Osceola County
0
2.5
5
10 Miles
Richard A. Halquist, FPEM
Lake Davenport
Lake Cecile
Lake Ventura
East Lake Tohopekaliga
Ajay Lake
Hinden Lake
Lake Myrtle
Lake Preston
Lake Joel
Center Lake
Coon Lake
Trout Lake
Lake Runnymede
St Cloud Canal
Fish Lake
Lake Lizzie
Live Oak Lake
Bay Lake
Conlin Lake
Sardine Lake
Alligator Lake
Buck Lake
Cat Lake
Pearl Lake
Brick Lake
Lake Gentry
Lake Tohopekaliga
Lake Russel
Lake Cypress
Lake Hatchineha
Hatchineha Canal

USGS

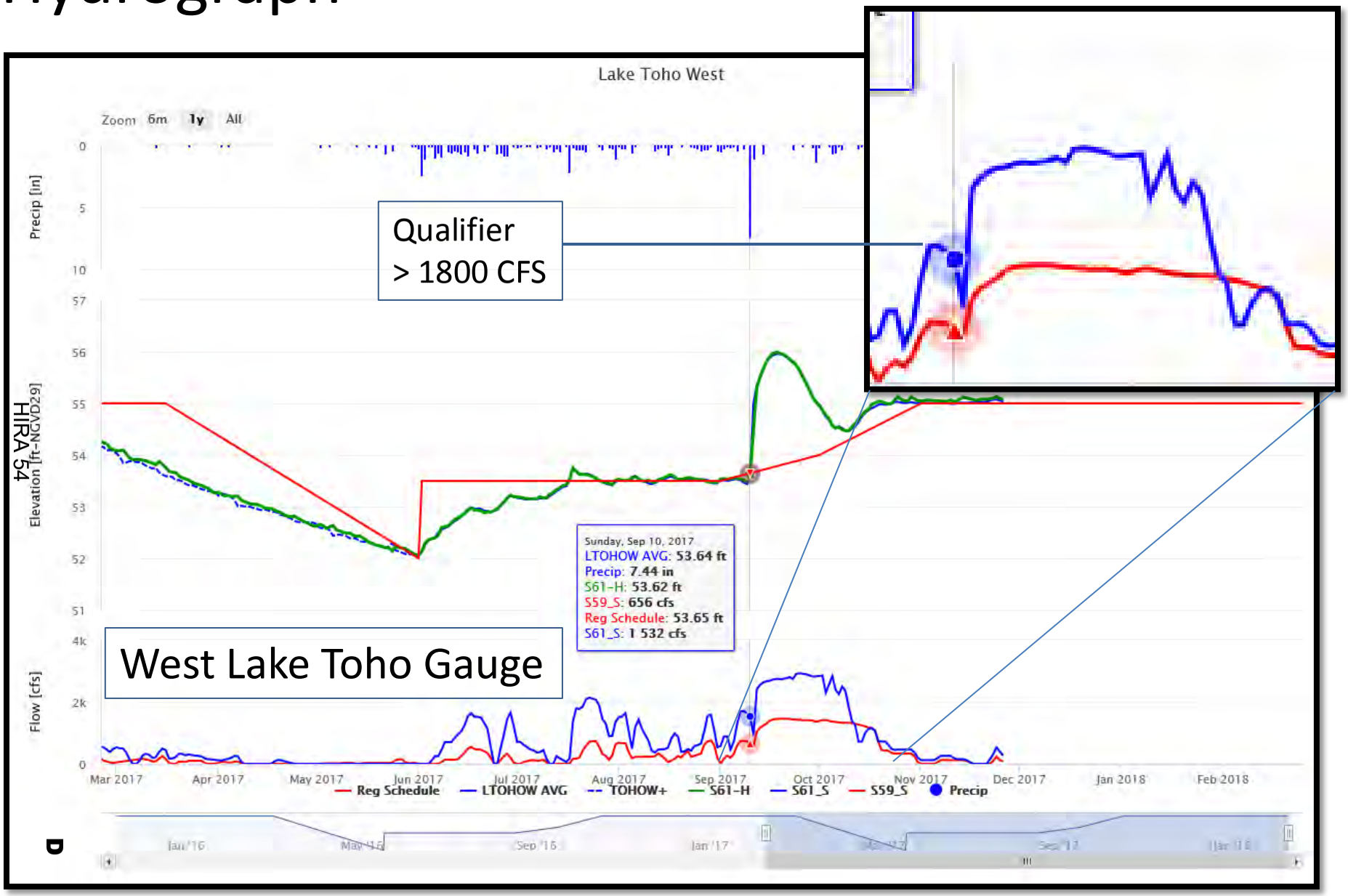
USGS 02264495 SHINGLE CREEK AT CAMPBELL, FL

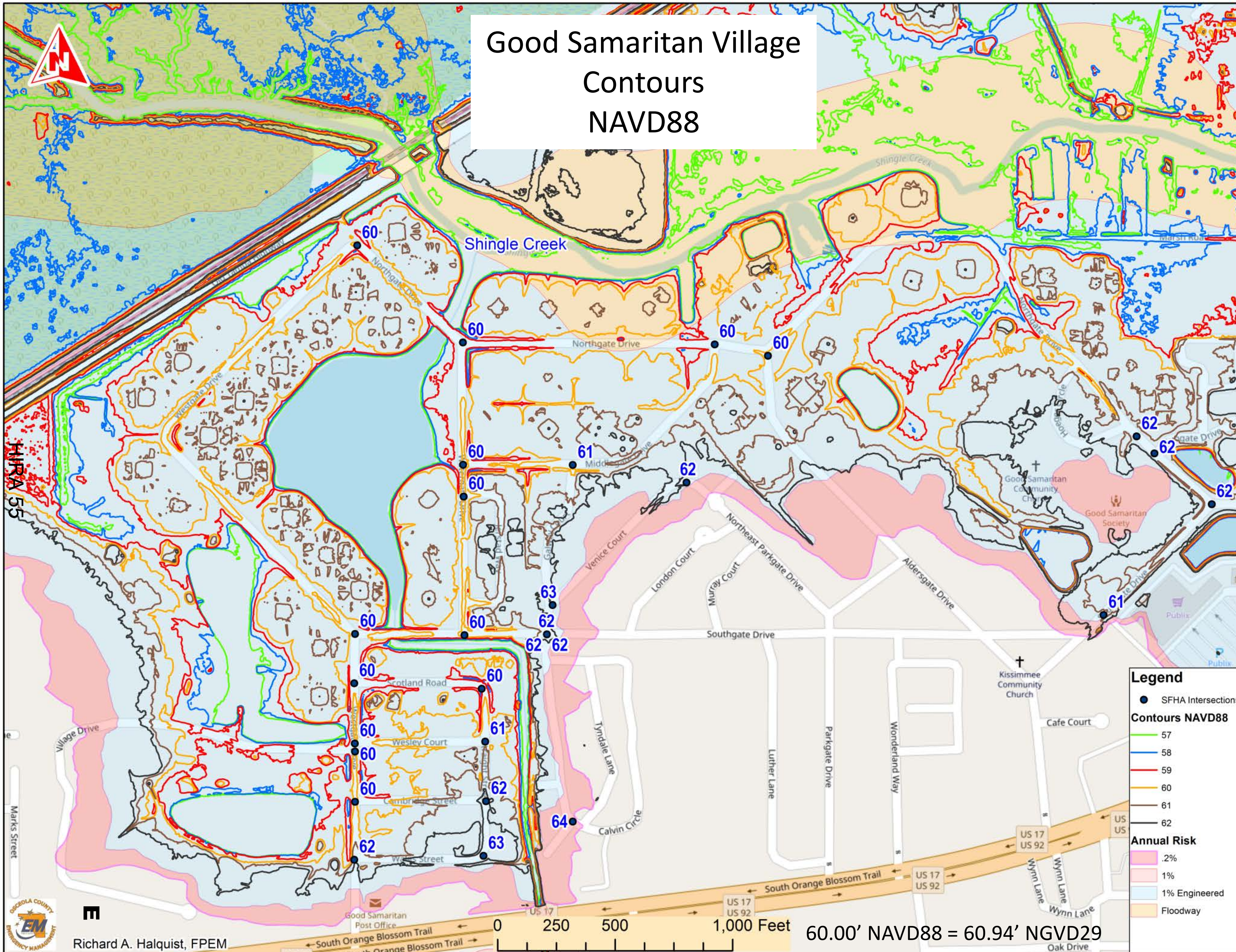


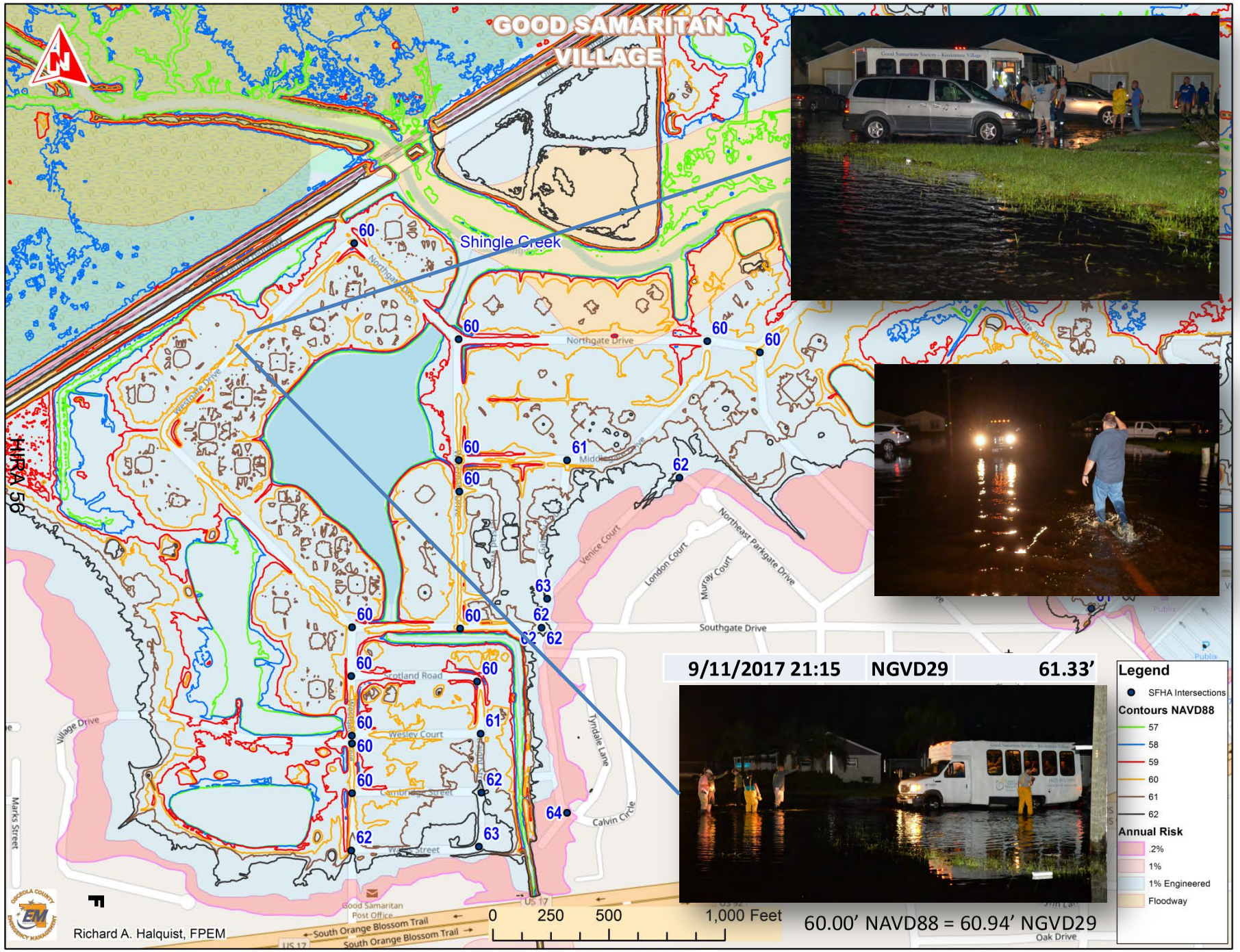
Hydrograph

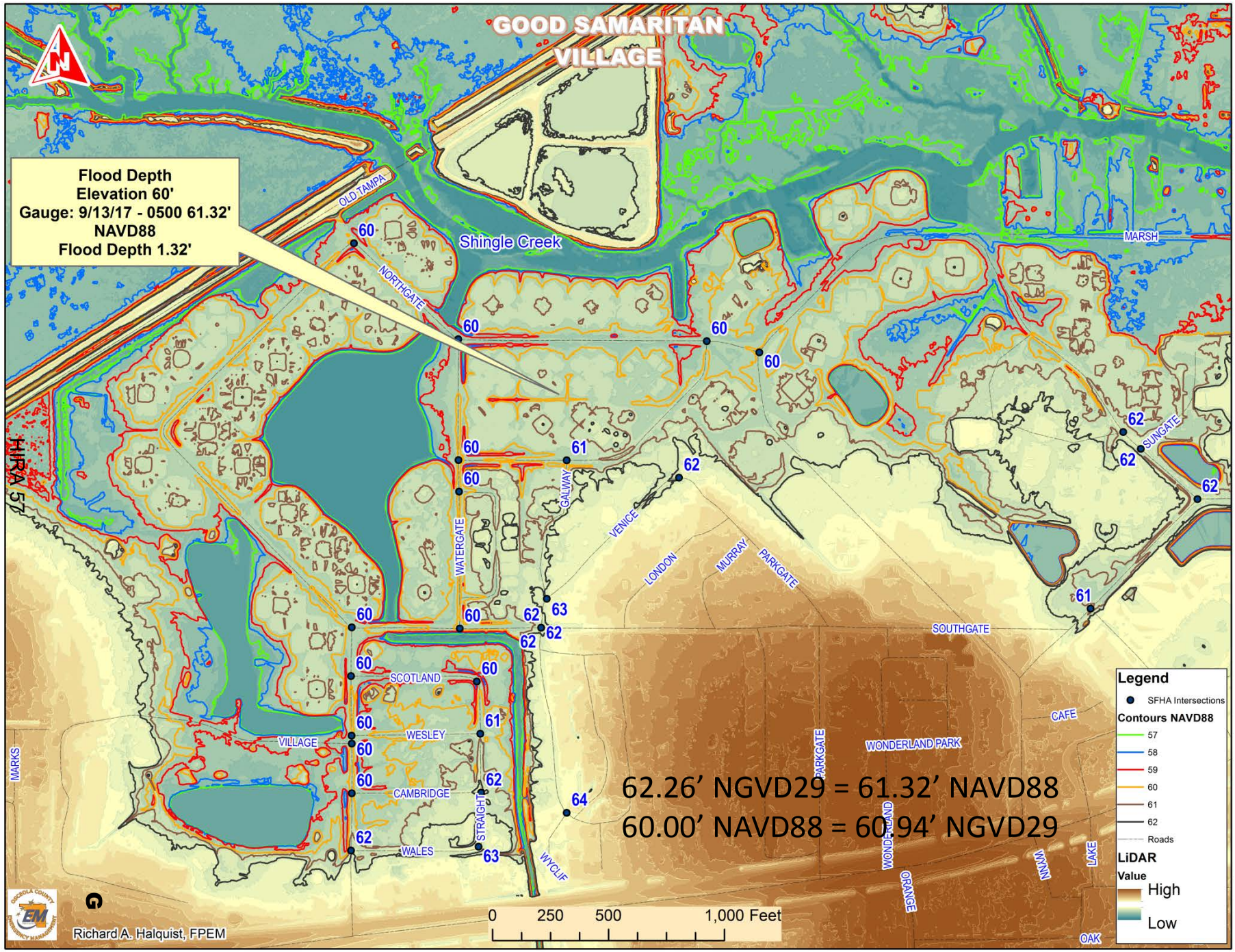

Lake Toho West
Zoom 6m 1y All
From Feb 25, 2017 To Feb 25, 2018
Precip [in]
Elevation [ft-NGVD29]
Flow [cfs]
Sunday, Sep 10, 2017
LTOHOW AVG: 53.64 ft
Precip: 7.44 in
S61-H: 53.62 ft
S59_S: 656 cfs
Reg Schedule: 53.65 ft
S61_S: 1 532 cfs
Reg Schedule
LTOHOW AVG
TOHOW+
S61-H
S61_S
S59_S
Precip
Lake Toho Gauge
c

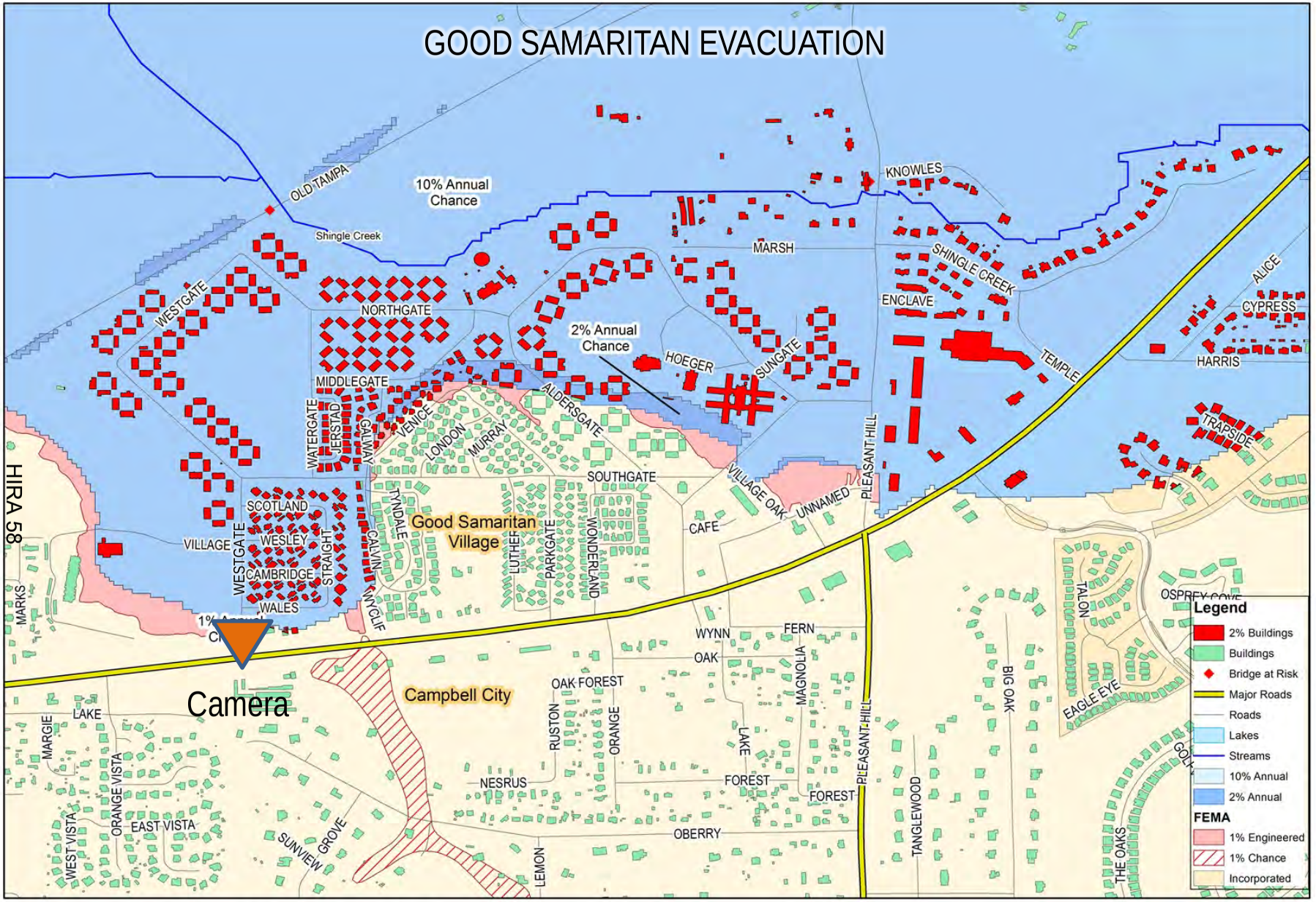
Hydrograph


Lake Toho West
Zoom 6m 1y All
Precip [in]
Elevation [ft-NGVD29]
HIRA 54
Flow [cfs]
Qualifier
> 1800 CFS
West Lake Toho Gauge
Sunday, Sep 10, 2017
LTOHOW AVG: 53.64 ft
Precip: 7.44 in
S61-H: 53.62 ft
S59_S: 656 cfs
Reg Schedule: 53.65 ft
S61_S: 1 532 cfs
Mar 2017
Apr 2017
May 2017
Jun 2017
Jul 2017
Aug 2017
Sep 2017
Oct 2017
Nov 2017
Dec 2017
Jan 2018
Feb 2018
Reg Schedule
LTOHOW AVG
TOHOW+
S61-H
S61_S
S59_S
Precip


Good Samaritan Village
Contours
NAVD88
Shingle Creek
Northgate Drive
Westgate Drive
Middlegate Drive
Scotland Road
Wesley Court
Cambridge Street
Wesley Street
Village Drive
Marks Street
Southgate Drive
Venice Court
London Court
Murray Court
Northeast Parkgate Drive
Aldersgate Drive
Tyndale Lane
Calvin Circle
Luther Lane
Parkgate Drive
Wonderland Way
Wynn Lane
Cafe Court
Oak Drive
Kissimmee Community Church
Good Samaritan Community Church
Good Samaritan Society
Good Samaritan Post Office
Publix
South Orange Blossom Trail
US 17
US 92
60
61
62
63
64
Legend
SFHA Intersections
Contours NAVD88
57
58
59
60
61
62
Annual Risk
.2%
1%
1% Engineered
Floodway
0
250
500
1,000 Feet
60.00’ NAVD88 = 60.94’ NGVD29
Richard A. Halquist, FPEM
Osceola County Emergency Management


GOOD SAMARITAN VILLAGE
Shingle Creek
Northgate Drive
Southgate Drive
Northeast Parkgate Drive
Venice Court
London Court
Murray Court
Scotland Road
Wesley Court
Cambridge Street
Tyndale Lane
Calvin Circle
Village Drive
Marks Street
Good Samaritan Post Office
South Orange Blossom Trail
US 17
Oak Drive
HURA 56
60
61
62
63
64
9/11/2017 21:15
NGVD29
61.33'
Legend
SFHA Intersections
Contours NAVD88
57
58
59
60
61
62
Annual Risk
.2%
1%
1% Engineered
Floodway
0
250
500
1,000 Feet
60.00' NAVD88 = 60.94' NGVD29
Richard A. Halquist, FPEM


GOOD SAMARITAN VILLAGE
Flood Depth
Elevation 60'
Gauge: 9/13/17 - 0500 61.32'
NAVD88
Flood Depth 1.32'
Shingle Creek
OLD TAMPA
NORTHGATE
MARSH
SUNGATE
WATERGATE
GALWAY
VENICE
LONDON
MURRAY
PARKGATE
SOUTHGATE
SCOTLAND
VILLAGE
WESLEY
CAMBRIDGE
WALES
STRAIGHT
WYCLIF
CAFE
WONDERLAND PARK
WONDERLAND
ORANGE
LAKE
OAK
MARKS
HIRA 57
62.26' NGVD29 = 61.32' NAVD88
60.00' NAVD88 = 60.94' NGVD29
Legend
SFHA Intersections
Contours NAVD88
57
58
59
60
61
62
Roads
LiDAR
Value
High
Low
0 250 500 1,000 Feet
Richard A. Halquist, FPEM



Good Samaritan Campbell City
Inundation
At Least 590 Buildings
2% Annual Chance

0 0.125 0.25 0.5 Miles

Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM
Update - October 2017


HIRA 59
WESTGATE DR
GOOD SAMARITAN
09/13/2017 1100
62.31’ NGVD29
Camera
Photo Credit
Andrew Sullivan

Mitigation Measures

This section provides mitigation measures for the impact of flooding. Mitigation measures are strategies focused on reducing the short and long-term impact from a disaster. Some of the mitigation measure ideas provided in this section references the guidance FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.

In Osceola County, lake level elevations are controlled to reduce flooding potential. Numerous flood protection measures and regulation schedules were developed by the U.S. Army Corps of Engineers (USACE) in the 1960's. The infrastructure and operation of the system is maintained by the South Florida Water Management District (SFWMD) under the direction of USACE. The SFWMD operations system regulates lake stages and water movement through the Kissimmee Chain of Lakes, Kissimmee River and Lake Okeechobee thereby providing mitigation measures to reduce the timing and impact of major flood event.

Osceola County also regulates development to reduce the flood risk potential. Stormwater systems are designed to accommodate the 10% (10 yr) 72hr storm event at minimum. In addition, compensating storage for impacts to the areas with a 1% annual change of flooding, Flood Zones A and AE, are required.

Incorporating Flood Mitigation in Local Planning

Comprehensive planning and floodplain management can mitigate flooding by influencing development. Strategies include:

- Determining and enforcing acceptable land uses to alleviate the risk of damage by limiting exposure in flood hazard areas.
- Floodplain and coastal zone management can be included in comprehensive planning.
- Developing a floodplain management plan and updating it regularly.
- Mitigating hazards during infrastructure planning. For example, decisions to extend roads or utilities to an area may increase exposure to flood hazards.
- Adopting a post-disaster recovery ordinance based on a plan to regulate repair activity, generally depending on property location.
- Passing and enforcing an ordinance that regulates dumping in streams and ditches.
- Establishing a "green infrastructure" program to link, manage, and expand existing parks, preserves, greenways, etc.
- Obtaining easements for planned and regulated public use of privately-owned land for temporary water retention and drainage.

Form Partnerships to Support Floodplain Management

Partnerships between local, state, and regional entities help expand resources and improve coordination. Consider the following actions:

- Developing a stormwater committee that meets regularly to discuss issues and recommend projects.
- Forming a regional watershed council to help bring together resources for comprehensive analysis, planning, decision-making, and cooperation.
- Establishing watershed-based planning initiatives to address the flood hazard with neighboring jurisdictions.
- Forming a citizen plan implementation steering committee to monitor progress on local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.

Limit or Restrict Development in the Floodplain

Flooding can be mitigated by limiting or restricting how development occurs in floodplain areas through actions such as:

- Prohibiting or limiting floodplain development through regulatory and/or incentive-based measures.
- Limiting the density of developments in the floodplain.
- Requiring that floodplains be kept as open space.
- Limiting the percentage of allowable impervious surface within developed parcels.
- Developing a stream buffer ordinance to protect water resources and limit flood impacts.
- Prohibiting any fill in floodplain areas.

Adopt and Enforce Building Codes and Development Standards

The use of building codes and development standards can ensure structures are able to withstand flooding. Potential actions include:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Adopting ASCE 24-05 Flood Resistant Design and Construction. ASCE 24 is a referenced standard in the IBC that specifies minimum requirements and expected performance for the design and construction of buildings and structures in the flood hazard areas to make them more resistant to flood loads and flood damage.
- Adding or increasing “freeboard” requirements (feet above base flood elevation) in the flood damage ordinance.
- Prohibiting all first floor enclosures below base flood elevation for all structures in flood hazard areas.
- Considering orientation of new development during design (e.g., subdivisions, buildings, infrastructure, etc.).
- Setting the design flood elevation at or above the historical high water mark if it is above the mapped base flood elevation.
- Using subdivision design standards to require elevation data collection during platting and to have buildable space on lots above the base flood elevation.
- Requiring standard tie-downs of propane tanks

Improve Stormwater Management Planning

Rainwater and snowmelt can cause flooding and erosion in developed areas. Stormwater management practices to prevent this include:

- Completing a stormwater drainage study for known problem areas.
- Preparing and adopting a stormwater drainage plan and ordinance.
- Preparing and adopting a community-wide stormwater management master plan.
- Regulating development in upland areas in order to reduce stormwater run-off through a stormwater ordinance.
- Linking flood hazard mitigation objectives with EPA Stormwater Phase II initiatives.
- Developing engineering guidelines for drainage from new development.
- Requiring a drainage study with new development.
- Encouraging the use of Low Impact Development techniques

Adopt Policies to Reduce Stormwater Runoff

In addition to stormwater management, techniques to reduce rain runoff can prevent flooding and erosion, such as:

- Designing a “natural runoff” or “zero discharge” policy for stormwater in subdivision design.
- Requiring more trees be preserved and planted in landscape designs to reduce the amount of stormwater runoff.
- Requiring developers to plan for on-site sediment retention.
- Requiring developers to construct on-site retention basins for excessive stormwater and as a firefighting water source.
- Encouraging the use of porous pavement, vegetative buffers, and islands in large parking areas.
- Conforming pavement to land contours so as not to provide easier avenues for stormwater run-off.
- Encouraging the use of permeable driveways and surfaces to reduce runoff and increase groundwater recharge.
- Adopting erosion and sedimentation control regulations for construction and farming.

Improve Flood Risk Assessment

Heighten awareness of flood risk with the following:

- Incorporating the procedures for tracking high water marks following a flood into emergency response plans.
- Conducting cumulative impact analyses for multiple development projects within the same watershed.
- Conducting a verification study of FEMA’s repetitive loss inventory and developing an associated tracking database.

- Regularly calculating and documenting the amount of flood-prone property preserved as open space.
- Requiring a thorough watershed analysis for all proposed dam or reservoir projects.
- Developing a dam failure study and emergency action plan.
- Using GIS to map areas that are at risk of flooding.
- Obtaining depth grid data and using it to illustrate flood risk to citizens.
- Incorporating digital floodplain and topographic data into GIS systems, in conjunction with Hazus, to assess risk.
- Developing and maintaining a database to track community exposure to flood risk.
- Revising and updating regulatory floodplain maps.

Improve Compliance with NFIP

The National Flood Insurance Program (NFIP) enables property owners in participating communities to purchase insurance protection against flood losses. Actions to achieve eligibility and maintain compliance include:

- Participate in NFIP.
- Adopt ordinances that exceed minimum Federal and state requirements to comply with NFIP.
- Conduct NFIP community workshops to provide information and incentives for property owners to acquire flood insurance.
- Designate a local floodplain manager and/or CRS coordinator who achieves CFM certification.
- Complete and maintain a FEMA elevation certificate database for pre-FIRM and post-FIRM buildings.
- Require and maintain FEMA elevation certificates for all new and improved buildings located in floodplains.

Manage the Floodplain beyond Minimum Requirements

In addition to participation in NFIP, implementing good floodplain management techniques that exceed minimum requirements can help minimize flood losses. Examples include:

- Incorporating the ASFPM's "No Adverse Impact" policy into local floodplain management programs.
- Revising the floodplain ordinance to incorporate cumulative substantial damage requirements.
- Adopting a "no-rise" in base flood elevation clause for the flood damage prevention ordinance.
- Extending the freeboard requirement past the mapped floodplain to include an equivalent land elevation.
- Including requirements in the local floodplain ordinance for homeowners to sign non-conversion agreements for areas below base flood elevation.
- Establishing and publicizing a user-friendly, publicly-accessible repository for inquirers to obtain Flood Insurance Rate Maps.
- Developing an educational flyer targeting NFIP policyholders on increased cost of compliance during post-flood damage assessments.
- Annually notifying the owners of repetitive loss properties of Flood Mitigation Assistance funding.
- Offering incentives for building above the required freeboard minimum (code plus).

Participate in and Improve the CRS

The Community Rating System (CRS) rewards communities that exceed the minimum NFIP requirements. Depending upon the level of participation, flood insurance premium rates are discounted for policyholders. Potential activities that are eligible to receive credit include:

- Advising the public about the local flood hazard, flood insurance, and flood protection measures.
- Enacting and enforcing regulations that exceed NFIP minimum standards so that more flood protection is provided for new development.
- Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainageways and retention basins.
- Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning.

Establish Local Funding Mechanisms for Flood Mitigation

Potential methods to develop local funding sources for flood mitigation include:

- Using taxes to support a regulatory system.
- Using impact fees to help fund public projects to mitigate impacts of land development (e.g., increased runoff).
- Levying taxes to finance maintenance of drainage systems and capital improvements.

Remove Existing Structures from Flood Hazard Areas

Communities may remove structures from flood-prone areas to minimize future flood losses by acquiring and demolishing or relocating structures from voluntary property owners and preserving lands subject to repetitive flooding.

Improve Stormwater Drainage System Capacity

Rainwater and snowmelt can cause flooding and erosion in developed areas. Structural stormwater management projects that prevent this include:

- Installing, re-routing, or increasing the capacity of a storm drainage system.
- Increasing drainage or absorption capacities with detention and retention basins, relief drains, spillways, drain widening/dredging or rerouting, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, or channel redirection.
- Increasing capacity of stormwater detention and retention basins.
- Increasing dimensions of drainage culverts in flood-prone areas.
- Using stream restoration to ensure adequate drainage and diversion of stormwater.
- Requiring developers to construct on-site retention basins for excessive stormwater and as a firefighting water source.
- Providing grassy swales along roadsides.

Conduct Regular Maintenance for Drainage Systems and Flood Control Structures

Regular maintenance will help drainage systems and flood control structures continue to function properly. Potential activities include:

- Performing regular drainage system maintenance, such as sediment and debris clearance, as well as detection and prevention of discharges into stormwater and sewer systems from home footing drains, downspouts, or sewer pumps.
- Implementing an inspection, maintenance, and enforcement program to help ensure continued structural integrity of dams and levees.
- Routinely cleaning debris from support bracing underneath low-lying bridges.
- Routinely cleaning and repairing stormwater drains.
- Regularly clearing sediment build-up on riverbanks near aerial lines.

- Inspecting bridges and identifying if any repairs or retrofits are needed to prevent scour.
- Incorporating ice jam prevention techniques as appropriate.

Elevate or Retrofit Structures and Utilities

Structures and utilities can be elevated to reduce flood damage, including:

- Elevating structures so that the lowest floor, including the basement, is raised above the base flood elevation.
- Raising utilities or other mechanical devices above expected flood levels.
- Elevating and anchoring manufactured homes or, preferably, keeping manufactured homes out of the floodplain.
- Relocating utilities and water heaters above base flood elevation and using tankless water heaters in limited spaces.

Floodproof Residential and Non-Residential Structures

Floodproofing techniques may protect certain structures from flood damage, including:

- Wet floodproofing in a basement, which may be preferable to attempting to keep water out completely because it allows for controlled flooding to balance exterior and interior wall forces and discourages structural collapse.
- Encouraging wet floodproofing of areas above base flood elevation.
- Using water resistant paints or other materials to allow for easy cleanup after floodwater exposure in accessory structures or in a garage area below an elevated residential structure.
- Dry floodproofing non-residential structures by strengthening walls, sealing openings, or using waterproof compounds or plastic sheeting on walls to keep water out.

Protect Infrastructure

Mitigation techniques can be implemented to help minimize losses to infrastructure from flood events, such as:

- Elevating roads and bridges above the base flood elevation to maintain dry access. In situations where flood waters tend to wash roads out, construction, reconstruction, or repair can include not only attention to drainage, but also stabilization or armoring of vulnerable shoulders or embankments.
- Raising low-lying bridges.
- Floodproofing wastewater treatment facilities located in flood hazard areas.
- Floodproofing water treatment facilities located in flood hazard areas.
- Depending on its infrastructure capabilities, using check valves, sump pumps, and backflow prevention devices in homes and buildings.
- ▪ Using bioengineered bank stabilization techniques.

Protect Critical/Essential Facilities

Techniques to protect critical facilities from flood events include:

- Requiring that all critical facilities including emergency operations centers (EOC), police stations, and fire department facilities be located outside of flood-prone areas.
- Requiring all critical facilities to meet requirements of Executive Order 11988 and be built 1 foot above the .2% (500 yr) flood elevation, if at all.
- Installing/upgrading stormwater pumping stations.
- Raising electrical components of sewage lift stations above base flood elevation.
- Raising manhole openings using concrete pillars.
- Installing watertight covers or inflow guards on sewer manholes.
- Installing flood telemetry systems in sewage lift stations.
- Installing back-up generators for pumping and lift stations in sanitary sewer systems along with other measures (e.g., alarms, meters, remote controls, and switchgear upgrades).
- Building earthen dikes around flood-threatened critical facilities.
- Using bioengineered bank stabilization techniques.

Construct Flood Control Measures

Small flood control structures can be built to prevent flood damage. Examples include:

- Using minor structural projects that are smaller and more localized (e.g., floodwalls or small berms) in areas that cannot be mitigated through non-structural activities or where structural activities are not feasible due to low densities.
- Using revetments (hardened materials placed atop existing riverbanks or slopes) to protect against floods.
- Using bioengineered bank stabilization techniques.

Protect and Restore Natural Flood Mitigation Features

Natural resources provide floodplain protection, riparian buffers, and other ecosystem services that mitigate flooding. It is important to preserve such functionality with the following:

- Protecting and enhancing landforms that serve as natural mitigation features (i.e., riverbanks, wetlands, dunes, etc.).
- Using vegetative management, such as vegetative buffers, around streams and water sources.
- Protecting and preserving wetlands to help prevent flooding in other areas.
- Establishing and managing riparian buffers along rivers and streams.
- Retaining natural vegetative beds in stormwater channels.
- Retaining thick vegetative cover on public lands flanking rivers.

Preserve Floodplains as Open Space

Preserving natural areas and vegetation benefits natural resources while also mitigating potential flood losses. Techniques include:

- Developing an open space acquisition, reuse, and preservation plan targeting hazard areas.
- Developing a land banking program for the preservation of the natural and beneficial functions of flood hazard areas.
- Using transfer of development rights to allow a developer to increase densities on another parcel that is not at risk in return for keeping floodplain areas vacant.
- Compensating an owner for partial rights, such as easement or development rights, to prevent a property from being developed.

Increase Awareness of Flood Risk and Safety

Ideas for increasing flood risk awareness include the following:

- Encouraging homeowners to purchase flood insurance.
- Annually distributing flood protection safety pamphlets or brochures to the owners of flood-prone property.
- Educating citizens about safety during flood conditions, including the dangers of driving on flooded roads.
- Using outreach programs to advise homeowners of risks to life, health, and safety.
- Offering GIS hazard mapping online for residents and design professionals.
- Establishing a Program for Public Information (PPI) with a PPI committee (as suggested by Activity 332 of the CRS Coordinator's Manual).

Educate Property Owners about Flood Mitigation Techniques

Educate property owners of options to mitigate their property from flooding through outreach activities. Below are some examples of how to implement this initiative.

- Using outreach activities to facilitate technical assistance programs that address measures that citizens can take or facilitate funding for mitigation measures.
- Encouraging homeowners to install backflow valves to prevent reverse-flow flood damages.
- Encouraging residents in flood hazards areas to elevate homes.
- Educating the public about securing debris, propane tanks, yard items, or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by flood waters.
- Asking residents to help keep storm drains clear of debris during storms (not relying on Public Works).

2020
Natural Hazard

Tornado

Risk and Vulnerability Rating: 37

TORNADO *(HIGH RATING: 37)*

A tornado is a violent and destructive rotating column of air usually exhibited as a funnel-shaped downward extension of a cumulonimbus cloud in contact with the ground. Tornadoes vary is shape and size, but are often visualized as a condensation funnel where the narrow end touches the earth and is frequently encircled by a debris cloud.

According to the National Weather Service, most Florida tornadoes have wind speeds between 40 mph and 110 mph, are approximately 250 feet across, and travel a short distance before dissipating. Some tornadoes can attain 300 mph winds, a mile in diameter, and stay on the ground for dozens of miles. The average duration of a tornado in the state of Florida is eight to fifteen minutes (NOAA's National Weather Service, Storm Prediction Center).

Hazard History

Since 1960, there are 40 reported tornadoes, ranging from EF0 – EF4, in Osceola County as demonstrated in the following table. While the majority of them are small, a few have been quite destructive. Most notable is the F3* 1998 tornado that killed 25 people and injured more than 145 when it struck northern Osceola County. Osceola County still holds the record of most tornado deaths in the State of Florida from the '98 event. No significant tornadoes have occurred since our last plan update (2015).

The Osceola County '98 tornado track extended from just south of the Campbell City area and travelled northeast with various touchdown points along the way. The tornado remained on the ground through Orange County to the north and into Brevard County to the north and east.

On the path, the tornado destroyed critical infrastructure including a fiber optic line tying two Public Safety Answering Points (PSAPs) and the Prime radio tower site. This effectively cut countywide public safety communications capability to limited mobile and portable radio traffic. Aerial electric utilities and telecommunications from several providers were also demolished.

The tornado destroyed many stores, restaurants and businesses with the largest concentration of fatalities occurring in the Ponderosa Campground, a travel trailer and camping site. Just to the northeast of this location, a subdivision known as Lakeside, received significant residential structural damage and many injuries. An interesting fact about the '98 tornado path is that it followed fairly close to a January 1973 tornado of similar strength. That tornado produced a similar amount of damage, but no reported fatalities.

Date	Fujita	Fatalities	Injuries	Path Width (Yards)	Path Length (Miles)	Damage
1960-06-08	1	0	1	10	0.1	$500-$5k
1961-04-12	1	0	1	100	14.6	$5k-$50k
1966-04-04	4	11*	530	300	135.8	$5M-$50M
1966-04-04	2	0	0	150	123.3	$50K-$500K
1971-06-28	0	0	0	50	0.3	< $50
1971-08-24	1	0	0	50	0.3	< $50
1973-01-28	2	0	7	100	14	$500K-$5M
1975-04-15	0	0	0	23	0.1	$50-$500
1975-04-15	0	0	0	23	0.1	-
1975-05-14	1	0	0	70	14.3	$5K-$50K
1976-05-13	0	0	0	10	0.1	$5K-$50K
1977-01-10	1	0	0	23	0.2	$50K-$500K
1977-02-24	0	0	0	10	0.3	$5K-$50K
1978-05-04	0	0	1	13	0.1	$50K-$500K
1981-03-19	2	0	11	50	5.4	$5M-$50M
1983-03-24	2	0	0	90	18	$50K-$500K
1983-03-24	1	0	0	80	21	$5M-$50M
1987-09-01	1	0	3	30	1	$50K-$500K
1995-08-02	1	0	0	40	0.3	$50K-$500K
1996-04-30	0	0	0	30	2	$50K-$500K
1997-07-04	1	0	0	40	0.50.5	$1M
1997-07-05	0	0	0	80	0.1	$200K
1997-07-11	0	0	0	30	0.3	$2K
1997-12-27	1	0	0	80	0.4	-
1998-02-22	3	25	150	250	28	$5.5M
1998-03-09	0	0	0	50	0.2	$70K
2001-06-03	0	0	0	30	0.5	-
2004-08-13	0	0	0	30	0.2	-
2004-08-13	1	0	0	200	2	-
2004-08-13	1	0	0	3000	2	-
2004-09-04	0	0	0	20	0.1	-
2006-08-30	0	0	0	30	0.2	-
2006-08-30	0	0	0	30	0.2	-
2008-11-30	0	0	0	20	0.09	-
2012-06-24	0	0	0	100	3.08	-
2012-06-24	0	0	0	50	1.15	-
2012-08-27	0	0	0	30	0.83	$15,000
2016-07-08	0	0	0	30	.25	
2017-06-14	0	0	0	10	.01	
2017-07-07	0	0	0	25	.69	$2000

Source: *http://www.spc.noaa.gov/wcm/#data* **Fatalities occurred outside Osceola County*

*The Fujita scale is the former damage scale use for tornadoes. Enhanced Fujita is currently used.

Vulnerability Analysis

Osceola County has warm unstable air increasing vulnerability to tornado activity. Geographically, Osceola County lies just to the east of an imaginary state centerline and since Florida is a peninsular state, sea-breezes form regularly pushing inland, colliding in Osceola County creating a rich thunderstorm environment.

As illustrated in the previous table, historically, the majority of tornado activity occurs between the months of February through August. Topography and climate are the principle factors contributing to the vulnerability of the community. Tornadoes form suddenly and exact location of formation is quite difficult to predict. Refer to the historic map of Notable Tornado Tracks later in the section.

The entire County and its cities are vulnerable to tornado activity. Since most of the tornadoes are small and short-lived, little damage and even mention occurs. The difference in a normal, summer afternoon EF-0 tornado and those that occur during the winter and early spring is size, duration and intensity.

Tornadoes forming during the winter and spring seasons are borne of the mesocyclone or supercell thunderstorm. These storms form along a line or frontal boundary with warm moist air to the south and cooler air to the north. Because of the differences in climatic conditions and rapid convection ahead of the line, shear arises causing constant thunderstorm rotation. The magnitude of the typical local mesocyclone spawned tornado can easily reach EF-3 or EF-4 and it is these tornadoes that are very deadly and destructive.

Impacts to the Population

A tornado impact can be devastating. One tornado can level an entire community. In addition to property loss/damage, historically, tornadoes have taken the lives of Osceola County residents. Populations residing in modular, manufactured or mobile homes are at higher impact risk, as these structures are very susceptible to tornado damage. Since manufactured housing provides less shelter capability than a site built home, people dwelling in them should seek alternative shelter during a tornado watch and warning.

On average, Osceola County receives approximately 5 million tourist visitors annually. Many of these people are not aware of the dangers of tornadoes; subsequently, they are unaware of what to do during a tornado watch or warning. This fact increases impact vulnerability.

Unlike other hazards, tornado impact is sporadic, sometimes leveling a building while not leaving a mark on the building next door. The directional track of a tornado is also unpredictable, but the fact remains that tornadoes are capable of destroying everything in its path.

While tornado prediction science is getting better all time, tornadoes still occur with little warning. This makes public warning and notifications challenging and even in well-advanced warnings; the public must take action for safe sheltering.

When tornadoes strike, depending on the resulting damage, shelter may be required. The American Red Cross and other local organizations may open a shelter or provide alternative living arrangements for displaced residents. Along with the need for shelters comes the increased secondary hazard including:

- Chainsaw accidents
- Downed power lines
- Structural instability and collapse
- Generator use

Impacts to the Built Environment

Tornadoes are especially destructive to above ground structures. Power lines can disconnect or fall down, blocking roadways and becoming a danger to the public. Damaged infrastructure, including roadways, bridges, and downed power lines pose a strain on emergency response services.

Buildings not destroyed by a tornado may still have extensive damage not particularly visible. Damage to the building envelop may allow for water intrusion as well as gas leakage. Should a gas leak occur, there is a high risk of building explosion and fire, while water intrusion can lead to future mold and insect infestation.

Impact to Critical Facilities

All critical facilities and infrastructure are vulnerable to tornadoes. Critical facilities are structures that provide an essential function or service for survival, continuation of public safety/service actions, and disaster recovery. Critical infrastructure is those community features providing specific service such as roadways, bridges and electrical distribution.

An abstract listing of the County's critical facilities is located in Appendix G. Osceola County considers critical facilities, in a single list, as protected information and are not listed within this document. The reader may obtain a current copy by contacting the Office of Emergency Management.

Economic Impacts

Tornadoes are destructive to property and infrastructure, posing an initial strain on emergency response staff and equipment. First responders may receive overtime pay, contributing to financial losses. Damaged bridges and roadways delay emergency response and cleanup efforts. Depending on the severity of the damage, businesses may be slow getting back up and running. Alternate methods of operations may need to occur, further slowing processes. On average, damage expenses for Osceola County are between $50,000 and $500,000 for a tornado event.

Environment Impacts

Tornadoes are devastating to the natural environment, impacting everything in its path, including vegetation, wildlife, water bodies and the natural landscape. Minor tornadoes can uproot vegetation and toss it around the area. This type of debris can be deadly to both animals and humans.

Duration

The life cycle of a tornado can last a little as a few minutes up to an hour or more. Tornadoes may touchdown and lift off the ground several times during its life. Even though the event is short lived, it is possible the affect will last for years.

Intensity

Tornadoes typically form in unusually violent thunderstorms when sufficient instability and wind shear are present in the lower atmosphere. Temperature, humidity and atmospheric instability contribute to the development of thunderstorm formation that can lead to tornado activity.

The Fujita and the Enhanced Fujita scales are used to rate tornadoes based on the amount of damage they produce. The Enhance Fujita scale is a revised version of the original Fujita scale, including engineered wind estimates and more specific damage descriptions. Both the Fujita and Enhanced Fujita scales use the same numerical rating (0-5). A '0' on the Enhanced Fujita scale (denoted at EF0) is a tornado that produces very little damage. A '5' on the Enhanced Fujita scale is a tornado that produces significant amount of damage.

Enhanced Fujita Scale damage and Wind Speed Estimates

EF Rating	Wind Speed	Expected Damage
EF-0	65-85 mph	**'Minor' damage:** shingles, gutters, tree branches.
EF-1	86-110 mph	**'Moderate' damage:** roof, broken windows, exterior doors, overturned mobile homes.
EF-2	111-135 mph	**'Considerable' damage:** roofs torn off, mobile homes destroyed, trees uprooted, cars tossed.
EF-3	136-165 mph	**'Severe' damage:** homes destroyed, buildings damaged, homes with weak foundations can be blown away.
EF-4	166-200 mph	**'Extreme' damage:** homes leveled, cars thrown, top story exterior walls of masonry buildings likely to collapse.
EF-5	>200 mph	**'Massive' damage:** homes swept away, high-rise buildings severely damaged, steel-reinforced concrete structures damaged, trees snapped.

The TORRO (Tornado and Storm Research Organization) scale is another method of rating the severity of tornados. The TORRO scale ranges from a T0 for extremely weak tornadoes to T11 for the most powerful known tornadoes.

Predictability

Tornadoes, by their nature provide very little warning time. Historically, eyewitnesses detect and report tornadoes. While the eyewitness is the most reliable source, the majority of residents in Osceola County live within the Urban Growth Boundary, comprising only 34% of the County area. As a result, the majority of the county land is unobserved. Fortunately, today's weather service meteorologists can accurately predict

and track potential tornadic storms, effectively increasing warning time. While it is still difficult to predict where and when a tornado will strike, forecasters are able to notify the public in dangerous conditions to prepare for tornado activity.

Risk Assessment

Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood of a tornado to result in adverse conditions that would cause injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated to determine the level of risk tornadoes have on Osceola County.

Tornadoes (Rating: 37)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence	5						
Capacity to cause damage		4					
Geographic Impact				2			
Speed of onset (warning time)				2			
Percent of population affected				2			
Potential for causing casualties				2			
Potential for causing negative economic impact				2			
Duration of event				2			
Seasonal pattern			3				
Environmental impact			3				
Predictability of hazard			3				
Impact mitigation potential (reverse rating)			3				
Warning system capability			3				
Corollary effects					1		
TOTAL	5	4	15	12	1	37	**=37**

Based on historical evidence, tornado activity occurs frequently and has a high capacity to cause damage. Since 80% percent of the county is undeveloped, the probability of affecting populated areas is lower than those areas less developed.

Given specific predictability difficulties, emergency management planners must assume a greater risk of tornado impact based on population and built density. Not that tornadoes are more deadly, or damaging in these areas, but simply that there is more to impact.

The actual duration of a tornado event is short on average; a tornado only requires minutes to cause catastrophic damage. Tornadoes do offer a seasonal pattern, typically between the months of March and August. The natural environment is not as impacted by a tornado event as much as the built environment; although, vegetation can uproot, trees snapped and agricultural crops destroyed.

Tornado mitigation activity can be difficult for the general citizenry, except to educate them on how to prepare themselves and property before an event. Since warning

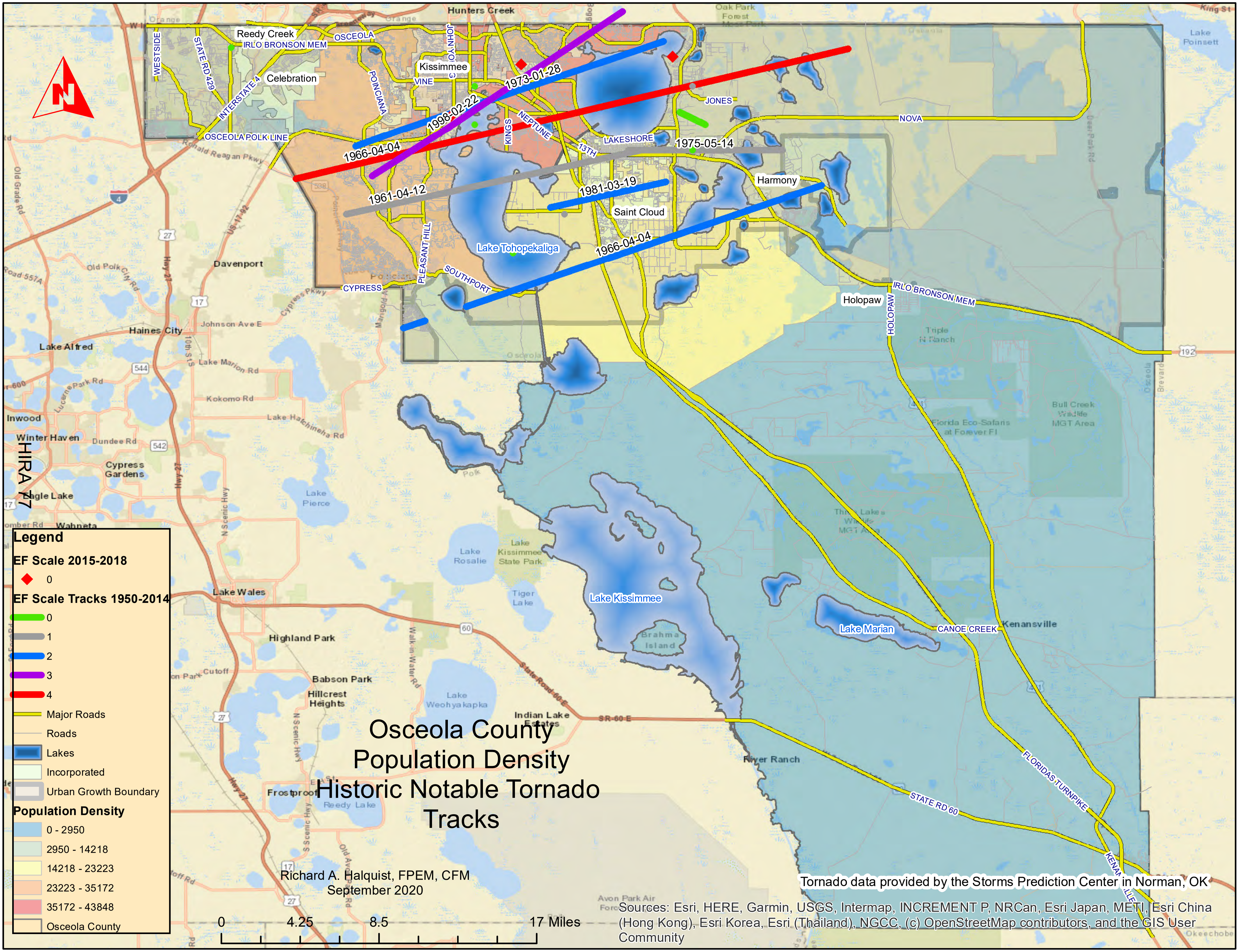
systems play such an important part, providing information on available warning systems is paramount. Additionally, teaching people to take action following a warning may help mitigate the threat. The County may also use the mass notification system providing immediate warning to the public in anticipation of tornado activity. This would only occur if conditions were highly favorable and the expected event was a potential tornado outbreak.

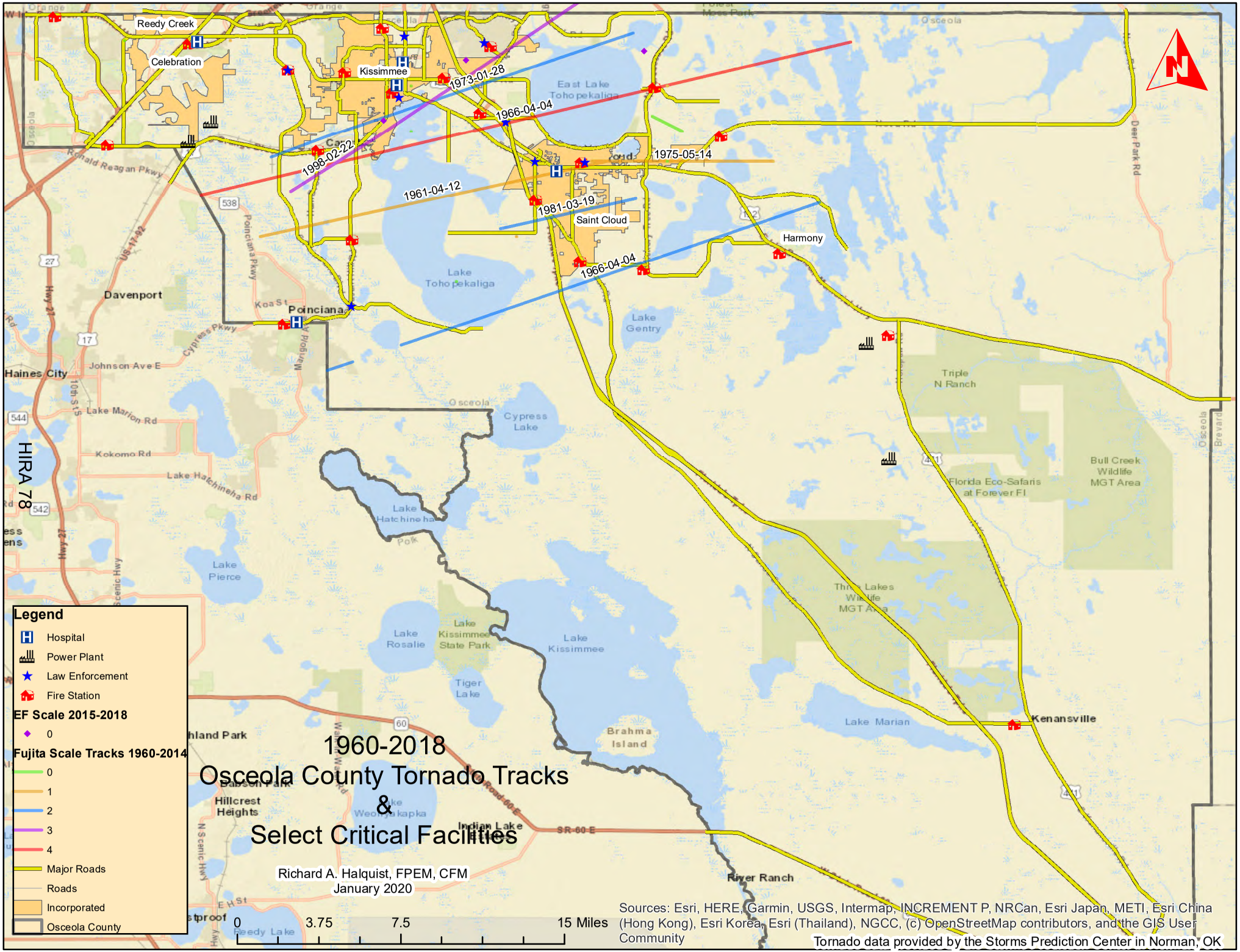
Geographical Impact Resource Maps

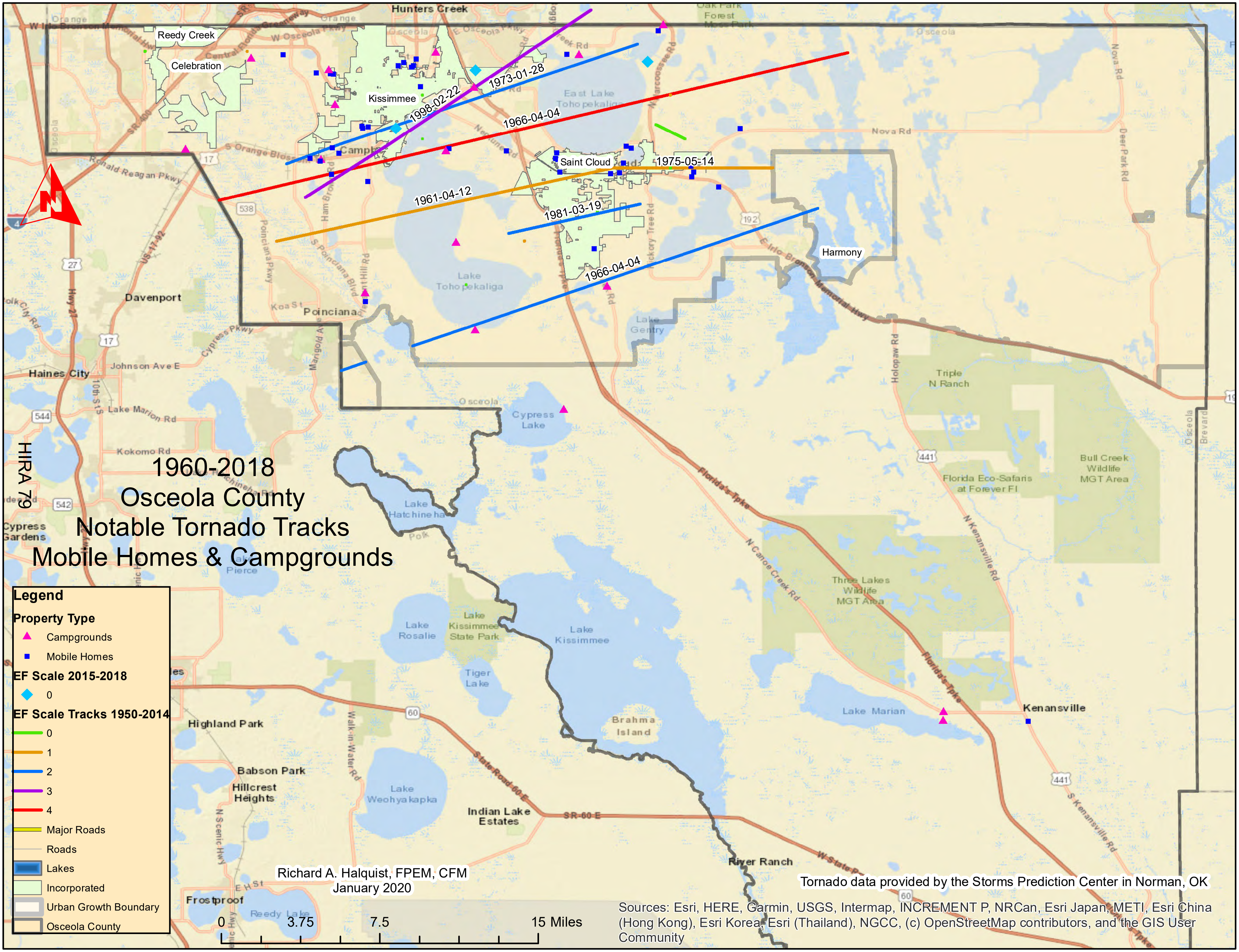
Tornadoes can occur anywhere in the represented jurisdictions. There is; however, a notable pattern in the large-scale winter tornado track pattern. While we cannot use this as a predictor, we can observe a consistent west to east direction of travel.

The following resource maps include:

- Population Density & Tornado Tracks
- Urban Growth Boundary with Select Critical Facilities & Tornado Tracks
- Mobile Home Parks and Notable Tornado Tracks


Osceola County
Population Density
Historic Notable Tornado
Tracks
Legend
EF Scale 2015-2018
0
EF Scale Tracks 1950-2014
0
1
2
3
4
Major Roads
Roads
Lakes
Incorporated
Urban Growth Boundary
Population Density
0 - 2950
2950 - 14218
14218 - 23223
23223 - 35172
35172 - 43848
Osceola County
1973-01-28
1998-02-22
1966-04-04
1961-04-12
1981-03-19
1975-05-14
1966-04-04
Kissimmee
Celebration
Reedy Creek
Saint Cloud
Harmony
Holopaw
Kenansville
Lake Tohopekaliga
Lake Kissimmee
Lake Marian
0
4.25
8.5
17 Miles
Richard A. Halquist, FPEM, CFM
September 2020
Tornado data provided by the Storms Prediction Center in Norman, OK
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community


Reedy Creek
Celebration
Kissimmee
Saint Cloud
Harmony
Davenport
Poinciana
Haines City
Kenansville
1973-01-28
1966-04-04
1998-02-22
1975-05-14
1961-04-12
1981-03-19
1966-04-04
East Lake Tohopekaliga
Lake Tohopekaliga
Lake Gentry
Cypress Lake
Lake Hatchineha
Lake Pierce
Lake Rosalie
Lake Kissimmee State Park
Lake Kissimmee
Tiger Lake
Brahma Island
Lake Marian
Triple N Ranch
Florida Eco-Safaris at Forever Fl
Bull Creek Wildlife MGT Area
Three Lakes Wildlife MGT Area
Hillcrest Heights
Indian Lake Estates
River Ranch
Ronald Reagan Pkwy
Poinciana Pkwy
Cypress Pkwy
Lake Marion Rd
Kokomo Rd
Lake Hatchineha Rd
Johnson Ave E
Deer Park Rd
SR-60-E
HIRA 78
Legend
Hospital
Power Plant
Law Enforcement
Fire Station
EF Scale 2015-2018
0
Fujita Scale Tracks 1960-2014
0
1
2
3
4
Major Roads
Roads
Incorporated
Osceola County
1960-2018
Osceola County Tornado Tracks
&
Select Critical Facilities
Richard A. Halquist, FPEM, CFM
January 2020
0
3.75
7.5
15 Miles
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Tornado data provided by the Storms Prediction Center in Norman, OK


1960-2018
Osceola County
Notable Tornado Tracks
Mobile Homes & Campgrounds
Legend
Property Type
Campgrounds
Mobile Homes
EF Scale 2015-2018
0
EF Scale Tracks 1950-2014
0
1
2
3
4
Major Roads
Roads
Lakes
Incorporated
Urban Growth Boundary
Osceola County
1973-01-28
1998-02-22
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1966-04-04
Kissimmee
Saint Cloud
Celebration
Reedy Creek
Harmony
Kenansville
Hunters Creek
Poinciana
Davenport
Haines City
East Lake Tohopekaliga
Lake Tohopekaliga
Lake Kissimmee
Lake Hatchineha
Cypress Lake
Lake Marian
Lake Gentry
Lake Rosalie
Tiger Lake
Lake Weohyakapka
Lake Kissimmee State Park
Brahma Island
Three Lakes Wildlife MGT Area
Bull Creek Wildlife MGT Area
Triple N Ranch
Florida Eco-Safaris at Forever Fl
Indian Lake Estates
River Ranch
Highland Park
Babson Park
Hillcrest Heights
Frostproof
Cypress Gardens
Nova Rd
Deer Park Rd
Holopaw Rd
N Kenansville Rd
S Kenansville Rd
N Canoe Creek Rd
Florida's Tpke
State Road 60 E
SR-60 E
Walk-in-Water Rd
Ronald Reagan Pkwy
Poinciana Pkwy
Cypress Pkwy
Johnson Ave E
Lake Marion Rd
Kokomo Rd
HIRA 79
0
3.75
7.5
15 Miles
Richard A. Halquist, FPEM, CFM
January 2020
Tornado data provided by the Storms Prediction Center in Norman, OK
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Mitigation Measures

This section provides mitigation measures for the impact of tornado activity. Some of the mitigation measure ideas provided in this section references the guidance FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.

Encourage Construction of Safe Rooms

Promote the construction and use of safe rooms by:

- Requiring construction of safe rooms in new schools, campgrounds, daycares, and nursing homes.
- Encouraging the construction and use of safe rooms in homes and shelter areas of manufactured home parks, fairgrounds, shopping malls, or other vulnerable public structures.
- Encouraging builders and homeowners to locate tornado safe rooms inside or directly adjacent to houses to prevent injuries due to flying debris or hail.
- Developing a local grant program to assist homeowners who wish to construct a new safe room.

Require Wind-Resistant Building Techniques

Require or encourage wind engineering measures and construction techniques that may include the following:

- Structural bracing
- Straps and clips
- Anchor bolts
- Laminated or impact-resistant glass
- Reinforced pedestrian and garage doors
- Window shutters
- Waterproof adhesive sealing strips
- Interlocking roof shingles
- Improve the selection of building materials so that wind-resistant materials are more readily available to the public
- Bury electrical and communications lines

Conduct Tornado Awareness Activities

Conduct outreach activities to increase awareness of tornado risk. Activities could include the following:

- Educating citizens through media outlets.
- Conducting tornado drills in schools and public buildings.
- Teaching school children about the dangers of tornadoes and how to take safety precautions.
- Supporting severe weather awareness week.
- Promoting use of National Oceanic and Atmospheric Administration (NOAA) weather radios.

2020

Natural Hazard

Wildfire

Risk and Vulnerability Rating: 37

WILDFIRE *(HIGH RATING: 37)*

A wildfire is an uncontrolled, rapidly spreading fire in grasslands, brush-lands, or forested areas. Wildfires occur as a result of either natural phenomenon such as climate, vegetation, lightning or human activities. Wildfires are more prone to occur between November and April, when cool cold fronts are prominent, bringing in cold dry air.

There are three basic types of wildfire – surface, crown and bog or muck fires. Each type brings different challenges in managing as well as the produced threat. This assessment provides a general overview and does not deal specifically with each type individually. The exception is that bog or muck fires may burn for years, generally ending when a drought period is over.

Eighty percent of Osceola County's landscape is rural, undeveloped and covered by natural vegetation. Wildfires are increasingly more dangerous over recent years due to an increase in development in and around the urban interface. The urban interface is defined as the area where the built environment meets lands prone to wildfire.

Hazard History

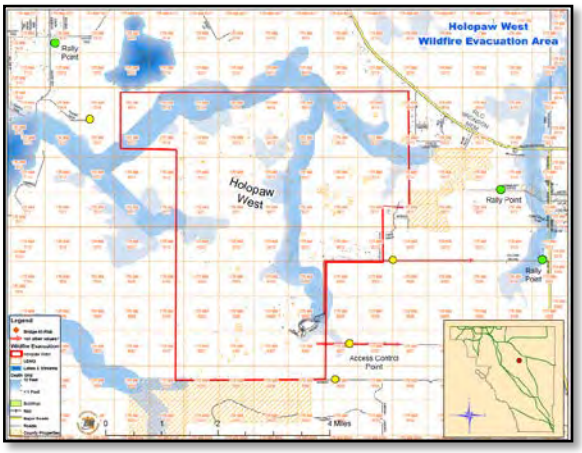
On average, Osceola County has 71 ignitions every year with a total of 2,560 since 1980. According to Florida Department of Agriculture and Consumer Services historical data, human caused activities is the largest contributor to wildfire events, comprising approximately 35%. Lightning strikes are the second greatest contributor at 24%. The table below provides historical data of wildfires in Osceola County.

Cause	*Fires*	*Percent*	*Acres*
Campfire	38	1.48	1,933.7
Children	76	2.97	335.8
Debris Burn*	280	10.94	17,418.6
Debris Burn--Auth--Broadcast/Acreage	23	0.90	5,460.3
Debris Burn--Auth--Piles	9	0.35	62.3
Debris Burn--Auth--Yard Trash	3	0.12	7.0
Debris Burn--Nonauth--Broadcast/Acreage	12	0.47	885.4
Debris Burn--Nonauth--Piles	24	0.94	81.6
Debris Burn--Nonauth--Yard Trash	36	1.41	1,085.1
Equipment use*	46	1.80	2,500.7
Equipment--Agriculture	11	0.43	397.1
Equipment--Logging	0	0	0.0
Equipment--Recreation	6	0.23	77.2
Equipment--Transportation	10	0.39	1,803.6
Incendiary	577	22.54	33,240.2
Lightning	621	24.26	43,795.2
Miscellaneous --Breakout	8	0.31	206.3
Miscellaneous --Electric Fence	0	0	0.0
Miscellaneous --Fireworks	6	0.23	27.4
Miscellaneous --Power Lines	9	0.35	93.6
Miscellaneous --Structure	8	0.31	4.6
Miscellaneous--Other	249		22,998.2
Railroad	4	0.16	4.7
Smoking	51	1.99	1,488.3
Unknown	453	17.70	20,750.7
Total	2,560		154,657.6

Source: Florida Department of Agriculture and Consumer Services – Florida Forest Service Orlando Mitigation

Vulnerability Analysis

Wildfires are a common occurrence in Osceola County's 1,510 square miles, posing risk to life, property and infrastructure. Of the 1,510 square miles, the rural areas, comprising some 1,100 square miles, contain agricultural production, conservation areas, and wildlands. When drought conditions peak, the rural landscape is at high risk for wildfires.



An extreme estimated wildfire that could burn is 20 square miles or 128,000 acres. Once ignited, a wildfire can spread at a rate of up to 14 miles per hour, consuming everything in its path. Additionally, wildfires have the potential to change direction unexpectedly, and jump landscape gaps such as roadways, water bodies and firebreaks.

Osceola County, with its municipalities, provides fire and emergency medical services from 22 stations countywide. Only two stations exist outside of the Urban Growth Boundary (Kenansville and Holopaw), potentially delaying response to wildfires in the rural landscape.

The Osceola County Comprehensive Plan prohibits public utilities, including water and fire hydrants outside of the Urban Growth Boundary. Due to limited water access, responders must rely on fire truck water-tankers and local retention water sources to extinguish wildfires and subsequent structural exposure fires.

The Florida Forest Service has principle jurisdiction for wildfire extinguishment. The County and cities provide direct first response, as State resources are limited as well. Collectively, the Florida Forest Service and the jurisdictions work to control any wildfire with an understanding that County and municipal forces transition combat services to structural and life protection while the State focuses on containing the runaway wildfire.

Osceola County and the cities identify eight high-risk areas that have historically demonstrated an increased risk in fire hazard. These areas are along the urban/rural interface, where dense vegetation meets with high density development. Fire and emergency response services are constrained with accessibility in these areas, and are limited in resources to effectively extinguish the fire.

The map section illustrates the eight identified high-risk areas for wildfire. A detailed representation of wildfire evacuation routes is contained within the Osceola County Evacuation Plan.

Impacts to the Population

Development has become more prevalent along the outskirts of the Urban Growth Boundary where rural land is readily available and less expensive than urban infill development options. Populations at greatest risk of exposure are those that reside outside of the Urban Growth Boundary and those along the urban/rural interface, also known as the Wildland Urban Interface. The greatest threat wildfires impose on the population is physical damage, to both life and property. A number of corollary hazards negatively impact the population, including toxins released from the burning and smoke. The County has identified safe evacuations routes to minimize the harmful impacts of wildfire.

Impacts to the Built Environment

Osceola County limits development within the Urban Growth Boundary in order to conserve a large portion of the County's rural setting. This growth management tool segregates high-density development from the vulnerable rural area, reducing the exposure hazard to existing and future development. Increased development in and around rural areas has increased the potential for loss of life and property from wildfires.

Impact to Essential Facilities

Specific essential facilities and infrastructure are more vulnerable to impacts of wildfire. Essential facilities and infrastructure outside of the Urban Growth Boundary and those along the urban interface are at highest impact risk.

Essential facilities are structures that provide an essential function or service for survival, continuation of public safety/service actions, and disaster recovery. A number of county fire stations and other facilities are located in or around the urban interface serving both the urban and rural environments. These facilities are at highest risk of wildfire impact.

Above ground infrastructure, such as gas pressure reducing valves pose, a high risk to the community if impacted by wildfire. Other above ground utilities such as communications equipment, control devices, electrical transmission lines, domestic water storage reservoirs and pumps, along the urban interface, if affected by fire, may impact the ability to deliver critical services including water supply.

An abstract depiction of the County's essential facilities is located in Appendix G of the LMS plan. Osceola County considers essential facilities, in a single list, as protected information and are not listed within this document.

Economic Impacts

The economic impact of wildfires depends on location. In addition to exhausting response and recovery services, wildfires disrupt the lives of residents, employees and businesses. Historically, Osceola County has been an agricultural community. Agricultural production relies on the weather, climate and water availability to thrive. Wildfires may result in the loss of harvest or livestock, destruction of irrigation systems and other agricultural infrastructure. These impacts have long lasting effects on agricultural production including crops, forest growth and arable land, which requires time to mature.

Tourism and Tourist Development Taxes heavily affect the County's economy. Disasters, whether natural or manmade, impact the tourism industry and county economic resources through disruption of services. A long-term wildfire such as a muck-fire may influence visitors to cancel plans thereby reducing revenue. A negative impact is possible even in a perceived threat.

With only two fire stations outside of the Urban Growth Boundary, wildfires make it difficult for fire/ems response efforts. When local resources are exhausted, regional support may be required. Payments for incoming assets to cover local resource shortfalls pose an undue burden on the county's economic resources.

Environment Impacts

The natural function of fires within the environment can be considered a renewal or "cleansing process" as long as the fire is managed. They clean up dead and decaying matter, maintain ecosystem balance by removing diseased plants and harmful insects and regenerate seeds through increased sunlight.

Uncontrolled wildfires present a considerable problem to vegetation and wildlife habitats. In addition to deforestation and the increased release of carbon dioxide into the air, wildfires impact the population, distribution and habitats of local wildlife.

Wildfires also impact the physical and chemical properties of water. Water flowing from the burn area may contain greater levels of sediment, organic debris and chemicals that may significantly degrade water quality and impair aquatic habitats. In addition to these impacts, runoff, erosion and nutrient loss contribute to changes in the watershed.

Duration/Intensity and Predictability

Wildfires ignite instantaneously with no warning and can generally last from hours to weeks in length. Longer duration wildfires such as the muck fire can even last years. Long-lasting wildfires create additional hazards through smoke production potentially affecting safe traffic conditions. These conditions are particularly true in muck fires.

The muck fire results when the organic matter in ground itself begins to burn. This most often occurs when there are periods of extended drought or development has redistributed natural water sources causing the richly organic material to form peat. These fires generally do not produce visible flame, except in eroded, cavernous areas already consumed. With the minimal flame, incomplete combustion produces thick, acrid, pungent smoke clinging to the ground. The smoke and associated smell carry for miles.

Many factors influence the intensity of wildfire. The primary intensity factor is the nature of the fuel. Florida vegetation has unique characteristics in composition. Some Florida vegetation is nearly combustible, producing vapors rapidly when heated just a few degrees above ambient temperature. This factor alone promotes ferocious conditions.

Another factor is weather conditions. Dry, cool and windy conditions serve to inject or create pressure on the burning material enhancing intensity. And while not directly related to weather, the condition of the vegetation as a result of weather promotes intensity, such as frost cured plant material.

Relative humidity, another factor, is a measure of moisture in the air based on the potential of how much moisture can be contained at a given temperature and pressure. Low relative humidity promotes fire intensity and growth potential. Finally, the dispersion index, or the ability of the atmosphere to relinquish combustion products above a wildfire, significantly impacts the intensity potential.

Predictability is only measurable in that given the right conditions, wildfire will occur. Since humans are most responsible for wildfire ignitions, there is a high degree of probability wildfire will occur. Winter conditions with a passing cold front and associated lightning storms are also cause for an increased probability of wildfire. This is particularly true late in the dry season in a cured vegetative state; a single lightning strike is capable of producing longstanding wildfire. Osceola County is particularly susceptible in that the relationship to available land area increases predictability.

Risk Assessment

Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood of a wildfire to result in adverse conditions that would cause injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated to determine the level of risk wildfires have on Osceola County and its cities.

Wildfire (Rating: 37)

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence	5					
Capacity to cause damage			3			
Geographic Impact			3			
Speed of onset (warning time)			3			
Percent of population affected				2		
Potential for causing casualties				2		
Potential for causing negative economic impact				2		
Duration of event				2		
Seasonal pattern			3			
Environmental impact		4				
Predictability of hazard			3			
Impact mitigation potential (reverse rating)					1	
Warning system capability			3			
Corollary effects					1	
TOTAL	5	4	18	8	2	0

=37

With an abundance of naturally vegetated rural landscape and warm climate, Osceola County is a highly conducive environment for wildfires. Based on historical evidence, wildfires occur annually and have a high capacity to cause damage. Since the populated areas are segregated from the rural, the probability of wildfires greatly impacting populated areas is relatively low.

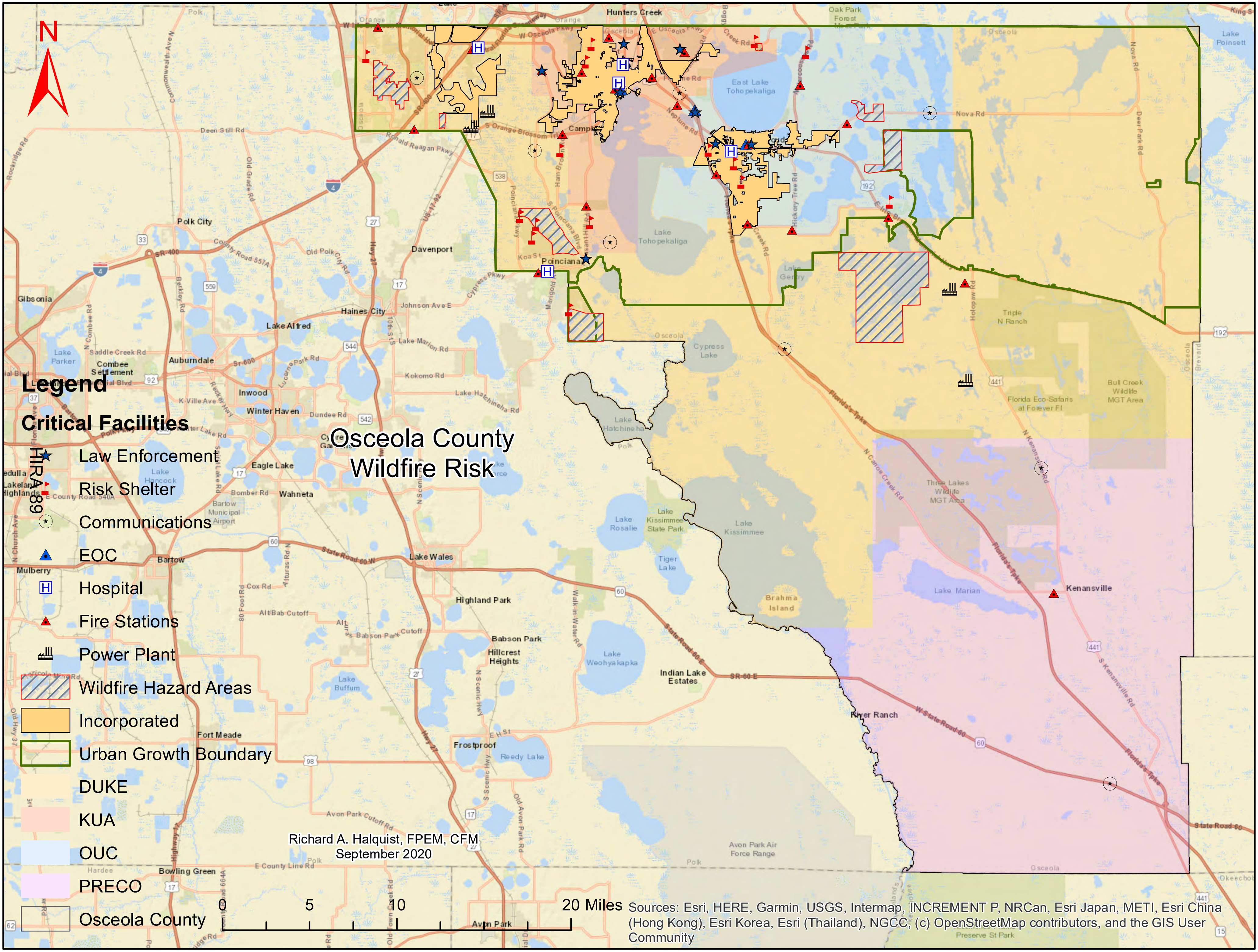
Wildfires occur with no warning time and can last from hours to weeks depending on weather conditions and fuel availability. During the months of November to April the environment is more susceptible to wildfire activity.

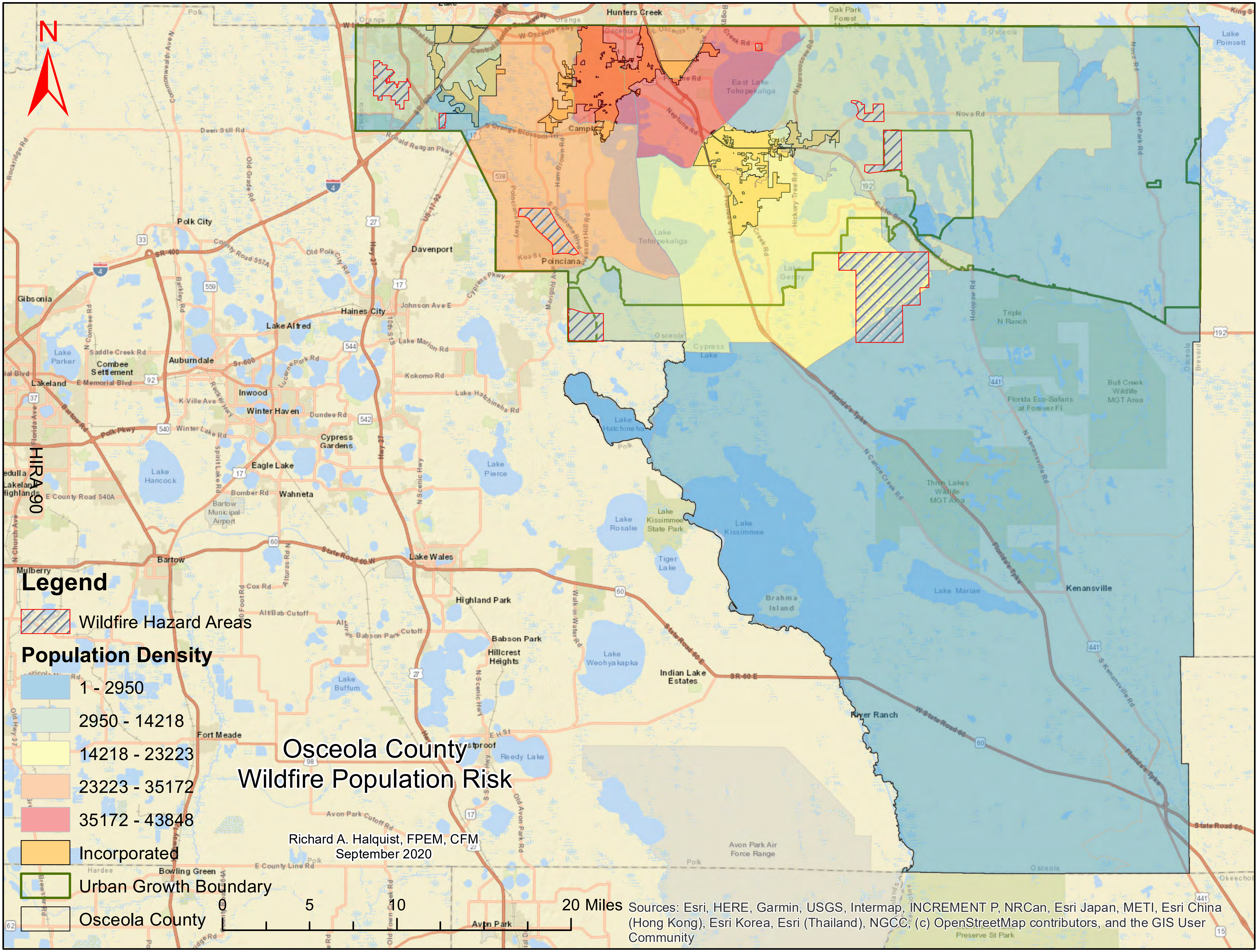
Both the natural and built environment are greatly impacted the effects of wildfire, but a number of mitigation efforts can be implemented to prevent wildfires, starting with education. Since warning systems are ineffective, providing information on prevention and response to a wildfire is paramount.

Geographical Impact Resource Maps

The following maps depict the high wildfire threat areas as determined by Osceola County Fire Rescue in cooperation with the Florida Forest Service.

- Wildfire Risk Areas – Urban Growth Boundary & Critical Facilities
- Wildfire Population Relationship


Osceola County
Wildfire Risk
Legend
Critical Facilities
Law Enforcement
Risk Shelter
Communications
EOC
Hospital
Fire Stations
Power Plant
Wildfire Hazard Areas
Incorporated
Urban Growth Boundary
DUKE
KUA
OUC
PRECO
Osceola County
HIRA 89
N
0 5 10 20 Miles
Richard A. Halquist, FPEM, CFM
September 2020
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
East Lake Tohopekaliga
Lake Tohopekaliga
Lake Kissimmee
Lake Hatchineha
Cypress Lake
Kenansville
Poinciana
Davenport
Haines City
Hunters Creek


Osceola County
Wildfire Population Risk
Richard A. Halquist, FPEM, CFM
September 2020
Legend
Wildfire Hazard Areas
Population Density
1 - 2950
2950 - 14218
14218 - 23223
23223 - 35172
35172 - 43848
Incorporated
Urban Growth Boundary
Osceola County
0
5
10
20 Miles
N
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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Mitigation Measures

This section provides mitigation measures for the impact of wildfire. Some of the mitigation measure ideas provided in this section reference the guidance FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.

Map and Assess Vulnerability to Wildfire

The first step in local planning is to identify wildfire hazard areas and assess overall community vulnerability. Potential actions include:

- Using GIS mapping of wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development, infrastructure, etc.
- Developing and maintaining a database to track community vulnerability to wildfire.
- Creating a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop wildfire mitigation priorities.

Incorporate Wildfire Mitigation in the Comprehensive Plan

Communities can review comprehensive plans to ensure wildfire mitigation has been addressed. The comprehensive plan may include the following:

- Recognizing the existence of wildfire hazards and identifying areas of risk based on a wildfire vulnerability assessment.
- Describing policies and recommendation for addressing wildfire risk and discouraging expansion in the wildland-urban interface.
- Including considerations of wildfire hazards in land use, public safety, and other elements of the comprehensive plan.

Reduce Risk through Land Use Planning

Local governments can mitigate future losses by regulating development in wildfire hazard areas through land use planning, including:

- Using zoning and/or a special wildfire overlay district to designate high-risk areas and specify the conditions for the use and development of specific areas.
- Addressing density and quantity of development, as well emergency access, landscaping and water supply.
- Promoting conservation of open space or wildland-urban boundary zones to separate developed areas from high-hazard areas.
- Setting guidelines for annexation and service extensions in high-risk areas.

Develop a Wildland-Urban Interface Code

Communities can develop regulations for safer construction and incorporate mitigation considerations into the permitting process. Potential actions include:

- Developing specific design guidelines and development review procedures for new construction, replacement, relocation, and substantial improvement in wildfire hazard areas.

- Addressing fire mitigation through access, signage, fire hydrants, water availability, vegetation management, and special building construction standards.
- Involving fire protection agencies in determining guidelines and standards and in development and site plan review procedures.
- Establishing wildfire mitigation planning requirements for large scale developments or planned unit developments.

Require or Encourage Fire-Resistant Construction Techniques

A local government can encourage fire-resistant construction or may choose to require it through local regulations. Examples include:

- Encouraging the use of non-combustible materials (i.e., stone, brick, and stucco) for new construction in wildfire hazard areas.
- Using fire resistant roofing and building materials in remodels, upgrades, and new construction.
- Enclosing the foundations of homes and other buildings in wildfire-prone areas, rather than leaving them open and potentially exposing undersides to blown embers or other materials.
- Prohibiting wooden shingles/wood shake roofs on any new development in areas prone to wildfires.
- Encouraging the use of functional shutters on windows.

Retrofit At-Risk Structures with Ignition-Resistant Materials

Existing structures in wildfire hazard areas can be protected through the use of non-combustible materials and technologies, including:

- Installing roof coverings, sheathing, flashing, skylights, roof and attic vents, eaves, and gutters that conform to ignition-resistant construction standards.
- Installing wall components that conform to ignition-resistant construction standards.
- Protecting propane tanks or other external fuel sources.
- Purchasing and installing external, structure-specific water hydration systems (sprinklers); dedicated power sources; and dedicated cisterns if no water source (e.g., lake, river, or swimming pool) is available.

Create Defensible Space Around Structures and Infrastructure

Local governments can implement defensible space programs to reduce risk to structures and infrastructure, including:

- Creating buffers around residential and non-residential structures through the removal or reduction of flammable vegetation, including vertical clearance of tree branches.
- Replacing flammable vegetation with less flammable species.
- Creating defensible zones around power lines, oil and gas lines, and other infrastructure systems.

Conduct Maintenance to Reduce Risk

Local governments can implement maintenance procedures to reduce wildfire, risk including:

- Performing arson prevention cleanup activities in areas of abandoned or collapsed structures, accumulated trash or debris, and with a history of storing flammable materials where spills or dumping may have occurred.
- Preventing or alleviating wildfires by proper maintenance and separation of power lines as well as efficient response to fallen power lines.
- Routinely inspecting the functionality of fire hydrants.
- Requiring and maintaining safe access for fire apparatus to wildland-urban interface neighborhoods and properties.

Implement a Fuels Management Program

A fuels management program may be implemented to reduce hazardous vegetative fuels on public lands, near essential infrastructure, or on private lands by working with landowners. The program can include the following:

- Performing maintenance including fuel management techniques such as pruning and clearing dead vegetation, selective logging, cutting high grass, planting fire-resistant vegetation, and creating fuel/fire breaks (i.e., areas where the spread of wildfires will be slowed or stopped by the removal of fuels).
- Using prescribed burning to reduce fuel loads that threaten public safety and property.
- Identifying and clearing fuel loads created by downed trees.
- Cutting firebreaks into public wooded areas in the wildland-urban interface.
- Sponsoring local “slash and clean-up days” to reduce fuel loads along the wildland-urban interface.
- Linking wildfire safety with environmental protection strategies (i.e., improving forest ecology, wildlife habitat, etc.).
- Developing a vegetation management plan.

Participate in Firewise Program

The Firewise program provides a series of steps that individual residents and their neighbors can take to keep their homes and neighborhoods safer from fire. The following actions can be considered:

- Joining the “Firewise Communities/USA” recognition program sponsored by the National Wildlife Coordinating Group (firewise.org).
- Sponsoring Firewise workshops for local officials, developers, civic groups, and neighborhood/homeowners’ associations.
- Consulting Firewise guidance and encouraging or requiring best practices in your community.

Increase Wildfire Risk Awareness

Education and outreach programs can target citizens, businesses, developers, landscapers, and insurers among others to increase awareness of wildfire risk and strategies for protecting homes and infrastructure. Consider actions such as:

- Offering GIS hazard mapping online for residents, developers, and design professionals.
- Organizing a local fire department tour to show local elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks.
- Working with insurance companies, utility providers, and others to include wildfire safety information in materials provided to area residents.
- Developing partnerships with neighborhood groups, homeowners' associations, and others to conduct outreach activities.
- Using local fire departments to conduct education programs in schools.
- Informing the public about proper evacuation procedures.
- Forming a citizen plan implementation steering committee to monitor progress of local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.

Educate Property Owners about Wildfire Mitigation Techniques

Educate property owners on actions that they can take to reduce risk to property, such as the following:

- Installing fire mitigation systems such as interior and exterior sprinkler systems.
- Performing safe disposal of yard and household waste rather than open burning.
- Removing dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards.
- Creating a defensible space or buffer zone cleared of combustible materials around property.
- Installing and maintaining smoke detectors and fire extinguishers on each floor of their homes or other buildings.
- Safely using and storing necessary flammable materials, including machine fuels. Approved safety cans should be used for storing gasoline, oily rags, and other flammable materials. Firewood should be stacked at least 100 feet away and uphill from homes.
- Keeping flammables, such as curtains, secured away from windows or using heavy fire-resistant drapes.

2020

Natural Hazard

Severe Thunderstorm

Risk and Vulnerability Rating: 34

SEVERE THUNDERSTORMS *(HIGH RATING: 34)*

Severe thunderstorms are a common occurrence in Osceola County. The National Weather Service defines severe thunderstorms as occurring as a single storm, in clusters or lines, consisting of heavy rain and lighting, and producing large hail, 1-inch in diameter (quarter size) or greater, strong wind gusts of 58 mph or greater, or tornadoes.

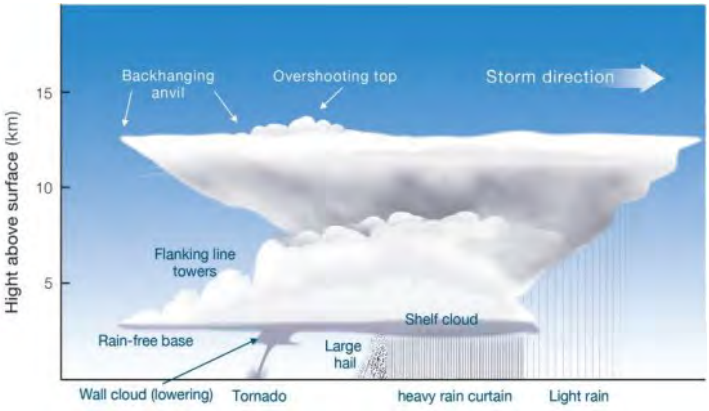
Lightning is a phenomenon present in all thunderstorms and is sometimes characterized as a separate hazard. Since lightning is required to classify a storm as a thunderstorm, emergency planners have included it here as component of thunderstorms. Florida is the lightning capital of North America and is generally attributed to the subtropical climate.

Lightning is a sudden or immediate discharge of electrical energy resulting from the convective nature of storm development and progress. Lightning or electricity discharges when polar opposites exist within the developing storm cloud structure. The discharge can be within the cloud, from cloud to cloud and frequently discharges to or from the ground.

Organized severe thunderstorms require moisture, instability and lift to form. Another component in rotating severe storms is vertical wind shear. The presence of wind shear causes the whole thunderstorm to rotate and potentially spawn a tornado. Shear is a change in wind direction with height. Frequently, a severe thunderstorm develops as a part of a cold front associated with strong winds in the upper levels of the troposphere. If these winds change with height, a sheared environment exists and potentiates the development of a rotating severe thunderstorm known as a mesocyclone.

The majority of injuries and fatalities from severe thunderstorms are a result of tornado activity. Tornadoes develop out of thunderstorms where a steady, upward flow of warm, low-pressure air is present. Lightning is also a frequent killer resulting from thunderstorm activity.

Another potentially devestating aspect of severe thunderstorms are downbursts. Downbursts are strong, often damaging winds produced by rapidly descending air; some are described as microbursts when the area is less than 2.5 square miles, and macro bursts for a larger area.



Hail is commonly present in severe thunderstorms. Most hail falls from

the central region of a cloud in a severe storm. Beginning as tiny ice pellets that collide with water droplets, hailstones grow larger as a strong updraft column buoys them up again to be refrozen and even larger in size. Eventually, the hailstone becomes heavier than the updraft can support and they fall out. The optimum freezing level for hail formation is between 8,000 and 10,000 feet.

Hazard History

Osceola County is located in the tropical climate zone, where weather is sunny, warm and humid due to its proximity to the equator. The tropical climate brings abundant rain, and during certain times of the year, daily thunderstorms occur. Due to these conditions, Osceola County encounters severe thunderstorms frequently, particularly during the summer.

The table below identifies historical severe storm events within Osceola County since 1983. Severe thunderstorm criteria changed in April of 2009. The table below reflects the criteria for both 2009 to current and prior. The principal change is hail diameter requirements increasing from ¾ inch to 1 inch. According to recorded data, severe thunderstorms occur most often during the months of May and June. Records within those months are highlighted in the following table.

Recorded Severe Thunderstorm Activity

Date	Event	Magnitude	Deaths	Injuries	Properties Damaged
08/28/1983	Hail	1.5	0	0	0
05/21/1988	Hail	0.75	0	0	0
11/05/1988	Thunderstorm Wind	60	0	0	0
05/28/1989	Hail	1.75	0	0	0
05/16/1991	Hail	0.75	0	0	0
03/25/1992	Hail	0.75	0	0	0
09/11/1993	Hail	0.75	0	0	0
08/06/1994	Hail	1	0	0	0
10/29/1994	Hail	1	0	0	0
03/18/1995	Hail	0.75	0	0	0
07/07/1995	Hail	0.88	0	0	0
07/11/1995	Hail	0.75	0	0	0
03/30/1996	Hail	1.75	0	0	0
04/23/1997	Hail	1	0	0	0
05/27/1997	Hail	1.75	0	0	0
07/04/1997	Hail	0.75	0	0	0
07/04/1997	Tornado	F1	0	0	200000
07/05/1997	Tornado	F0	0	0	2000
07/08/1997	Hail	0.75	0	0	0
10/27/1997	Hail	1	0	0	0
10/27/1997	Thunderstorm Wind	50	0	0	0
02/16/1998	Thunderstorm Wind	60	0	0	80000
02/22/1998	Hail	0.75	0	0	5000
02/23/1998	Tornado	F3	25	145	50000000
02/28/1998	Hail	1	0	0	0
04/20/1998	Hail	1.75	0	0	0
05/04/1998	Hail	1.75	0	0	0
05/05/1998	Hail	1	0	0	0
06/18/1998	Hail	1	0	0	0
01/03/1999	Thunderstorm Wind	50	0	0	70000
01/03/1999	Thunderstorm Wind	61	0	0	0
05/06/1999	Hail	2	0	0	0
05/11/1999	Hail	0.75	0	0	0

06/03/1999	Hail	1.75	0	0	0
06/04/1999	Thunderstorm Wind	60	0	0	0
06/22/1999	Thunderstorm Wind	60	0	0	0
08/01/1999	Hail	1.75	0	0	0
08/01/1999	Thunderstorm Wind	50	0	0	5000
05/09/2000	Hail	0.75	0	0	0
07/07/2000	Hail	0.75	0	0	0
03/29/2001	Hail	1.75	0	0	0
03/31/2001	Hail	0.75	0	0	0
05/31/2001	Hail	0.75	0	0	0
06/15/2001	Hail	0.75	0	0	0
06/17/2001	Hail	1.25	0	0	0
06/19/2001	Hail	0.88	0	0	0
08/10/2001	Hail	0.75	0	0	0
05/30/2002	Hail	1	0	0	0
03/14/2003	Thunderstorm Wind	50	0	0	2000
03/14/2003	Hail	1	0	0	0
03/16/2003	Hail	1	0	0	0
07/29/2003	Hail	1	0	0	0
07/29/2003	Thunderstorm Wind	50	0	0	0
05/02/2004	Hail	1	0	0	0
07/07/2004	Hail	1	0	0	0
08/13/2004*	Tornado	F1	0	0	0
08/13/2004*	High Wind	65	1	0	373000000
09/04/2004*	Tornado	F0	0	0	0
09/04/2004*	High Wind	55	0	0	3500000
09/25/2004*	Strong Wind	77	0	0	11000000
03/21/2005	Thunderstorm Wind	60	0	0	0
03/26/2005	Hail	0.88	0	0	0
05/03/2005	Hail	1.75	0	0	0
08/04/2005	Thunderstorm Wind	50	0	0	10000
08/04/2006	Hail	1	0	0	0
05/04/2007	Hail	0.75	0	0	0
01/13/2008	Hail	1.25	0	0	0
04/06/2008	Hail	0.75	0	0	0
04/06/2008	Thunderstorm Wind	52	0	0	0
06/02/2008	Hail	1.75	0	0	0
06/10/2008	Thunderstorm Wind	50	0	0	3000
06/10/2008	Thunderstorm Wind	60	0	0	5000
06/10/2008	Thunderstorm Wind	50	0	0	1000
06/24/2008	Hail	0.75	0	0	0
04/14/2009	Hail	1	0	0	0
05/29/2010	Hail	1.25	0	0	0
05/27/2011	Hail	1	0	0	0
06/17/2011	Hail	1	0	0	0
04/20/2012	Hail	1	0	0	0
06/24/2012	Tornado	EF0	0	0	0
06/24/2012	Thunderstorm Wind	50	0	0	50000
02/12/2014	Thunderstorm Wind	65	0	0	0
02/12/2014	Hail	1	0	0	0
06/20/2015	Hail	1	0	0	0
08/20/2015	Hail	1	0	0	0
09/4/2015	Thunderstorm Wind	43	0	0	2000
03/26/2016	Hail	1.5	0	0	50000
03/26/2016	Thunderstorm Wind	50	0	0	10000
06/1/2016	Thunderstorm Wind	52	0	0	0
06/14/2016	Hail	1	0	0	0
07/8/2016	Tornado		0	0	0
06/14/2017	Tornado		0	0	0
06/14/2017	Thunderstorm Wind	43	0	0	5000
07/7/2017	Tornado		0	0	20000
07/17/2017	Hail	1	0	0	0
06/5/2018	Thunderstorm Wind	52	0	0	0
06/19/2019	Thunderstorm Wind	60	0	0	10000
07/28/2019	Thunderstorm Wind	50	0	0	0
07/28/2019	Thunderstorm Wind	56	0	0	0

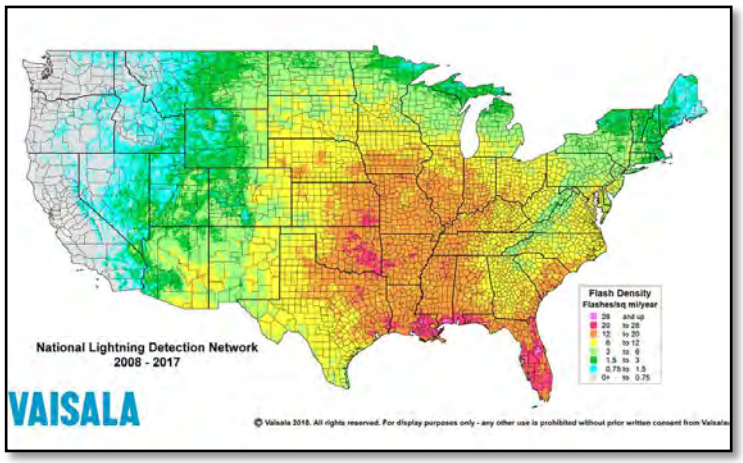
07/28/2019	Hail	1	0	0	0
05/21/2020	Hail	1	0	0	0
05/21/2020	Hail	1.75	0	0	0
05/30/2020	Thunderstorm Wind	55	0	0	0
06/24/2020	Hail	1	0	0	0

**Tropical Cyclone induced*

Vulnerability Analysis

Osceola County and its jurisdictions are equally vulnerable to severe thunderstorms. Severe thunderstorms occur annually within Osceola County and are more frequent during the months of May and June. A severe thunderstorm is characterized as producing winds in excess of 50 knots (58 MPH), producing hail 1 inch in diameter or larger and frequent lightning. Wind ranks as the number one cause of property damage from severe thunderstorms in the community.

Osceola County is a tourist destination and home to seasonal residents. Many of these frequent travelers enjoy staying in mobile, manufactured, or modular housing. These residential homes are at highest risk for wind damage present during severe thunderstorms. According to available data, approximately 13,000 mobile, manufactured, and modular homes exist in Osceola County.



There are, on average, 80-90 thunderstorm days each year in central Florida and while not all are severe thunderstorms, all produce lightning. Since this is a factor in all thunderstorms, it is particularly significant in severe thunderstorms. As a storm becomes severe, the updraft strengthens and as this occurs, additional electrical activity amplifies. This increases lightning activity throughout the storm.

According to the National Weather Service (NWS), more lightning deaths occur in the time before and after the rain than other associated severe storm hazards. A severe thunderstorm can provide lightning for such great distances, the affected element may not even be aware that a severe storm is approaching. This gives great credence to the term lightning “out of the blue”. Osceola County can expect no less than 12 lightning flashes per square kilometer every year as provided by the NWS.

Impacts to the Population

Osceola County is home to over 380,000 residents, and host to five million visitors annually. Since 1980 there have been a total of 26 fatalities and 145 injuries reported from severe thunderstorm activity.

Secondary impacts, including lightning, strong winds, heavy rain and hail greatly threaten the jurisdiction. Heavy rains can cause flash flooding on roadways, hydroplaning, poor

visibility, and relocation of debris in the roadway. Strong, straight-line winds blow to speeds in excess of 10 (54.8–63.6 mph) on the Beaufort Wind Scale scattering dangerous debris, downing power lines, and damage the natural landscape posing a threat to citizens and their property.

The tourist community is especially vulnerable to the impacts of a severe thunderstorm, as they are not familiar with the hazards that threaten Osceola County, and are less prepared when disaster strikes.

Impacts to the Built Environment

The secondary impacts from a severe thunderstorm can produce extensive damage to the County's infrastructure and built environment. Damaged infrastructure including; roadways, bridges and power lines place additional strain on emergency response services. Roadways become impassable due to flooding or blockage of debris. Strong winds can cause damage to structures and infrastructure, both directly (i.e. downed power line) and indirectly (i.e. tree falling down on a home).

Impact to Critical Facilities

Critical facilities are vulnerable to the effects of severe thunderstorms. They provide an essential function or service for survival, continuation of public safety/service actions, and disaster recovery. Critical infrastructure is those community features providing specific service such as roadways, bridges and electrical distribution.

An abstract listing of the County's critical facilities is located in the Tropical Cyclone map section. Osceola County considers critical facilities, in a single list, as protected information and are not listed within this document.

Economic Impacts

Power outages, road closures and unsafe or limited driving conditions can temporarily impact the function of normal economic systems. Severe thunderstorms can cause damage to property and infrastructure, posing an initial strain on emergency response staff and equipment. Depending on the severity of the damage, businesses may be slow getting back up and running. Alternate methods of operations may need to occur, slowing processes. Government processing may be slower than usual depending on the demand for services and status of operating systems.

Environment Impacts

The environmental impacts from a severe thunderstorm are minimal. Depending on the amount of rainfall, flooding may occur. Strong winds can move water, down trees and blow about vegetation. When the effects of a severe thunderstorm impact the natural environment, resilience is reduced. Strong winds and debris are damaging to natural vegetation. Rainfall eventually makes its way into the large waterways, which may still be flooding for days after the storm has passed. High winds can also induce erosion along waterfronts. Hazards may be human induced when fuel and other contaminants are released into the environment.

Duration

The majority of thunderstorms are often localized, in that it may rain in some parts of the community but not others. Isolated areas that receive heavy damage are usually under threat for a short period of time until the storm dissipates or moves on. Severe thunderstorms in Osceola County typically last less than an hour.

Predictability and Intensity

Severe thunderstorms, including the possibility of tornadoes, may occur suddenly, leaving little time for people to react and move to safety. Even with ample warning, severe thunderstorms may be difficult to predict. The National Weather Service Melbourne Weather Forecast Office forecast and monitors all potential and active severe weather activity for Osceola County and the surrounding region.

Risk Assessment

Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood of a severe thunderstorm to result in adverse conditions that would cause injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated in determining the level of Osceola County severe thunderstorm risk.

Severe Thunderstorm (Rating: 34)

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence	5					
Capacity to cause damage				2		
Geographic Impact				2		
Speed of onset (warning time)		4				
Percent of population affected		4				
Potential for causing casualties					1	
Potential for causing negative economic impact						0
Duration of event					1	
Seasonal pattern		4				
Environmental impact					1	
Predictability of hazard			3			
Impact mitigation potential (reverse rating)		4				
Warning system capability						0
Corollary effects			3			
TOTAL	5	16	6	4	3	0

=34

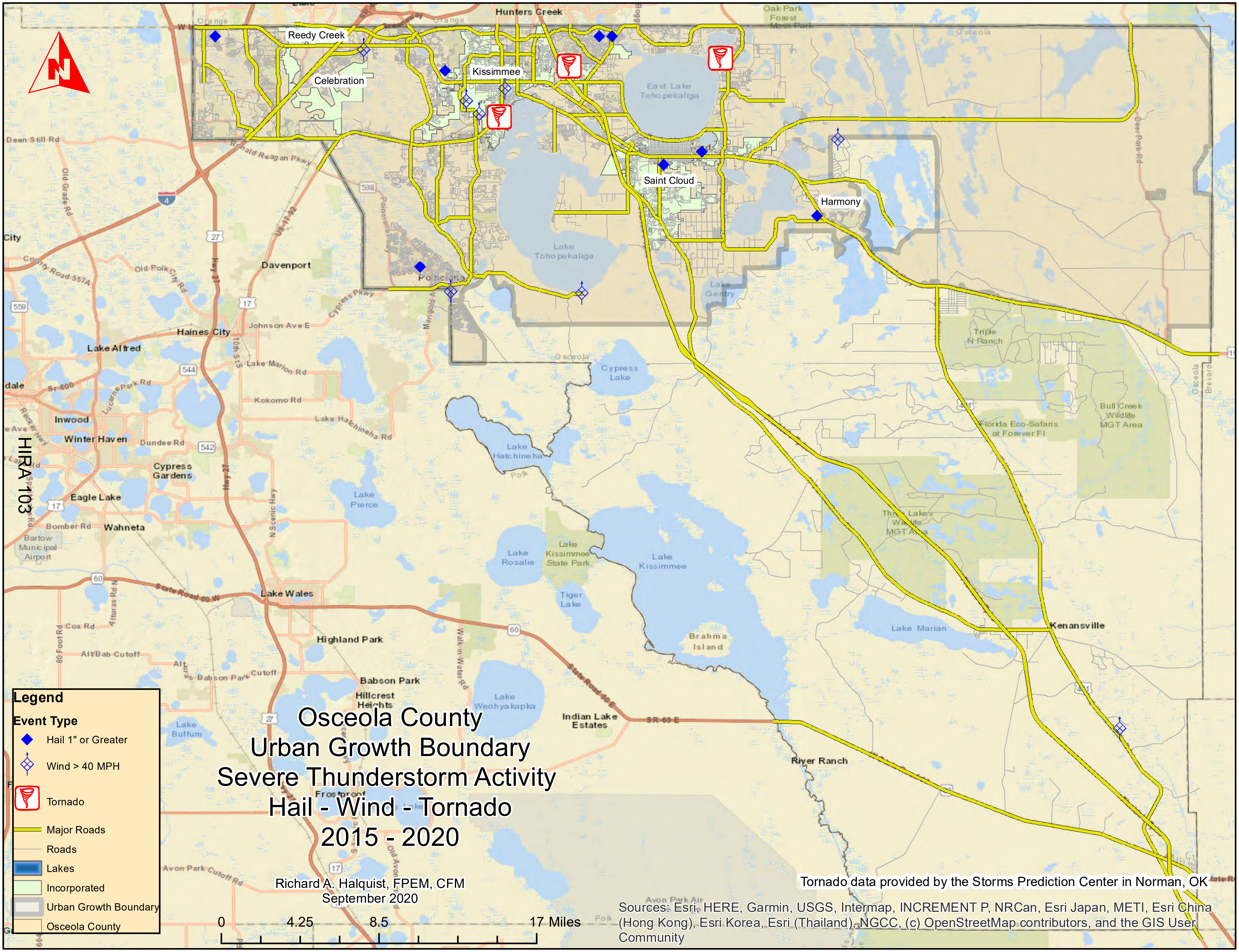
Historic records indicate that severe thunderstorms occur every year in Osceola County. While the threat of severe thunderstorms is concentrated during the months of May and June, the community is at risk of personal, economic and environmental damage. Increasing development density within the County's Urban Growth Boundary promotes a higher risk to the majority of the population from the impacts of severe thunderstorms.

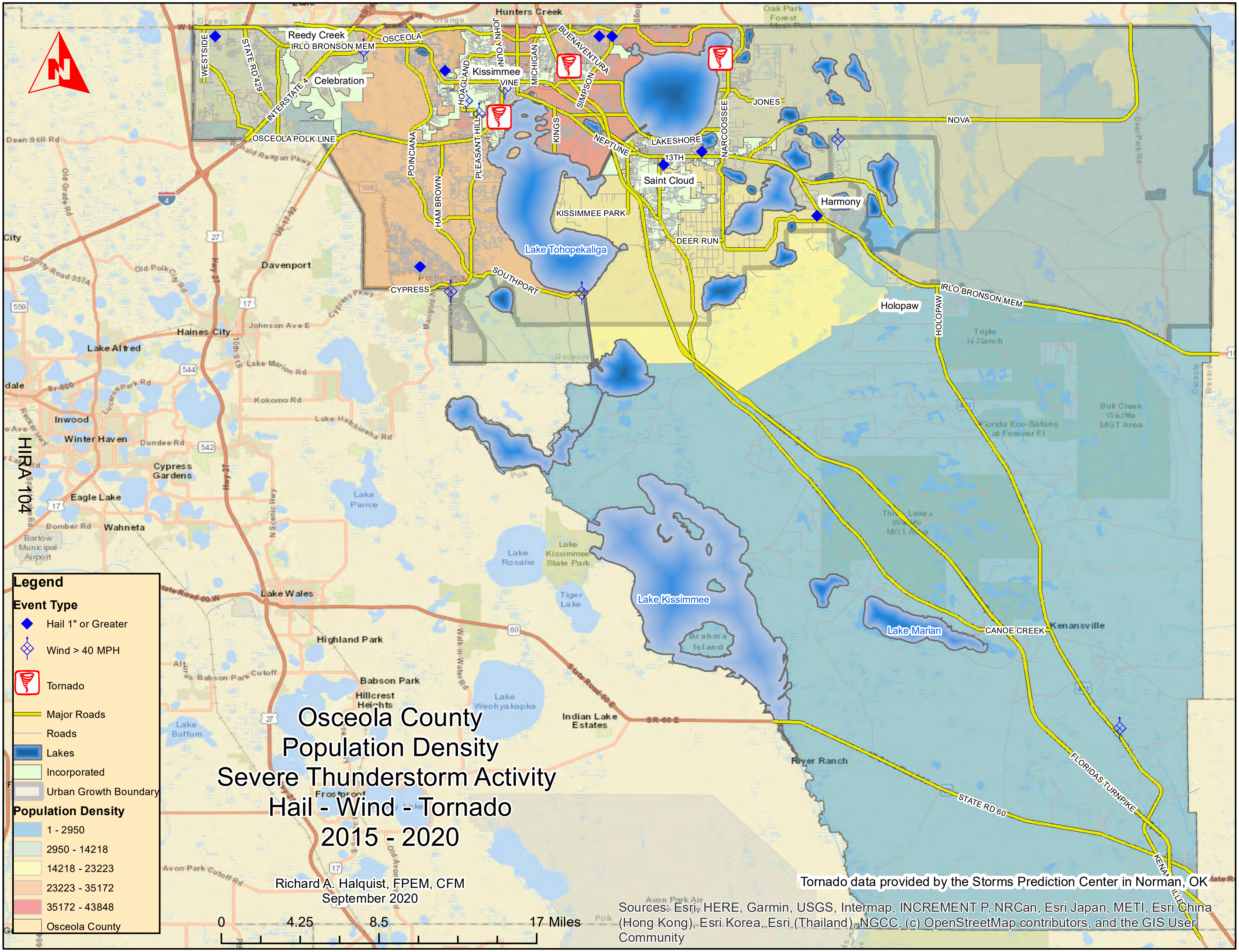
Mitigation measures can greatly reduce the amount of damage expected to occur. Osceola County's Office of Emergency Management works with the community to identify and implement effective mitigation tools to withstand the impacts of severe thunderstorms.

While we can anticipate severe thunderstorms to form during the late spring through summer, with the assistance of real-time information from the Melbourne Weather Forecast Office, Osceola County can warn the community in advance of severe thunderstorm impact.

Geographical Impact Resource Maps

- Osceola County Population Risk
- Historical Reported Severe Activity


Osceola County
Urban Growth Boundary
Severe Thunderstorm Activity
Hail - Wind - Tornado
2015 - 2020
Richard A. Halquist, FPEM, CFM
September 2020
Legend
Event Type
Hail 1" or Greater
Wind > 40 MPH
Tornado
Major Roads
Roads
Lakes
Incorporated
Urban Growth Boundary
Osceola County
0
4.25
8.5
17 Miles
Tornado data provided by the Storms Prediction Center in Norman, OK
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Reedy Creek
Celebration
Kissimmee
Hunters Creek
East Lake Tohopekaliga
Lake Tohopekaliga
Saint Cloud
Harmony
Lake Gentry
Cypress Lake
Lake Hatchineha
Lake Kissimmee
Lake Kissimmee State Park
Brahma Island
Lake Marian
Kenansville
Triple N Ranch
Florida Eco-Safaris at Forever Fl
Bull Creek Wildlife MGT Area
River Ranch
Indian Lake Estates
Lake Weohyakapka
Lake Rosalie
Tiger Lake
Lake Pierce
Davenport
Haines City
Lake Alfred
Inwood
Winter Haven
Cypress Gardens
Eagle Lake
Wahneta
Lake Wales
Highland Park
Babson Park
Hillcrest Heights
Frostproof
Lake Buffum


Osceola County
Population Density
Severe Thunderstorm Activity
Hail - Wind - Tornado
2015 - 2020
Richard A. Halquist, FPEM, CFM
September 2020
Legend
Event Type
Hail 1" or Greater
Wind > 40 MPH
Tornado
Major Roads
Roads
Lakes
Incorporated
Urban Growth Boundary
Population Density
1 - 2950
2950 - 14218
14218 - 23223
23223 - 35172
35172 - 43848
Osceola County
0
4.25
8.5
17 Miles
Tornado data provided by the Storms Prediction Center in Norman, OK
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Mitigation Measures

This section provides mitigation measures for the impact of severe thunderstorms. Some of the mitigation measure ideas provided in this section references the guidance FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. Severe thunderstorms produce a number of corollary effects including, but not limited to, lightning, flooding and tornadoes. Please also review the mitigation measures located within these chapters specific to those hazards.

Improve Household Disaster Preparedness

Educate the public on how to prepare for hazards and disasters, including the following:

- Encouraging property owners to purchase hazard insurance not as an alternative to mitigation, but rather to add financial protection if damage does occur.
- Encouraging residents to prepare by stocking up the necessary items and planning for how family members should respond during a disaster. Publicized information about household preparedness can be found at www.ready.gov.
- Providing hazard vulnerability checklists for homeowners to conduct their own inspections.
- Promoting the purchase and use of NOAA weather radios by residents.
- Encouraging citizens to secure loose items (i.e., patio furniture).
- Participating in Nation Weather Service StormReady Program.
- Purchasing and installing NOAA weather radios in schools, government buildings, parks, etc.
- Storing digital or hard copies of public records in low-risk, offsite locations.

Increase Hazard Education and Risk Assessment

Hazard education and awareness activities include:

- Incorporating hazard mitigation principles into all aspects of public-funded building.
- Developing and implementing a multi-hazard public awareness program.
- Providing information on all types of hazards, preparedness and mitigation measures, and responses during hazard events.
- Establishing a “hazard awareness week” in coordination with the media to promote hazard awareness (seasonal).
- Establishing an interactive website for educating the public on hazard mitigation and preparedness measures.
- Annually hosting a public hazards workshop or exposition for all residents.
- Establishing hazard information centers.
- Creating a speakers bureau for disaster-related topics that focus on mitigation and preparedness measures.
- Enhancing hazard awareness of the private sector, particularly lenders, insurance agents, and realtors.
- Scheduling an annual “what’s new in mitigation” briefing for the local governing body (possibly with SHMO, etc.).

2020

Natural Hazard

Pandemic

Risk and Vulnerability Rating: 32

PANDEMIC *(HIGH RATING: 32)*

Pandemic is the widespread propagation of a contagious disease in the human population. Further, it means extending beyond regional boundaries, including across continents. Generally, a pandemic is an epidemic spreading to the far reaches of the globe.

In considering pandemic, many diseases are capable of reaching this threshold. Most notable are the influenza viruses because they mutate so rapidly and are easily spread amongst humans. A simple sneeze can spread the influenza virus resulting in contamination for more than one person.

Hazard History

Many microbial organisms can achieve pandemic state and to list the historic reference here would be beyond the scope of this document. In general, pandemic occurs more regularly than not, but is controlled by today's modern medicine and health techniques.

Notable influenza pandemics extend from the 1918 pandemic of the "Spanish Flu" to the 2009, H1N1 Influenza. There are others in this period including the 1967 Influenza and the 2005 H5N1 "Bird Flu". Each pandemic brings a high mortality rate and threatens the world population.

At the time of the writing of this document in 2020, the COVID-19 pandemic, which began in late 2019, had resulted in over 58 million cases and 1.3 million deaths worldwide. Osceola County experienced over 17,000 cases, resulting in over 900 hospitalizations and 236 deaths.

COVID-19 testing at Osceola Heritage Park

In addition to the health impacts of the pandemic, the economic and social impacts were also very pervasive as many jurisdictions "shut-down" as a safety precaution, resulting in the closing of many businesses and very limited social interaction opportunities.

Even while still active in response to the pandemic, researchers were able to conduct studies linking the social isolation to psychological impacts. The long-term effects are yet to be seen and the economic recovery will also take significant time.

Vulnerability Analysis

All populations are vulnerable to the spread of disease and certainly to pandemics. A significant fact in Osceola County's vulnerability is that the jurisdiction and associated municipalities are an international destination. World travelers arrive to visit the famous central Florida theme parks and beaches, bringing an increased threat of disease spread. This factor coupled with the number of service workers dependent on the tourism industry create significant vulnerability. Additionally, the local population interaction directly with the tourist population join to increase vulnerability.

The age range of population vulnerability includes all ages. The most vulnerable are the infirm (those already weakened by chronic illness), and the elderly. Osceola County has a diverse mix of these populations with an over age 65 population of 30% adding to vulnerability.

Impacts to the Population

The population is directly impacted because humans host the causative agent. The numbers of ill and fatalities rises through the progression of the disease. The greater number of sick potentiates the need for additional hospital care and subsequently all populations are impacted, directly or indirectly.

Pandemic illness occurs in waves. This is primarily due to the mutation of the virus but can also be attributed to extended unprotected social interactions. As the virus mutates, the illness conditions can change; even enough to alter necessary treatment for those affected.

Impacts to the Built Environment

The built environment is not generally affected, except that service to some businesses and other large facilities may be impaired due to sick workers. A pandemic of a particularly virulent disease could render a building or service unusable depending required cleaning techniques.

Impact to Essential Facilities

There is no direct impact from pandemic. The corollary effects are the inability to provide services due to a reduced or sickened workforce. Additionally, facilities may become weakened from overuse and lack of maintenance, again related to insufficient workforce to appropriately manage.

Economic Impacts

The causative disease may not directly impact the economy, except that travel will surely be limited and sick people are not able to patronize the business community. As in other hazards, travel limitations and social distancing result in lowered revenues and increases in demands for services. Panic buying and supply stream shortages may also have a large effect on economic efficiencies along all stages of production and service provision.

At the time of this publication in 2020, Osceola County businesses reported losses over $107.5 million due to the impacts of the COVID-19 pandemic.

Environment Impacts

Human pandemic does not directly affect the environment. There are possibilities of an increased risk to environmental conditions due to workers unable to control material and chemicals from a sickened workforce.

Duration/Intensity and Predictability

Pandemic can last for long periods as the disease makes its way through the mutation process. In cases of a “superbug”, pandemic may last longer as a result of an inability to produce a vaccination or other treatment product.

Intensity is directly related to the type of illness and the resulting associated disease processes. Pneumonia is a typical resulting condition of the influenza virus. The propensity of the disease to attack specific organs also adds to the intensity.

Predictability is a matter of science. The ability to predict a pandemic is difficult even in today’s advanced medical world. However, close monitoring by various public health agencies can provide an indication of potential expansion of an epidemic to a full pandemic, as well as determine and/or predict current and future areas of a high concentration of cases, known as “hotspots”.

This can help guide the decision-making process for implementing potential mitigation measures and allocating resources. Still, these factors are not standard and, as earlier stated, the causative organism may be extremely difficult to predict or provide any expectation of duration. Some organisms may last for years after achieving pandemic status.

At the time of this revision, a vaccine was created in record speed and began successful distribution in December. A second successful vaccine immediately followed the first and is also in distribution.

Risk Assessment

Risk is the application of the hazard as applied to the vulnerability. In applying this to pandemic, there is a high risk, primarily as a result of the factors assessed in the table below. The entire population is vulnerable whether simultaneously or in time-phased increments.

Pandemic (Rating: 32)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence				2			
Capacity to cause damage					1		
Geographic Impact		4					
Speed of onset (warning time)					1		
Percent of population affected				2			
Potential for causing casualties				2			
Potential for causing negative economic impact			3				
Duration of event	5						
Seasonal pattern				2			
Environmental impact					1		
Predictability of hazard				2			
Impact mitigation potential (reverse rating)			3				
Warning system capability			3				
Corollary effects					1		
TOTAL	5	4	9	10	4	0	**=32**

Mitigation Measures

Mitigation measures are strategies which the LMS Working Group can support in implementing to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures for the impact of pandemic events, by identifying community-level, non-pharmaceutical interventions that can be implemented to reduce disease burden in communities and limit the spread of infection.

Increase Public Awareness and Precautionary Actions

Hazard education and awareness activities include:

- Provide the public with information on the dangers of the spread of disease, including social distancing, routine hand washing, availability of vaccinations, understanding signs and symptoms, etc.

Personal Protective Protocols

Actions to limit potential exposure to the virus and infected individuals include:

- Personal Protective Equipment (PPE) use. The general public may be advised and/or required to make use of PPE, such as facial coverings and gloves, while in public settings. Additional precautions should be taken by those individuals with a high risk of exposure, including healthcare workers and first responders. This may include the use of other PPE such as face shields, aprons, and coveralls.

Implement Social Distancing Measures

Take steps to reduce social contacts in order to limit person-to-person transmission of the virus, especially large gatherings that may have “super-spreader” potential. Such measures may be implemented in the forms of both recommendations (voluntary actions) and mandates (with or without punitive actions) and include:

- Closure of schools and universities, childcare facilities, religious services, entertainment venues, and other places where people congregate.
- Establishing capacity limits within places of business to ensure that proper social distancing protocols can be followed.
- Adapting work schedules and practices to reduce the density and face-to-face interactions within workplace environments. This may include telework, video conferencing, and expanded leave. Health care settings may reduce schedules, space out waiting rooms, and create weekend and evening timetables to accommodate backlog and care for the highest-risk patients. Telehealth concepts could be expanded to triage people quarantined at home.

Isolate Cases and Populations

Reduce community spread by isolating known cases and limiting travel between populations. Examples include:

- Home quarantine of members of household contacts. Institutional quarantining of people who have been in contact with confirmed or probable cases is unrealistic during pandemics as it overwhelms the system and may lead to more infections. Voluntary home quarantine reduces stress on the emergency

healthcare system. Although family clusters of infections may occur, the numbers of affected people are likely to be far lower than in institutional settings.

- Impose travel restrictions (without compromising essential services). Travel is the single most important contributor to disease transmission, however absolute travel bans may increase fear and affect the travel of essential staff and the timely movement of supplies. Home deliveries of essential commodities may be feasible in some communities. Reduced frequency of transport to and from "hot spots" may also include health screening at travel hubs and jurisdictional boundaries. Additionally, individuals may be recommended or required to quarantine prior to and/or after travel to known "hot spots" or other areas of concern.
- Identify facilities that may serve as additional isolation and/or quarantine locations, which may be utilized for the general public, individuals at a high risk for exposure such as healthcare workers and first responders, and the homeless population which may not otherwise have somewhere to properly isolate/quarantine.

Protect Vulnerable Populations

Stricter precautionary measures may be needed to mitigate any potential spread to vulnerable populations, including youth, infirm, elderly, and the transient/homeless.:

- Limiting visitation to long-term care facilities, health care facilities, and other locations with vulnerable populations.

Monitor and Test

There must be a continuing effort to maintain situational awareness on existing and potential "hot spots", vulnerable populations, and potential means for community spread. Monitoring and testing will help to identify populations and areas of concern which may assist in the allocation of resources:

- Health screening at places of business and other areas of congregation
- Providing for the availability of community testing both of symptomatic and asymptomatic individuals.

Natural Hazard

2020

Agriculture & Livestock Disease

Risk and Vulnerability Rating: 31

AGRICULTURE & LIVESTOCK DISEASE *(MEDIUM RATING: 31)*

Osceola County farms a wide variety of agricultural products. According to the 2017 Census of Agriculture, Osceola has over 525,000 acres of land in farm production, which is the most in the state and nearly 60% of the County's land area. Operations include cattle, sod, citrus, peach, blueberry, vegetable and bee farming. There are currently 392 operational farms in Osceola County, 188 of which (48%) manage livestock operations and 204 of which produce crops. Total sales in 2017 were over $85 million, a decrease of 21.4% from 2012 total sales of over $108 million.

Osceola County Farm Production

Product Type *(Note: Operators may have more than one product type)*	***Number of Farms***
Livestock	298
Orchards	39
Nursery, greenhouse, floriculture, sod	99
Vegetables, melons, potatoes, sweet potatoes	12
Hay and Haylage	44

Source: 2017 Census of Agriculture, USDA, National Agricultural Statistics Service

Hazard History

The agriculture industry, which is a large part of Osceola's heritage and economy, faces a number of challenges. Invasive pests and the potential for introduction of diseases that affect agriculture production threaten the community's market access, natural environment, public health, and the food supply. In addition to natural phenomena that threaten our crops and livestock, population growth pressures increasingly reduce the amount of land available for agricultural production. Corollary effects may lead to the competition for water resources, flooding from stormwater runoff from new development, and increased land prices.

- *Climate:* Osceola County has a subtropical climate with frequent annual storm activity between the months of June and November. Tropical cyclones, severe thunderstorms, and heavy rain produce corollary effects that impact crop and livestock production, including flooding, standing water that invites mosquito generation, and tornadoes.

- *Bioterrorism:* Biological agents, such as Anthrax, are germs that can sicken or kill humans, livestock, or crops. Anthrax spores are easily found in nature, can be produced in a lab, and can last a long time in the environment. The microscopic spores can be put into powders, sprays, food, and water. Difficult to detect, Anthrax can be used as a form of bioterrorism. In 2001, Anthrax was deliberately mailed through the U.S. postal system as an act of terrorism towards humans.

Threats to Livestock

Cattle ranching has historically been the predominant agricultural industry in the Osceola County. Beef production in Osceola County ranks second in a state that ranks 13th nationally. Below are a just a few of the natural dangers that threaten the ranching industry.

- *Foot/Hoof and Mouth:* Foot/Hoof and Mouth Disease (FMD) is a severe, highlight contagious viral disease that infects all animals with divided hooves. There have been no cases in the state of Florida. If one animal contracts Foot and Mouth the entire farm operation, and a larger quarantine area will be shut down. Even though an outbreak of FMD is highly unlikely, the disease could deal a devastating blow to the livestock industry. FMD is a worldwide concern, as it can spread quickly and cause significant economic losses. FMD causes production losses and hardships for farmers and ranchers. It also has serious impacts on livestock trade; a single detection of FMD anywhere in the United States would likely stop international trade completely for a period of time. While many other countries across the globe are dealing with FMD in their livestock populations, the U.S. eradicated the disease in 1929. The U.S. Department of Agriculture's Animal and Plant Health Inspection Service continues to take measures to prevent FMD from reentering the country.

- *Bovine Spongiform Encephalopathy, BSE (Mad Cow Disease):* BSE is a transmissible fatal brain disease found in cattle shown to be linked to a fatal brain disease in humans called Creutzfeldt-Jakob Disease, vCJD. Although vCJD can occur with zero exposure to BSE, humans may contract the disease through ingesting cattle products (excluding dairy products) with BSE. Since 1993, the Center for Disease Control has recorded a total of four (4) confirmed recorded cases of BSE and four (4) confirmed cases of vCJD in the U.S. (source: CDC).

- *Screw-worms:* Osceola County encountered the wrath of the Screw-worm in the 1950's. The screw-worm is especially harmful to livestock, affecting grazing cattle and horses. The fly deposits their eggs into minuscule wounds, leaving the larvae within the body of the host feeding on the flesh as a parasite. Screw-worms were eradicated by releasing sterile male flies. Last case in the Southeastern United States was in 1959.

Threats to Crops

Citrus Greening/HLB, Black Spot, Blight, Alternaria, Phytophthora, Greasy Spot, Melanose, Scab, and Tristeza are just some of the diseases that threaten the County's citrus industry. Pests such as mites, insects and nematodes offer an additional threat to citrus farmers. These impacts, among others, have greatly impacted crop production in Osceola County.

Invasive Plants: Invasive plants, such as the Tropical Soda Apple and Brazilian Pepper, spread through pastures and natural areas like wildfire. They impact crop production and can cause health problems in livestock. The use of herbicides and pesticides is costly and only attack the plant on one side of the property line. The most common way the Tropical Soda Apple is spread is through the consumption by animals. The plant's fruit contains hundreds of seeds that are viable after digestion. More recently there have been discoveries of how to naturally rid of the invasive species. A beetle found in South America is a leaf-eating insect that harvests on the Tropical Soda Apple. This insect has been introduced to Central Florida as a means to mitigate the spread of the invasive species.

Mediterranean Fruit Fly (Medfly): Through the importation of crops, the Mediterranean Fruit Fly found its way into Osceola County in 1997. The Medfly attacks over 200 species of fruits and vegetables. Female Medflys deposit their eggs under the skin of fruit that is just beginning to ripen. Within three days hatched larvae burrow into the pulp of developing fruit, establishing entry points for bacteria and fungi that cause the fruit to rot. As with the Screw-worm outbreak, the sterile insect technique was introduced to eradicate the outbreak of the Medfly.

Threats to Beekeeping

Osceola County prides itself on the production of local honey. There has been a significant decrease in insect pollination due to loss of habitat, parasites, and diseases. The loss in pollination greatly impacts the beekeeping industry as well as crop production that relies on the pollination process.

Risk Assessment

While agricultural incidents are few and far between in Osceola County and do not impact the cities directly, the impact can be devastating to the economy and public health. Without warning one case of animal or crop disease could quarantine and embargo a large part of the County.

Quarantine and embargo impact primarily the county, but can have corollary impacts to the cities. The livestock/crops economic stability may cause financial shortfalls operating within the cities; although, the land and assets, livestock/crops, exist in the County.

Agriculture & Livestock Disease (Rating: 31)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence				2			
Capacity to cause damage			3				
Geographic Impact			3				
Speed of onset (warning time)				2			
Percent of population affected					1		
Potential for causing casualties					1		
Potential for causing negative economic impact		4					
Duration of event			3				
Seasonal pattern					1		
Environmental impact		4					
Predictability of hazard						0	
Impact mitigation potential (reverse rating)			3				
Warning system capability					1		
Corollary effects			3				
TOTAL	0	8	15	4	4	0	**=31**

Mitigation Measures

Mitigation measures are strategies which the LMS Working Group can support in implementing to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures for the potential impacts of agriculture and livestock events.

Purchase Crop Insurance

A healthy farm economy is essential to the economic stability of Osceola County. Crop insurance provides a safety net against perils such as draught, flooding, hail, and other natural implications.

Inspection Regulations

The U.S. Department of Agriculture, the U.S. Environmental Protection Agency and the Florida Department of Agriculture are entities that regulate agricultural producers to ensure the safety of the producers and consumers. States vary in statutory regulations which may pose economic hardship to farmers/ranchers in Florida. Additionally, and of highest concern is the import of products from other countries. To ensure the safety of the local agricultural industry it is important to enforce regulations that protect from harmful consequences mentioned herein.

Educate the Community

Increase community awareness of the dangers that potentially may threaten the agricultural industry, including:

- Planned development projects
- Planned expansion of the Urban Growth Boundary
- Foreign plants, insects, food or animals brought into the County

Establish local Animal Response Team

With over 25 participating agencies/organizations, the Florida State Agricultural Response Team (FLSART) supports an effective and coordinated incident response for the animal and agricultural sectors in the State of Florida. While the FLSART responds to incidents throughout the state, it is highly encouraged that counties establish a local Animal Response Team.

Local Agriculture Response Ordinance

Adopt an ordinance into County Code that outlines emergency response protocol for agricultural disasters.

Maintain Situational Awareness

Monitor for potential threatsContinue to identify natural remedies for threats to the County's agriculture and livestock threats (i.e. beetles that devour Tropical Soda Apple, sterile flies that eradicated the screwworm)

- It is important that Osceola County continue to leverage its partnership with the local University of Florida Institute of Food and Agricultural Sciences (UF/IFAS Extension) branch. UF/IFAS Extension provides a variety of services, including the publication of educational materials for industry professionals and the public, conducting research on emerging threats, and providing training and education on a variety of agricultural topics. Close communication with UF/IFAS Extension

will allow Osceola County to stay abreast of any potential threats and allow for more expedient and effective mitigation measures.

- Another valuable resource within Osceola County is the Bronson Animal Disease Diagnostic Laboratory (BADDL), which provides consummate scientific expertise in the detection and investigation of animal diseases that affect livestock, companion animals, and public health. In addition to maintaining consistent communication with BADDL to remain informed of any emerging threats, it is important to promote the services available through the BADDL to both industry professionals and the general public alike, to ensure that potential threats are identified as soon as possible and timely mitigation actions can be taken.

2020

Natural Hazard

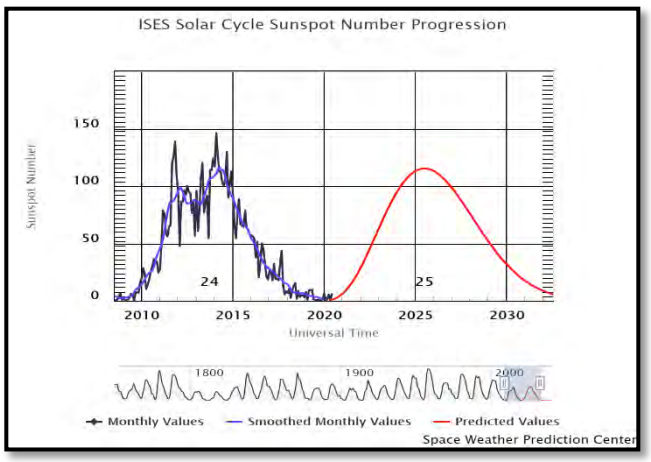
Geomagnetic Storm

Risk and Vulnerability Rating: 28

GEOMAGNETIC STORM *(MODERATE RATING: 28)*

The sun is 93,000,000 miles from earth equating to an approximate eight-minute travel of the sun's rays at the speed of light. The sun also provides a certain degree of influence on the earth's magnetic field called the magnetosphere. A geomagnetic storm is a temporary or otherwise disruption of the magnetosphere caused by intense energy directed toward the earth from the sun. The storm influence can result in a wide variety of events ranging from abnormal rotation to increased ultraviolet light intensity and up to disruptive waves of solar wind with potentially catastrophic results.

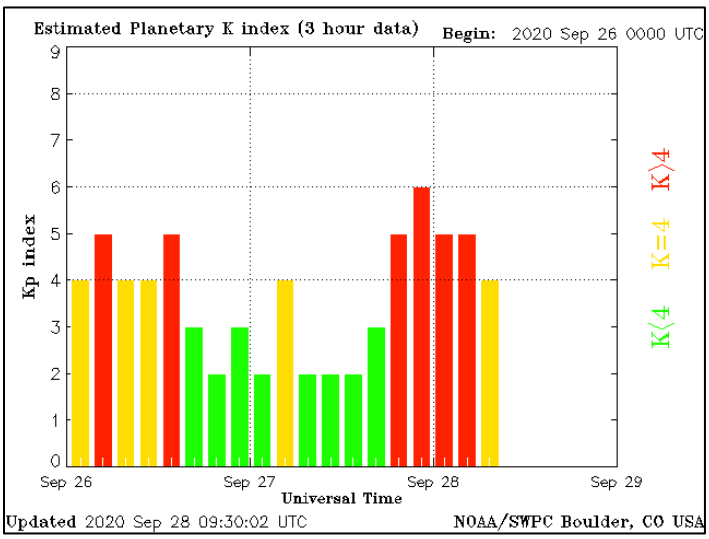
The sun behaves with a certain predictability known as the Solar Cycle. The cycle is based on activity ranging from quiet to maximum. This cycle occurs approximately every 11 years with the maximum bringing very active solar disruptions from sunspots yielding major solar flares and ultimately resulting in what scientists call Coronal Mass Ejections (CME) all of which can cause geomagnetic storms.



Hazard History

Monitoring solar activity is not new. Tracking and monitoring date many thousands of years. Even hundreds of years ago, thinkers and scientists of the time recognized and recorded the solar cycle. It is only in the past 200 years that the solar cycle and related activity present a real, recognizable threat based on the technological advances of the modern era.

In the early 1800's, notable geographer Alexander van Humboldt recorded erratic activity in a magnetic compass during an auroral event and may be the first known magnetic interference recording.



In the mid-1800's, a significant solar storm caused unprecedented interference, and with modern telegraph advances of the day, caused widespread disruption and damage to the telegraph system. The storm is often referred to the Carrington Event, in honor of the scientist Richard Carrington.

The Carrington event is known for its bright aurora displays as far south as Cuba. This event actually caused telegraphic equipment to operate on its own, even after the disconnection

of an applied electrical source.

In a study conducted in 2019, the storm known as the New York Railroad Storm was discovered to possibly rival or at least equal that of the Carrington Event. Other storms have occurred over the years including the 1882, 1921 and 1960 events.

A significant recent storm of record occurred in 1989 and resulted in a very widespread power loss. The storm affected the Hydro Quebec power grid and the associated cascading events caused the loss of power to over six million people.

In the summer of 2014, a geomagnetic storm watch resulting from an X Class solar flare was declared. The effect from this potential storm produced minor interruptions to electrical and telecommunications systems in the United States and Canada but none reported in Florida except for some paging carriers reported service interruptions. Osceola County and its municipalities have no reported incidents or affects related to geomagnetic activity.

Vulnerability Analysis

The entire earth, including Osceola County and its cities, are vulnerable to the effects of the sun. Solar activity produces waves throughout the entire electromagnetic spectrum. This also includes all ranges of light, so while the earth enjoys the benefits of the light and general magnetic influence, there are certain dangers related to the sun's activity. As mentioned earlier, solar flares and associated coronal mass ejections influence the magnetosphere, but they also induce electrical energy. The influx of electrical energy has the potential to damage electronic equipment, in space or otherwise, as well as the earth's electrical systems, including power facilities.

Electrical energy transmitted through space may be induced to electrical systems through the electrical grid. The grid is the vast interconnecting network of electrical transmission lines. The grid acts to absorb the energy adding to the current already on the lines.

When the current arrives at an electrical substation, the expected voltage is no longer present, but has increased with a tremendous potential to damage the proprietary transformers, essentially shutting-down the ability to deliver electricity. The activity and over-voltage damages the transformers resulting in widespread power disruptions potentially leaving large populations without electricity.

These are the considered, basic earth-bound threats from geomagnetic storms. Other threats include damage to communications networks, both in space and on earth. Sensitive electronics, including aircraft and computers, are vulnerable to geomagnetic influence. These events are not to be confused with an electromagnetic pulse (EMP)

because of a high-altitude nuclear explosion. While some of the damage may be similar, this phenomena is covered in a different threat area.

Impacts to the Population

Population impact is significant in that a large-scale loss of electric power and many electronic devices without an understanding of cause can create panic. Emergency Management planners call these type events as blue-sky events where there seems to be no perceivable cause. Imagine if the power went down, there was no ability to use electronic devices, and then trying to determine the cause with none apparent, it would be a frightening event.

Impacts to the Built Environment

The physical structure of the built environment may show no sign of disaster. It is possible that the resulting electrical systems overloads may ignite fires, there will appear to be no cause.

Impact to Essential Facilities

Many services provided by essential facilities and Infrastructure would not be operable following a large-scale geomagnetic storm. Consequences of geomagnetic storm activity can include widespread power failures, pipeline corrosion, the shutdown of cable systems, an increased drag on satellites, inaccurate navigational sensors and the loss of millions of dollars in revenue.

Emergency call centers may be overrun with concerned callers, if a call is even possible. Electronic commerce would be at a standstill. Many automobiles could stop running and most of all; emergency officials may not be able to message the public in the impacted areas.

Special needs clientele dependent on electricity, medical centers and many other functions would come to a halt. In addition, while there is no direct human impact, the corollary effect would be overwhelming. This includes tension, fear, rioting and looting all a result of panic.

Economic Impacts

Without electricity and electronics transaction devices, the economy would be gravely impacted. Even considering a regional event, the ability to control aircraft, execute sales transactions and pump gasoline could not happen. Many gasoline stations have emergency power capabilities, but the ability to deliver fuel would be interrupted by the incapacitation for fuel transport lines. Communications to order fuel would also be interrupted. Tourism, a major economic backbone in the central Florida region would cease.

Environment Impacts

There are no known direct environmental impacts; however, the ability to control flowing fuels and other manufacturing mechanisms could result in unleashing extreme hazards. Managing hazardous and other manufacturing would nearly be impossible in the long term.

Duration/Intensity and Predictability

The duration and intensity are dependent on the amount of damage caused by the magnetic alteration. In addition, the amount of induced voltage and numbers of proprietary equipment damage contribute largely to the duration. A large-scale power and electronics disruption may last for as long as a year with partial restoration occurring sooner as replacement equipment becomes available.

The National Oceanic and Atmospheric Administration (NOAA) monitors space weather including geomagnetic storms. In the science and process of monitoring, NOAA establishes a series of scales relating to the magnitude or intensity a geomagnetic storm can deliver. The maps portion of this hazard document contains those scales and references examples of impact related to the severity of the storm.

Predictability for these events is minimal. As stated earlier, the solar cycle is predictable to a certain extent, but not with a great deal of accuracy. Even in a predictable solar flare with disruptive geomagnetism, the longest lead-time may only be three days. In some cases only a matter of minutes. NOAA also provides alerts and warnings related to geomagnetic storm. Their warning process includes the expected strength.

Risk Assessment

Risk is the expected impact to the populations as well as the environment. A geomagnetic storm of consequence will disrupt large geographical areas impacting the entire county along with its cities equally including the inhabiting population.

Significant geomagnetic storms, although infrequent, have the potential to severely impair and destroy critical infrastructure. Equipment may be permanently damaged and services at all levels disrupted. The population may be patient for a short time, but become overwhelmed by the lack of service. The resulting consequences may be widespread civil unrest resulting in further damage and loss of life.

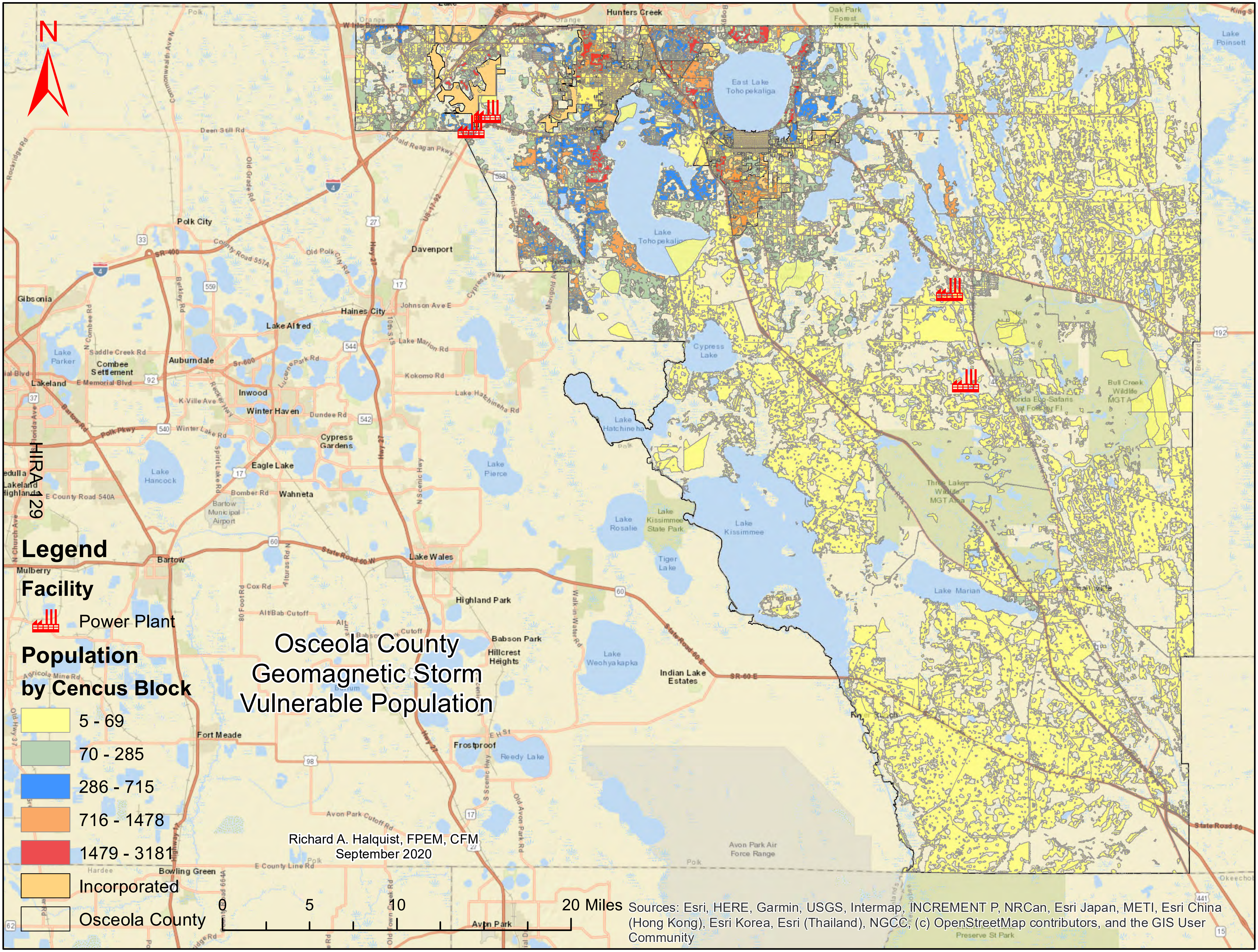
Geomagnetic Storm (Rating: 28)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence			3				
Capacity to cause damage		4					
Geographic Impact		4					
Speed of onset (warning time)		4					
Percent of population affected		4					
Potential for causing casualties						0	
Potential for causing negative economic impact			3				
Duration of event					1		
Seasonal pattern					1		
Environmental impact						0	
Predictability of hazard					1		
Impact mitigation potential (reverse rating)						0	
Warning system capability						0	
Corollary effects			3				
TOTAL	0	16	9	0	3	0	**=28**

The recorded events of significant magnitude are few, but the consequences could be extremely grave. Mitigation efforts may be limited to awareness and training in self-sufficiency. Refer to the mitigation section for specific measures aimed at lowering the risk in this hazard area.

Geographical Impact Resource Maps

- Geomagnetic Storm Risk
- NOAA Reference Scales


N
Osceola County
Geomagnetic Storm
Vulnerable Population
Legend
Facility
Power Plant
Population
by Cencus Block
5 - 69
70 - 285
286 - 715
716 - 1478
1479 - 3181
Incorporated
Osceola County
0 5 10 20 Miles
Richard A. Halquist, FPEM, CFM
September 2020
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
East Lake Tohopekaliga
Lake Tohopekaliga
Cypress Lake
Lake Hatchineha
Lake Kissimmee
Lake Marian
Lake Rosalie
Tiger Lake
Lake Weohyakapka
Lake Pierce
Lake Hancock
Lake Parker
Lake Poinsett
Reedy Lake
Bull Creek Wildlife MGTA
Three Lakes Wildlife MGT Area
Avon Park Air Force Range
Lake Kissimmee State Park
Hunters Creek
Davenport
Haines City
Lake Alfred
Polk City
Auburndale
Winter Haven
Lakeland
Eagle Lake
Cypress Gardens
Bartow
Lake Wales
Highland Park
Babson Park
Hillcrest Heights
Frostproof
Fort Meade
Indian Lake Estates
Bowling Green
Avon Park

NOAA Space Weather Scales

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values* determined every 3 hours	Number of storm events when Kp level was met; (number of storm days)
G 5	Extreme	Power systems: widespread voltage control problems and protective system problems can occur, some grid systems may experience complete collapse or blackouts. Transformers may experience damage. Spacecraft operations: may experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. Other systems: pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).**	Kp=9	4 per cycle (4 days per cycle)
G 4	Severe	Power systems: possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. Spacecraft operations: may experience surface charging and tracking problems, corrections may be needed for orientation problems. Other systems: induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).**	Kp=8	100 per cycle (60 days per cycle)
G 3	Strong	Power systems: voltage corrections may be required, false alarms triggered on some protection devices. Spacecraft operations: surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. Other systems: intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).**	Kp=7	200 per cycle (130 days per cycle)
G 2	Moderate	Power systems: high-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. Spacecraft operations: corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. Other systems: HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).**	Kp=6	600 per cycle (360 days per cycle)
G 1	Minor	Power systems: weak power grid fluctuations can occur. Spacecraft operations: minor impact on satellite operations possible. Other systems: migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).**	Kp=5	1700 per cycle (900 days per cycle)

* Based on this measure, but other physical measures are also considered.
** For specific locations around the globe, use geomagnetic latitude to determine likely sightings (see www.swpc.noaa.gov/Aurora)

Solar Radiation Storms			Flux level of ≥ 10 MeV particles (ions)*	Number of events when flux level was met**
S 5	Extreme	Biological: unavoidable high radiation hazard to astronauts on EVA (extra-vehicular activity); passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. *** Satellite operations: satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources; permanent damage to solar panels possible. Other systems: complete blackout of HF (high frequency) communications possible through the polar regions, and position errors make navigation operations extremely difficult.	10^5	Fewer than 1 per cycle
S 4	Severe	Biological: unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** Satellite operations: may experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. Other systems: blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.	10^4	3 per cycle
S 3	Strong	Biological: radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** Satellite operations: single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. Other systems: degraded HF radio propagation through the polar regions and navigation position errors likely.	10^3	10 per cycle
S 2	Moderate	Biological: passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk.*** Satellite operations: infrequent single-event upsets possible. Other systems: effects on HF propagation through the polar regions, and navigation at polar cap locations possibly affected.	10^2	25 per cycle
S1	Minor	Biological: none. Satellite operations: none. Other systems: minor impacts on HF radio in the polar regions.	10	50 per cycle

* Flux levels are 5 minute averages. Flux in particles·s^{-1}·ster^{-1}·cm^{-2} Based on this measure, but other physical measures are also considered.
** These events can last more than one day.
*** High energy particle (>100 MeV) are a better indicator of radiation risk to passenger and crews. Pregnant women are particularly susceptible.

Radio Blackouts			GOES X-ray peak brightness by class and by flux*	Number of events when flux level was met; (number of storm days)
R 5	Extreme	HF Radio: Complete HF (high frequency**) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. Navigation: Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 ($2x10^{-3}$)	Fewer than 1 per cycle
R 4	Severe	HF Radio: HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. Navigation: Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)
R 3	Strong	HF Radio: Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. Navigation: Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	Moderate	HF Radio: Limited blackout of HF radio communication on sunlit side of the Earth, loss of radio contact for tens of minutes. Navigation: Degradation of low-frequency navigation signals for tens of minutes.	M5 ($5x10^{-5}$)	350 per cycle (300 days per cycle)
R 1	Minor	HF Radio: Weak or minor degradation of HF radio communication on sunlit side of the Earth, occasional loss of radio contact. Navigation: Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

* Flux, measured in the 0.1-0.8 nm range, in W·m^{-2}. Based on this measure, but other physical measures are also considered.
** Other frequencies may also be affected by these conditions.

URL: *www.swpc.noaa.gov/NOAAscales* April 7, 2011

Mitigation Measures

Mitigation measures are strategies can support reducing the loss of life and property from a disaster. Unfortunately, mitigating for geomagnetic storms is a challenging task.

Increase Hazard Education

Understanding community vulnerability and level of risk is important to identify and prioritize mitigation alternatives. Increase awareness through the following:

- Increase awareness of the negative consequences of geomagnetic storms to the public when conducting community outreach events.
- Provide literature on the impacts of geomagnetic storms on media outlets (i.e. websites, social media, etc.)

Enhance Warning Systems

Advance warning systems provide infrastructure owners and operators with the necessary information to prevent negative consequences.

- Identify systems that provide advanced warning through early detection of geomagnetic activity.

Infrastructure Hardening

The grid can be protected through hardening and through the installation of ground-induced current blocking devices that would prevent currents generated by geomagnetic storms from flowing through the grid. The following measures can be taken:

- Contribute to research and advocacy of infrastructure hardening.
- Educate local utility providers of available mitigation options.

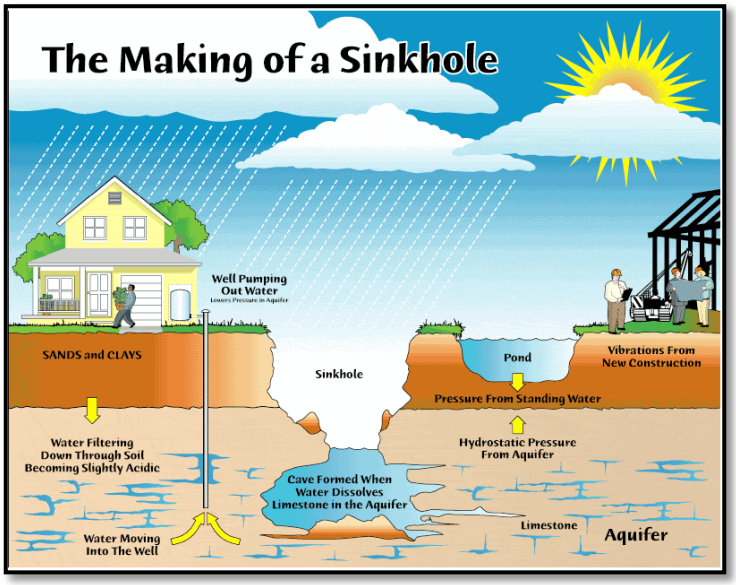
2020

Natural Hazard

Sinkhole

Risk and Vulnerability Rating: 21

SINKHOLES *(Low Rating: 21)*

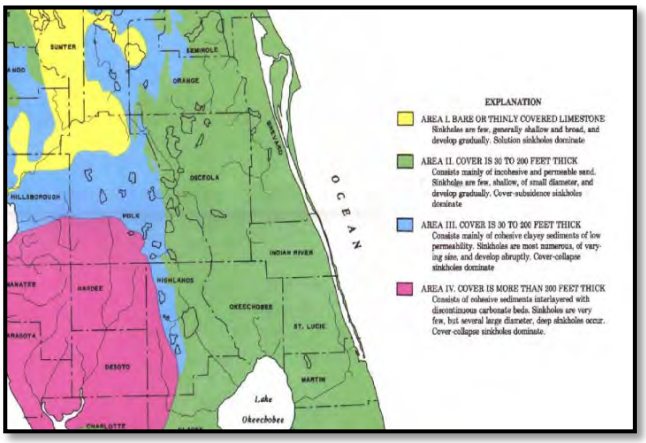


Sinkholes are natural depressions in the surface of the earth caused by the removal of soil or bedrock, often both, by water. Sinkholes vary in diameter, volume and composition from less than a few feet to hundreds, even thousands of feet. The size may vary in diameter and depth, including sidewall consistency ranging from smooth soil-lined bowls to bedrock-edged chasms.

It is common for sinkholes to form after long periods of rain and even after periods of drought. Sinkholes may form gradually or suddenly and typically by the gradual removal of slightly soluble bedrock such as limestone. This occurs from normally percolating water. This same mechanism may collapse a cave-roof causing the sudden formation. In addition to this, a lowering of the water table reduces support pressure for the soils above resulting in earthen structural collapse. Occasionally sinkholes exhibit a visible opening into a cave below.

Hazard History

Osceola County, like most of the State of Florida is located on a limestone surface. However, unlike many areas in the State where limestone and other karst formations are close to the surface, the limestone bedrock in Osceola County is relatively deep under a clay, sand and soil layer.



Because of the unique topography on the eastern slope of the Florida Spine, there is a relatively low risk for catastrophic sinkhole formation within the county. Most of the sinkholes within Osceola County are shallow, not usually greater than 4 to 5 feet and only about 10 to 30 feet in diameter and gradually forming over time. There were only nineteen (19) sinkholes reported in Osceola County between 2002 and November of 2020, compared to ninety (90) reported sinkholes in neighboring Orange County during that same period.

Vulnerability Assessment

Impacts to the Population

While a direct impact on a person is unlikely, it did happen in March of 2013. A sinkhole opened directly below an inhabited residence and the occupant was lost to the growing cavern. The event occurred in Hernando County, Florida, an area with a high sinkhole incidence.

Most occurrences create an inconvenience. The inconvenience may include traffic rerouting, utility disruption and business closure. There are also those incidents threatening homes and structures requiring displacement, permanently or temporarily.

As previously stated, the number of occurrences reported in Osceola County and its jurisdictions is very low. According to the Florida Geological Survey (FGS), sinkhole vulnerability and risk lies primarily to the farthest western portion of the County and does not include the cities. The FGS points out that sinkholes can and do occur in other parts of the county; however, they are nearly always slow-to-form and have little to no impact to the population.

At the time of this writing, one sinkhole is known to be active right at the western county line. This sinkhole is on private property and the landowner continues to monitor growth.

Impacts to the Built Environment

The built environment is far more susceptible to sinkhole impact than any other element. Structures, including residential and commercial properties may be unusable for long periods and even destroyed. Direct impact from a sinkhole can devastate a single household, even if the actual damage is not substantial and easily repaired.

The fear associated with returning to a home damaged by a sinkhole can be overwhelming causing the occupants psychological stress. They may be forced to sell what was once their dream property simply from the fear of another event occurring. Additionally, disclosure to potential buyers may force property owners to take a loss on their investment.

The built environment includes all structures produced by humans. This includes infrastructure such as roads, under and above ground utilities and other utility structures. Water and sewer systems are particularly vulnerable with consequences in that providing services without these systems is not possible. This report provides more detail about infrastructure in the Critical Facilities section.

Impact to Critical Facilities

While there is no increased vulnerability to an event of this type, the consequences to the loss of function in a critical facility may be monumental. Critical facilities are those facilities that provide critical and essential service. These include fire and police stations, utility providers, communications facilities and the like.

In some cases, these facilities may not even be inhabited, but their functional loss can have grave consequences. A loss of electric utilities may prevent lifesaving treatments, both residential and commercial. Displaced fire stations will result in longer response times and diminish service capability. The loss of water or sewer treatment plants and its supporting infrastructure can result in neighborhoods without service and the need to deliver water as well as unsanitary conditions without sewer service.

Economic Impacts

Sinkholes, like any other calamity, will disrupt the economic flow depending on the extent of impact. Typically, sinkholes are small scale in nature and while sometimes tragic, do not usually create an insurmountable economic slowdown. Local businesses may suffer from decreased traffic and if directly impacted, may close their doors but only long enough for repair or relocation completion.

A significant sinkhole in a tourist driven area could lead to negative publicity, which may decrease visitation. If the event is large enough and impacts a major theme park directly, there are generally enough resources to stymie or offset the revenue shortfall.

Environment Impacts

The sinkhole phenomenon is a natural event creating many lakes in the central Florida region. Conversely, a sinkhole occurring in an industrial area or area with hazardous material storage can result in pollution to the aquifer. Some of this depends on the type sinkhole and how deep below the surface the erosive water force. Not typical in Osceola County, the large and sudden karst collapse generally is a deeper and a more significant event leading to a higher potential for aquifer waste intrusion.

Duration

The actual duration of a sinkhole formation is variable depending on the development process. Osceola County sinkholes are those, which require some time to develop. They are typically slow but if rapid, are generally of the smaller variety.

Intensity

This term may not appropriately apply to sinkholes. Some hazards bring about periods of intense consequences, but sinkholes typical lumber along and in appearance time are short. Intensity does not aptly describe the consequences in either sinkhole formation methodology.

Predictability

There is currently research attempting to provide some degree of predictability. The process has not had a great deal of success. Although when and if remains an unknown, it is possible to know potential sinkhole locations. Certain geological testing and ground penetrating radar allows geologists to know where sinkholes may occur. Knowledge of Florida's karst topography can also be of aid in predictability and vulnerability.

Risk Assessment

A number of criteria provide the foundation in determining the level of risk of sinkholes. Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood of sinkhole activity to result in adverse conditions that would cause injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is table that includes each criterion evaluated to determine the level of risk sinkhole activity has on Osceola County.

Sinkhole (Rating: 21)

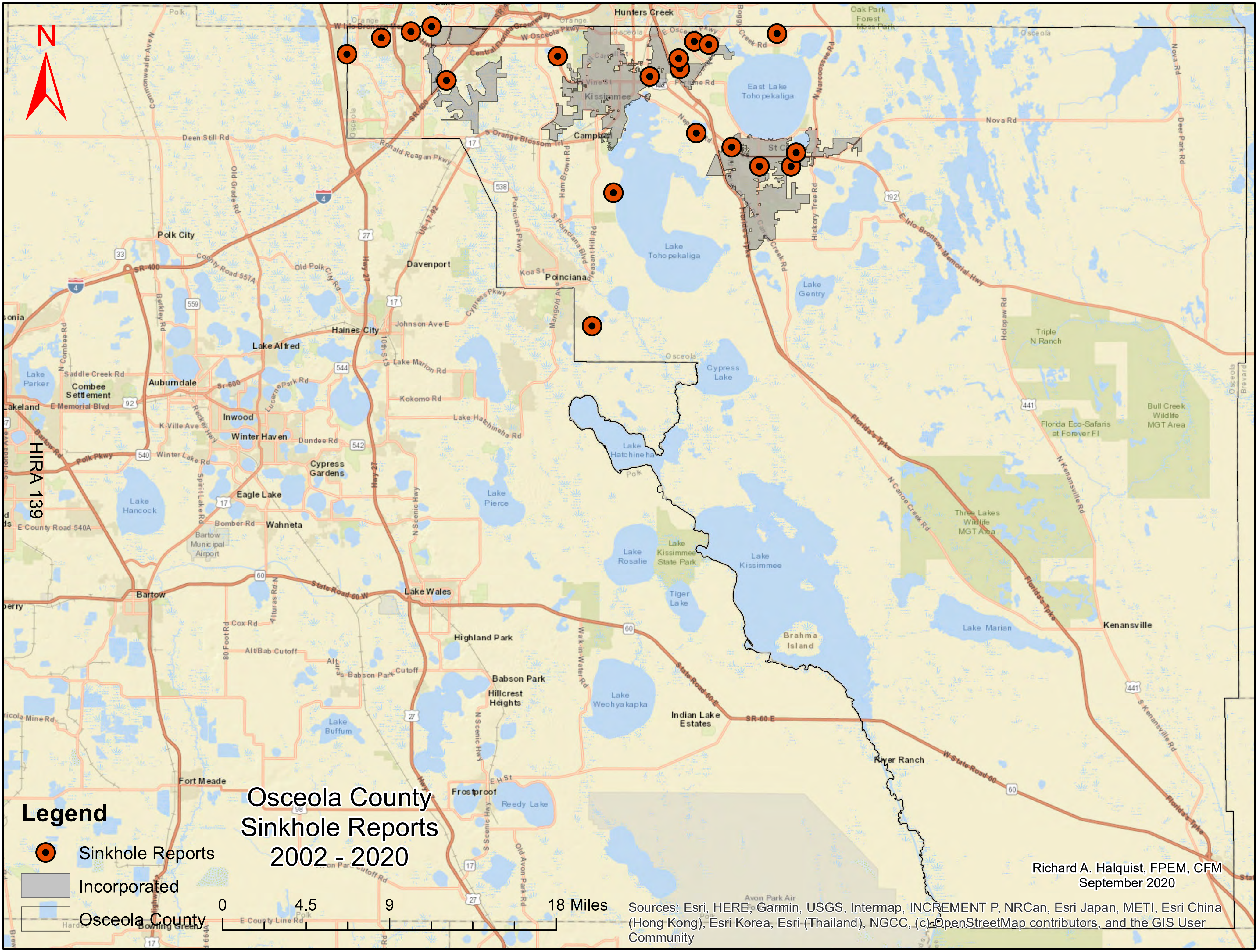
Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence					1	
Capacity to cause damage					1	
Geographic Impact					1	
Speed of onset (warning time)		4				
Percent of population affected					1	
Potential for causing casualties					1	
Potential for causing negative economic impact					1	
Duration of event				2		
Seasonal pattern						0
Environmental impact					1	
Predictability of hazard						0
Impact mitigation potential (reverse rating)			3			
Warning system capability		4				
Corollary effects					1	
TOTAL	0	8	3	2	8	0

=21

Osceola County geological, ground and soil features can produce sinkholes. Typically, in the majority of the County, the type sinkhole has a less devastating human impact. The built environment is far more susceptible to the impact of sinkholes. This is due primarily to the slow development, lacking the large collapse of earthen limestone.

Geographical Impact Resource Maps

- Reported Sinkholes


Osceola County
Sinkhole Reports
2002 - 2020
Legend
Sinkhole Reports
Incorporated
Osceola County
0
4.5
9
18 Miles
N
HIRA 139
Richard A. Halquist, FPEM, CFM
September 2020
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Hunters Creek
Kissimmee
St Cloud
Poinciana
Davenport
Haines City
Lake Alfred
Polk City
Auburndale
Inwood
Winter Haven
Cypress Gardens
Eagle Lake
Wahneta
Bartow
Lake Wales
Highland Park
Babson Park
Hillcrest Heights
Indian Lake Estates
Frostproof
Fort Meade
Kenansville
River Ranch
Combee Settlement
Lake Tohopekaliga
East Lake Tohopekaliga
Lake Kissimmee
Lake Marian
Lake Hatchineha
Cypress Lake
Lake Gentry
Lake Rosalie
Lake Pierce
Lake Weohyakapka
Reedy Lake
Lake Hancock
Triple N Ranch
Bull Creek Wildlife MGT Area
Three Lakes Wildlife MGT Area
Lake Kissimmee State Park
Florida's Tpke

Mitigation Measures

This section provides mitigation measures for the impact of sinkholes. Some of the mitigation measure ideas provided in this section references the guidance FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.

Map and Assess Vulnerability

Some areas with sinkhole risk may not be fully identified in your community. Consider actions such as:

- Using GIS to map areas that are susceptible to sinkholes.
- Identifying and mapping geologically unstable terrain so that development can be prevented or eliminated.
- Using ground-penetrating radar to areas of instability and map their location.
- Improving accuracy of hazard area maps to educate residents about unanticipated risks. Upgrading maps provides a truer measure of risks to a community.

Manage Development in High-Risk Areas

Development regulations should consider areas with unstable/poor soil conditions, including the following:

- Prohibiting development in areas that have been identified as at-risk to sinkhole formation.
- Restricting development in areas with soil that is considered poor or unsuitable for development.

Considerations in Building Design

If sinkholes are considered during building design, future damage may be prevented. Potential actions include:

- Educating design professionals about where to locate high risk areas.

Remove Existing Structures from Hazard Areas

To prevent property loss, acquire and demolish or relocate buildings and infrastructure in high-risk areas.

Educate Residents about Sinkholes

Increase residents' knowledge of sinkholes through the following:

- Promoting community awareness of risks and impacts.
- Offering GIS hazard mapping online for residents and design professionals.

Natural Hazard

2020

Climate Change

Risk and Vulnerability Rating: 19

CLIMATE CHANGE *(LOW RATING: 19)*

Climate change refers to long-term fluctuations in climate patterns that can disrupt the delicate balance of natural ecosystems. Conditions on Earth are never in equilibrium, and as such, climate change has always existed and will continue to always exist. Various contributing factors relate to changes in climate patterns including: solar irradiance, changes in the earth's reflectivity, and contributions to the earth's greenhouse effect.

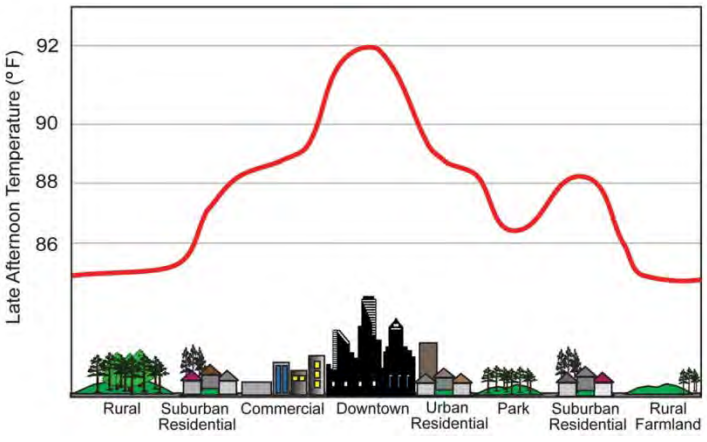
A portion of the scientific community believes that human factors may also contribute to the change in climate patterns. Technological advances that produce excessive emissions of carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons into the earth's atmosphere may negatively affect the earth's climate.

As a specific hazard, it is difficult to quantify a direct impact, but the corollary effects of climate change, regardless of cause, are most detrimental. The adverse effect includes; sea level rise, increased extremes in temperatures, reduction in air quality, and the predominance of climate-enhanced weather hazards such as flooding and severe storms. An additional factor is that climate change is ongoing as demonstrated by the reported duration.

Sustained changes in climate are believed to affect the health of a population. Warmer average temperatures can lead to more frequent and longer heat waves, increasing the number of heat-related illnesses and fatalities. Children and older adults are more vulnerable to heat-related illnesses. Osceola County's population under the age of 18 and over the age of 65 makes up 38% of the total population (U.S. Census, 2013).

Increasing Temperatures

Scientist have found that over the past century, the average temperature of the Earth has increased by 1.4 degrees Fahrenheit, and is predicted to increase by another 2-11 degrees over the next 100 years (EPA). This phenomenon may result in record temperatures in summer and winter seasons, produce more frequent or heavier rainfall, and rise in sea levels.



Urban areas include a dense built environment with limited vegetation and dry impermeable surfaces. Large amounts of concrete and asphalt in urban areas absorb and hold heat. Tall buildings prevent heat from dissipating and reduce air flow. At the same time, there is generally little vegetation to provide shade and

evaporative cooling. As a result, urban areas can be up to 10 degrees Fahrenheit warmer than the surrounding rural areas (U.S. Global Change Research Program). This phenomenon is referred to as the "heat island effect". The above graph illustrates temperature levels at various landscapes.

Sea Level Rise

According to the NOAA, global sea level is rising at an increased rate. The reported predominant cause of global sea-level rise is thermal expansion created by the warming of the oceans (water expands as it warms) (NOAA). Indirectly, the melting of land-based ice (such as glaciers and polar ice caps), due to rising temperatures, contributes to water volume in the oceans. NOAA also reports a sea level decline in certain areas including Alaska and Louisiana, the latter attributed to subsidence.

While coastal communities may see a more direct vulnerability to this phenomenon, inland communities like Osceola County are also impacted. Osceola County has large bodies of water that can potentially be affected by thermal expansion. Additionally, stream flow that normally traverses to other external water bodies, including the ocean, may be impeded or reduced through expansion and subsequent rise.

Sea level rise as a result of climate change also impacts the fresh water aquifer. Osceola County has a large fresh water resource. This resource geographically lies to the eastern side of the county. As such, the eastern boundary is only 16 miles from the coast and saltwater intrusion may impact the natural water resources of the county.

Records and research indicate that sea level has been steadily rising at a rate of 0.04 to 0.1 inches per year since 1900. The rise in sea level would need to increase 20 feet before Osceola County was directly impacted (NOAA). Osceola County may be indirectly impacted by increased demands from affected coastal communities.

Osceola County is located in central Florida and specifically provides the headwaters of the Everglades to the south. Sea level rise may impede the natural flow of water to the east and south. This impediment would result in the increasing flood potential. The subsequent affect will be an increase in flood depth. The hazard map depicts the normal 2% annual chance boundary with an expected depth of 3.5’ at Jane Green Creek. Sea level rise could push this depth point to 3.88’, a measure expected in a one percent annual chance of flooding.

Air Quality

When energy from the sun reaches the Earth, the planet absorbs some of this energy and radiates the rest back to space as heat. Atmospheric gases like carbon dioxide and methane can trap this energy and prevent the heat from escaping (EPA). Scientists have predicted that warmer temperatures from climate change

may increase the frequency of harmful air pollutants, contributing to aggravated respiratory conditions (EPA 2018).

The table demonstrates a quantitative measure of air quality hazard potential. Since the harmful atmospheric gases vary in concentration and standard measure, the most likely standard of magnitude is the Air Quality Index (AQI).

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

Vulnerability

All of Osceola County and its jurisdictions are vulnerable to climate change in some way. The population centers to the north and west, including the cities, are most vulnerable to degraded air quality, temperature extremes and flooding. Areas to the east and south, the more agricultural areas, are susceptible to the same; however, the population is less.

Impacts

Impacts include human exposure to increased extreme weather events, acute and chronic health conditions related to increasing AQI numbers and flooding potential. For full details on flooding, review the Flood Hazard section of this document.

Excessive AQI numbers can relate to a negative impact on the livestock and sensitive flora and fauna in the ranch and farmlands of the county. This includes crops on commercial farms. Ranches and farmlands, while susceptible to flooding, generally have natural mitigation measures and can relocate livestock

The impact map later in this section demonstrates the expected areas in relation to impact. To date, there are no known impacts to Osceola County.

Risk Assessment

Climate change is a new emerging topic and there has been insufficient correlation between previous local events to enumerate specific occurrences. Based on current studies, a number of criteria provide the foundation in determining the level of risk for climate change. Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood of a change in climate patterns to result in adverse conditions that would cause injury or damage.

Given the expected affects, all of Osceola County is at risk from climate change. While specific areas may receive different impacts. The hazard applies to the entire county. The criteria also include any corollary effect attributed directly to the assessed event. Below is table that includes each evaluated criterion thereby determining the level of risk climate change has on Osceola County.

Climate Change (Rating: 19)

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence					1	
Capacity to cause damage					1	
Geographic Impact			3			
Speed of onset (warning time)						0
Percent of population affected				2		
Potential for causing casualties						0
Potential for causing negative economic impact					1	
Duration of event				2		
Seasonal pattern			3			
Environmental impact				2		
Predictability of hazard					1	
Impact mitigation potential (reverse rating)					1	
Warning system capability						0
Corollary effects				2		
TOTAL	0	0	6	8	5	0

=19

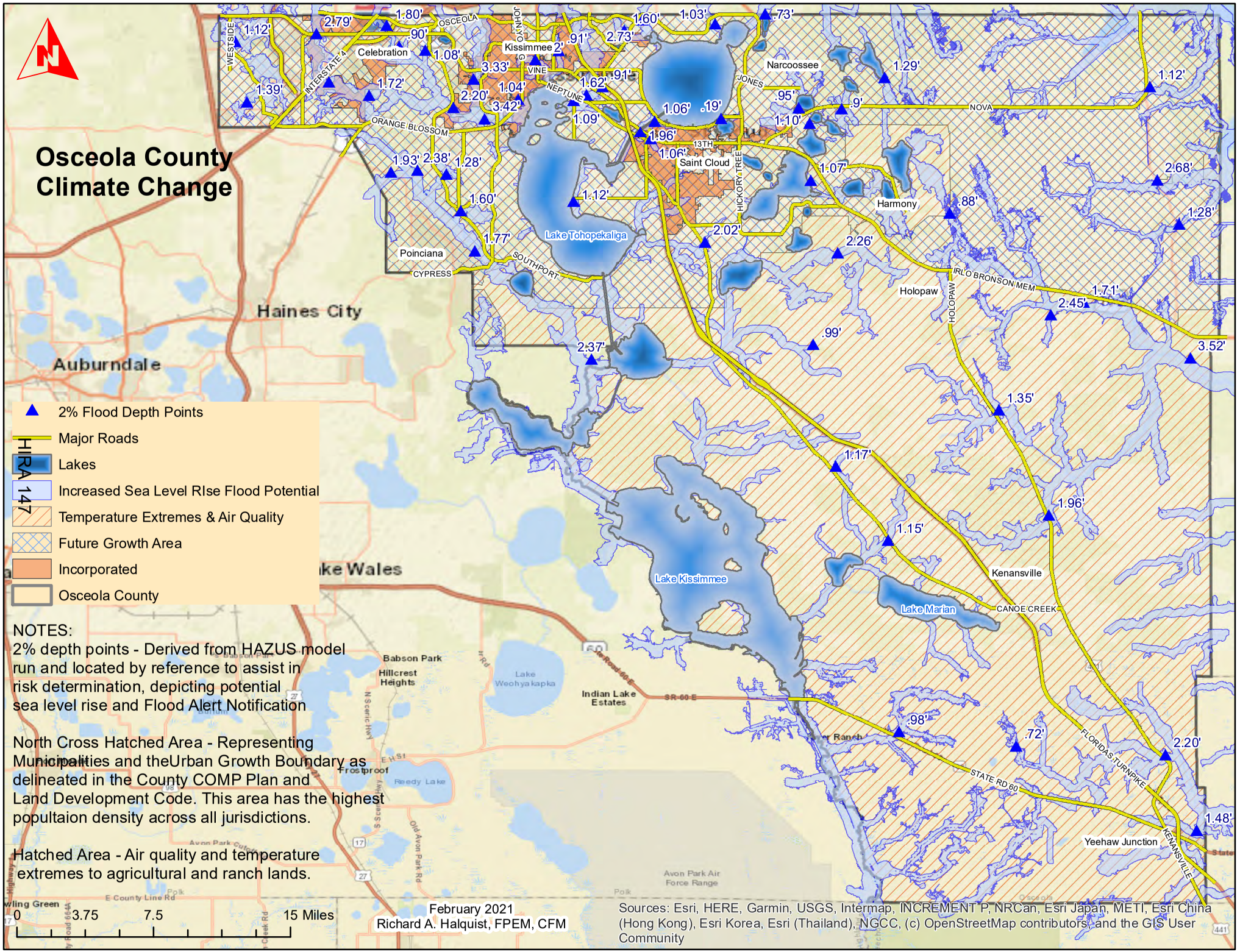
Planners recognize that the climate is always changing and that many influences contribute to climate conditions. The likelihood of climate change affecting Osceola County during the next decade is minimal. If the County were impacted, there would be no geographic limitations. Climate change produces corollary effects that could potentially impact the County in the future.

Warning systems are not in place specifically for climate change, but are available for specific indirect events. Seasonal patterns may be impacted by climate change

with record high temperatures in summer months, more frequent or heavier rainfall in rainy seasons, and colder temperatures in the winter season. Today, many scientists are committed to monitoring climate change and the potential consequences resulting in changes to weather patterns.

Geographical Impact Resource Maps

- Climate Change Map


Osceola County
Climate Change
2% Flood Depth Points
Major Roads
Lakes
Increased Sea Level RIse Flood Potential
Temperature Extremes & Air Quality
Future Growth Area
Incorporated
Osceola County
HIRA 147
NOTES:
2% depth points - Derived from HAZUS model run and located by reference to assist in risk determination, depicting potential sea level rise and Flood Alert Notification
North Cross Hatched Area - Representing Municipalities and theUrban Growth Boundary as delineated in the County COMP Plan and Land Development Code. This area has the highest popultaion density across all jurisdictions.
Hatched Area - Air quality and temperature extremes to agricultural and ranch lands.
0 3.75 7.5 15 Miles
February 2021
Richard A. Halquist, FPEM, CFM
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Haines City
Auburndale
Lake Wales
Kissimmee
Celebration
Narcoossee
Saint Cloud
Harmony
Poinciana
Holopaw
Kenansville
Yeehaw Junction
Lake Tohopekaliga
Lake Kissimmee
Lake Marian
Lake Weohyakapka
Reedy Lake
Babson Park
Hillcrest Heights
Indian Lake Estates
Frostproof
Avon Park Air Force Range
OSCEOLA
VINE
NEPTUNE
JONES
NOVA
ORANGE BLOSSOM
13TH
HICKORY TREE
SOUTHPORT
CYPRESS
IRLO BRONSON MEM
HOLOPAW
CANOE CREEK
STATE RD 60
FLORIDAS TURNPIKE
KENANSVILLE
WESTSIDE
INTERSTATE 4
SR-60-E

Mitigation Measures

Mitigation measures are strategies supporting implementation of policy or action that reduce the loss of life and property from a disaster. Unfortunately, mitigating for Climate Change is a challenging task.

Increase Hazard Education

Understanding community vulnerability and level of risk is important to identify and prioritize mitigation alternatives. Increase awareness through the following:

- Increase awareness of the negative consequences of climate change to the public when conducting community outreach events.
- Provide literature on the impacts of climate change to media outlets (i.e. websites, social media, etc.)

Enhance Monitoring Systems

Advanced monitoring systems may provide system operators with the necessary information to prevent negative consequences.

- Provide air quality monitoring systems providing early detection of poor air quality index numbers.
- Identify systems that provide advanced warning through early detection of changes in streamflow and significant weather activity.

2020

Man-Made Hazard

Cyber Attack

Risk and Vulnerability Rating: None

CYBER ATTACK *(HIGH RATING: 39)*

The threat of a successful cyber-attack is ever growing, particularly in today's world of constantly evolving and often overwhelming technological advancements. There are several factors to consider in assessing this emerging threat. These include:

- Sector or business under attack
- Proclivity for success
- Skill level of the attacker
- Duration of attack
- Degree of stealth employed
- Access acquired

Having recognized the potential depth in assessing a cyber-attack and to maintain a fairly simple approach, emergency planners considered a moderate level in each area listed above.

An added layer to assessing this hazard, is the many forms it can take. Examples include:

- Social engineering
- Malware
- Bots
- Identity theft
- Data breaches
- Critical Infrastructure attacks
- Network and system hacking

Additionally, the sectors considered are those most likely to impact the widest range of population. These sectors include:

- Financial
- Medical
- Public Safety
- Public Utilities
- General Government

As an example, a successful attack on the electric utility system, public or private, will most likely have a very deep and significant impact to a large population because everyone is affected in various ways. Power shutdown in any of these sectors results in significant negative consequences.

Attackers and methods are quite diverse. They range from a lone individual with the right training, equipment, and access, to a room full of trained, well-financed attackers

working continuously to breech security systems in data infrastructure. Foreign governments are reported to regularly employ the latter technique.

In the end, much of the affects from a successful attack relate directly to motive. Here again, a diverse set of possibilities exist. The personal attack to gain or control information about a single individual varies from the larger scale efforts to steal money or gain control of infrastructure and even sensitive data systems for national defense. Attacking any of these targets has negative consequences despite continued efforts to maintain secure data systems.

Hazard History

To date, there are no known attacks specific to Osceola County other than nuisance attacks, typically aimed at Denial of Service (DOS). The DOS aims specifically at overloading an information system to prevent legitimate requests for service from reaching a target. Small scale malware and viruses attack data systems daily, but are generally intercepted by programs specifically designed to do so.

Larger scale companies operating in the jurisdiction have succumbed to successful attacks, including enormous theft of personal information. These companies include Bank of America, Home Depot, and Target.

Many attackers target the network systems through known vulnerabilities. Their attack approach may vary, but the end desire is the same – access to the internal network of the target. Once inside the firewall, the named system designed to keep the unauthorized out, the attacker can carry out a variety of operations. The installation of certain software designed to monitor network traffic can yield a large amount of information for the attacker.

The attacker may also establish a path to return as necessary to manipulate other things. Gaining access is only one small success; establishing the right stealthy internal process may be the most difficult. Generally, good network practices and security are sufficient to keep out most attackers.

It is important to note that a cyber-attack may come from anywhere around the world, as there are no systems in place to separate the World Wide Web. An attacker sitting in a bungalow in the Ukraine has as much access capability as the neighbor next door. Increasing this risk is the multiple methods of “masking” the origin of the attack.

Vulnerability Analysis

All data systems are vulnerable to cyber-attacks. Even with the latest software and hardware, including the best technicians available, every data system is susceptible. As technology continues to expand, protection increases, but so do the abilities of everyone inclined to develop “hacking” methodologies.

The public safety sector is potentially exposed to a new vulnerability, due to the conversion of radio systems to internet protocol based systems. Bandwidth is

maximized in these systems making more channels available, but the vulnerability is increased by the nature of the packet data systems employed.

With utility control and monitoring systems expanding and becoming more interconnected, their vulnerabilities increase as well. Electronic systems control the flow and routing of material in the systems, all of which are interconnected to maintain continuity across multiple system platforms. Access to a single system, rendering it unusable, potentially brings about calamity to them all.

Organizations and industries as a whole, must be diligent in determining not only what their external threats are, but also what potential internal threats and opportunities for malicious actions exist. Additionally, they must weigh the options in determining what operating systems should be implemented, whether they be a more interconnected, open environment or a more isolated “silo”.

Impacts to the Population

Any successful attack to the sectors listed in this analysis impact the population directly. For example, if the financial system is rendered useless, even if only temporarily, there will be a loss of the ability for merchants to conduct certain types of business. The consumer may be unable to make purchases or receive funds from their paycheck. This is similar also in the power sector; the loss of electricity to dependent customers can result in worsening conditions of patients on life support machinery.

Impacts to the Built Environment

While there may be no direct impact from an attack, the built environment is susceptible in other ways. Monitoring systems for safety may be compromised; transportation within the structure may also be affected. Air management systems, safety monitoring systems (Examples: smoke/fire detection systems, carbon monoxide detection systems, temperature monitoring systems), and security systems are all vulnerable and without them, the built environment may become unusable, even if only for a shot time.

Impacts to Critical Infrastructure

There are many potential impacts to life-sustaining critical infrastructure that may result from cyber-attacks. Transportation networks of all modes, utility facilities, and communication networks all greatly rely on the successful operation and integrity of their various control, conveyance, and monitoring systems. Any successful breach of these systems and interruption in services can have devastating impacts on the communities they serve.

Impact to Essential Facilities

Essential facilities, including public safety, medical, utility, government, and others, bring a cascading harm potential. Radio communications may become compromised creating confusion on the part of responders. The “911” phone system may become inoperable resulting in the inability to receive calls from those in need of service.

Medical facilities dependent on electronic data system may provide false reporting or even not operate at all. Utility systems, as mentioned previously, will be unable to provide normal service. A successful attack on the right data systems could render satellite systems useless. This impact would extend to the general communication capability of everyone dependent on that system including GPS navigation.

Economic Impacts

The corollary effect of cyber-attacks can be quite extensive, including economic impacts. The inability to exchange money and conduct business reduces economic flow and if unchecked, could bring collapse depending on the duration and success of the attack. Most people do not keep a cash supply on-hand and as a result, may not be able to make purchases. Additionally, the public perception of a compromised system, even if unwarranted, can lead to a lack of consumer trust and result in impacts to the local economy and supply chains.

The hospitality industry, which is a large constitutes a large percentage of Osceola County's economy, is particularly vulnerable in that nearly all of the industry systems are electronic. This includes reservation systems and other hotel/motel control systems. Even if there is no evidence of something wrong, the business may be impacted such that they may need to close for the duration of the incident.

Environmental Impacts

Systems responsible for ensuring containment of waste materials may be impacted by a cyber-attack. A cyber-attack may render these systems uncontrollable, requiring extensive cleanup efforts and resulting in considerable damage to the environment. Another potential risk identified by emergency planners is the compromise of water control systems. A breech in the control of local locks may result in both the draw-down of some water bodies and the flooding of others, leading to potential impacts of the local ecosystems including flora and fauna. This would be in addition to any property damages and disruption to local transportation corridors that may also occur due to flooding.

Duration/Intensity and Predictability

The duration and intensity of a cyber-attack depends on the nature of the attack and persistence of the perpetrator(s). A well-orchestrated, long-duration attack may have significant consequences across all sectors and mediums. In certain cases, where a Trojan or other malicious anomaly is able to gain access, entire systems may be controlled for long periods and as such, inflict more damage. Prediction of cyber-attacks is difficult, as the threat is "unseen", however certain intelligence partners are sometimes able to identify potential threats and timeframes for impacts. Critical facilities and systems are constantly monitored for nuisance attacks and other threats. However, the technologies employed by the various potential perpetrators are always evolving and the protective measures in place may not be sufficient to stop more advanced malware.

Risk Assessment

Risk is the application of the hazard as applied to the vulnerability. In applying this to cyber-attack, emergency planners assessed it to be a high risk to the community, primarily as a result of the factors assessed in the table below. The entire population is vulnerable and the impacts are extremely varied and potentially catastrophic.

Cyber Attack (Rating: 39)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence	5						
Capacity to cause damage			3				
Geographic Impact			3				
Speed of onset (warning time)		4					
Percent of population affected			3				
Potential for causing casualties					1		
Potential for causing negative economic impact	5						
Duration of event					1		
Seasonal pattern						0	
Environmental impact				2			
Predictability of hazard		4					
Impact mitigation potential (reverse rating)					1		
Warning system capability			3				
Corollary effects		4					
TOTAL	10	12	12	2	3	0	**=39**

Mitigation Measures

Mitigation measures are strategies which the LMS Working Group can support in implementing to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures cyber-attack events that can be implemented to reduce their impacts.

Increase Public Awareness and Precautionary Actions

Hazard education and awareness activities include:

- Provide the public with information on the dangers of the spread of malware and other cyber-attack methods, including steps to take to protect various systems from their effectiveness. Additionally, industry-specific information should be provided to targeted audiences to help ensure the viability and integrity of their specific systems.

Maintain Situational Awareness

Maintaining situational awareness allows for more timely, appropriate, and effective response measures that help to limit the potential impacts from cyber-attacks. The impacts from these incidents can be mitigated through the following:

- Effective systems monitoring. This improves the reaction time for appropriate response measures to be taken, mitigating the potential impacts of successful cyber-attacks.
- Educate and train partners on best-practices and emerging threats. As many systems are interconnected, they are only as strong as their weakest link. It is important that all individuals and stakeholders with access to various systems know how to operate with proper cyber-security protocols in place.
- Gather and report cyber-security intelligence. The information gathered by each partner and intelligence agencies, such as local law enforcement, Central Florida Intelligence Exchange (CFIX), and the Cybersecurity and Infrastructure Agency (CISA), should be shared as necessary to mitigate the impacts of any cyber-attacks.

Assess and Improve System Security Measures and Protocols

Constant evaluation of existing systems allows for appropriate corrections to security measures and protocols to be made. Examples include:

- CISA-conducted assessment scans. This is currently completed weekly by Kissimmee Utility Authority and has proven to be an effective means for system evaluation and improvement that other critical facilities may choose to replicate.
- The United States Environmental Protection Agency requires regular risk assessments of the systems utilized by utility providers and provides a template for other critical infrastructure partners to follow.
- Communications system jamming drills.
- Participation in assessments conducted by the North American Electric Reliability Corporation and other industry-specific agencies. The Florida Municipal Power Association provides KnowBe4 scanning for its members, setting an example for other industries and agencies to follow.
- Agencies and their partners should conduct inventories to establish an understanding of how their systems operate and determine which elements/components of their operations are isolated and which may be interconnected to other systems outside of their firewalls and security measures.

Ensure System Redundancies

A successful cyber-attack may render primary systems inoperable. Redundancy measures must be in place, especially in regards to critical infrastructure and critical facilities so that may continue to operate. Examples include:

- Ensure that a Continuity of Operations Plan (COOP) is prepared for all key facilities, agencies, and partners.
- Integrate equipment and support redundancies.

2020

Man-Made Hazard

Terrorism

Risk and Vulnerability Rating: 36

TERRORISM *(HIGH RATING: 37)*

Terrorism is defined as any violent or destructive acts committed by individuals or groups aimed at intimidating a population, people or government to accept or met their demands. The purpose of a terror event is to create fear while promoting an ideological goal. Typically, terrorism is not used for materialistic purposes. While there is no internationally agreeable definition, these basic tenets define the nature of terrorism.

The Central Florida region recognizes that terrorism is both foreign and domestic. Certain domestic ideological groups exist in Osceola County as well the region. Each poses a threat to the County as well as the region. The consequences of any terror incident are significant and every method of mitigation should be employed to reduce the effects.

Hazard History

There are no specific reportable terrorism incidents within Osceola County, however there are ties to several acts outside of the jurisdiction. Several of the individuals responsible for the September 11, 2001 terror attacks on the nation trained in Florida and at least two here in Osceola County. Even as recent as the Boston Bombing Attack of April 15, 2013, at least one of the perpetrators resided locally. There is an abundance of evidence that terror support activity continues to exist within the jurisdiction.

The Central Florida Intelligence Exchange reports there are several incidents of elicitation within Osceola County over the past several years. One example is that of surveillance of a critical facility. In many of these cases, activity was observed and reported by trained individuals.

In 2018, a security breach occurred at one of Orlando Utilities Commission's (OUC) facilities in Seminole County. The incident involved a vehicle that drove through two security gates protecting critical infrastructure. Nothing further came from the incident, but there was potential for great damage and impact to the provision of utility services to the area. OUC provides electric services within the portion of Osceola County surrounding the City of Saint Cloud and a similar attack could potentially result in power loss to thousands of households.

Vulnerability Analysis

There is significant vulnerability with Osceola County. The jurisdiction provides large open land space and as such, provides the opportunity to house and train individuals with ideological motivation to do harm to the people and country. Additionally, several area attractions and event venues may present attractive targets to potential perpetrators. This vulnerability extends to the principle economic staple, tourism.

Tourism and visitation to Osceola County and the region is extremely vulnerable in that an attack or even a report of activity causes the tourist based influx to decrease.

After the September attacks of 2001, New York experienced a large decline in visitation. This brought a decrease in revenue to businesses. In that circumstance, there was a nationwide appeal to help bolster tourist dollars.

An event in the County or region will certainly decrease the influx of visitation and subsequent revenue. This affect reaches internationally in that every year, millions of visitors come to the area. A certain decline is inevitable and the resulting consequences, grave.

Academic and research facilities such as Valencia College and other area schools may also be viewed as potential targets of terrorism, given the large student populations, potential access to materials of interest, and the sensationalism associated with attacks on schools.

The developing NeoCity technology district is recognized by emergency planners as another potential target, given the materials and technologies housed and employed within the facilities. Additionally, as the district grows and more tenants begin operations, intellectual properties may also serve as a valuable target for terrorist activities.

Impacts to the Population

A terror attack of any type will directly affect the population. The effect is directly related to the specific type of attack. A biological attack is capable of not only impacting the immediate community, but may well spread internationally. Of equal consequence, a radiological material attack affects the immediate area and includes the distant population.

Explosions more likely affect the immediate area. This is not to discount that the fear created by the event has indirect consequences. An ideally placed explosion is directly capable of killing thousands and the psychological effects are long term.

Impacts to the Built Environment

Attacks on the built environment bring about structural and economic damage. There are circumstances whereby a terror attack may render a building unusable for a period of time, if not permanently. An example of a non-explosion attack capable of such an affect is the October 2001 anthrax attack on the publishing building in south Florida. The built environment is susceptible to a wide range of terrorist activity.

Impact to Essential Facilities

Life sustaining critical facilities are particularly susceptible in that a disruption of services resulting from an attack extends well into the population base. The services include electricity, water and water treatment, medical and emergency services, and health care. A successful attack on a critical facility can disable delivery of a wide range of services and ultimately render a large area susceptible to corollary impacts. A

loss of communications infrastructure promotes widespread panic and prevents public safety officials from informing the public. It also prevents coordinated relief efforts.

Economic Impacts

Economic impacts may be among the most significant in a terror event. The nature of the event promotes widespread fear resulting in reduced revenue. Even if business and commerce are not directly affected, the intensity of the event may extend well into the economy. This negative effect is widespread including businesses, manufacturers, and the transportation sector.

Environmental Impacts

Environmental impacts vary widely depending on the type of attack. A radioactive laden bomb will have immediate and long-lasting consequences. An attack on the food supply through some devious mechanism or disease also provides immediate and extended impact. Cleanup following an explosive device may impact the environment. Emergency planners have also identified flood control devices as potential terrorist targets, damage to which could have major environmental impacts.

Duration/Intensity and Predictability

These factors vary depending on the mechanism of delivery. Duration in many circumstances may be long term. Certainly, a device capable of producing a nuclear explosion will be intense and last a very long time, depending on the magnitude.

There is no certainty in the predictability of any of these events. Despite continued efforts to provide predictability, there is no sure, set way to determine if and when an attack may occur. Increases in intelligence and response capabilities may not always be accurate. This is primarily due to such a diverse spectrum of people and organizations willing to initiate an attack to further their cause.

Risk Assessment

Risk is the application of the hazard as applied to the vulnerability. In applying this to terror, there is a high risk, primarily as a result of the factors assessed in the table below. The entire population is vulnerable whether simultaneously or in time-phased increments.

Terrorism (Rating: 37)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence					1		
Capacity to cause damage	5						
Geographic Impact			3				
Speed of onset (warning time)			3				
Population affected		4					
Potential for casualties	5						
Potential for negative economic impact	5						
Duration of event			3				
Seasonal pattern						0	
Environmental impact			3				
Predictability of hazard					1		
Impact mitigation potential (reverse rating)					1		
Warning system capability				2			
Corollary effects					1		
TOTAL	15	4	12	2	4	0	**=37**

Mitigation Measures

Mitigation measures are strategies in which the LMS Working Group can support in implementing to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures for the impacts of terrorism.

Preventative and Protective Measures

Identify preventative and protective control measures that focus on protecting structures by deflecting the destructive forces from vulnerable structures and populations. Examples include:

- Repair and strengthen existing structures and infrastructure.
- Prevent an attack by making vulnerable targets less appealing.
- Partners sharing actionable intelligence regarding potential threats can allow for preventative actions to be taken.
- Properly designed landscape and architectural features can delay the execution of an attack.

Regulatory Measures

Regulatory measures include legal and other regulatory instruments that governments use to prevent, reduce, or prepare for the losses associated with manmade hazard events that affect commercial buildings. Examples include:

- Legislation that organizes and distributes responsibilities to protect a community from manmade threats.
- Regulations that reduce the financial and social impact of manmade hazards through measures such as insurance.
- New or updated design and construction codes
- New or modified land use and zoning regulations

Man-Made Hazard

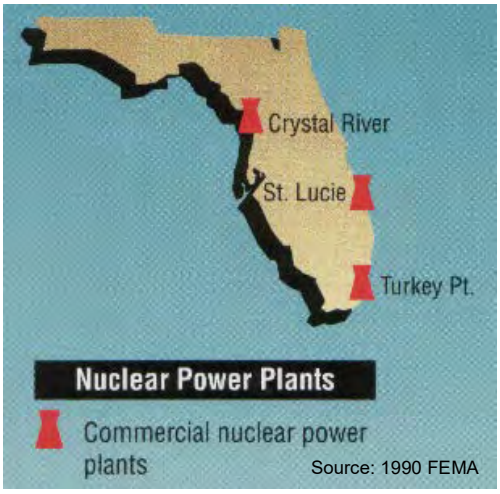
2020

Nuclear Facility Incident

Risk and Vulnerability Rating: 36

NUCLEAR FACILITY INCIDENT *(HIGH RATING: 36)*

Osceola County is susceptible to the effect of a nuclear facility incident in that a portion of the county lies within the ingestion pathway. The ingestion pathway is a geographical area within a 50-mile radius of an operating nuclear plant. The St. Lucie Nuclear Power Facility located on Hutchinson Island in St. Lucie County is that facility. The total exposure area in Osceola County is approximately 90 square miles.



The ingestion pathway assumes that in a catastrophic plant failure resulting in a radiological release, radioactive material will spread out as fallout. The assumption is also that fallout carried by the atmosphere will spread to at least a portion of the County. This material may not immediately affect the population; however, it will last a longtime in agriculture products and livestock.

There is also the expectation that evacuees will travel out of the direct impact area and ultimately to Osceola County. There is a risk associated with evacuation in that the persons and transportation modes possibly carry radioactive contamination. The material may not immediately affect the evacuating people, but in time, the exposure may have negative results.

Hazard History

There have been no known events at the facility resulting in a release affecting Osceola County. There are other incidents at other facilities enough to demonstrate the need to classify this hazard. The St. Lucie plant lies on the Atlantic Ocean and is vulnerable to significant weather events including hurricanes, earthquake, and tsunamis.

At the time of this analysis, none of these has significantly impacted the plant, but the Fukushima incident in 2011, is sufficient to substantiate mitigation practices. Osceola County Emergency Management is a member of the St. Lucie Nuclear Planning Task Force.

Vulnerability Analysis

Only a portion of the jurisdiction is within the ingestion pathway. Directly related to the hazard, but secondary to ingestion, is the potential spread of contamination by evacuees. Osceola County has the longest stretch of the Florida's Turnpike. This route may be the evacuation route of choice for those within the 10-mile evacuation zone.

The Osceola County Turnpike portion is nearly 45 miles without an exit. This presents a large challenge should an incident occur. Since this is primarily a health challenge, Emergency Management official's effort is coordinating the necessary resources supporting the Department of Health response.

The point of entry into Osceola County has little available resources within a rapid response. This is primarily due to the principle sparse population in the extreme southeastern portion of the County. The jurisdiction relies primarily on one fire station within thirty miles.

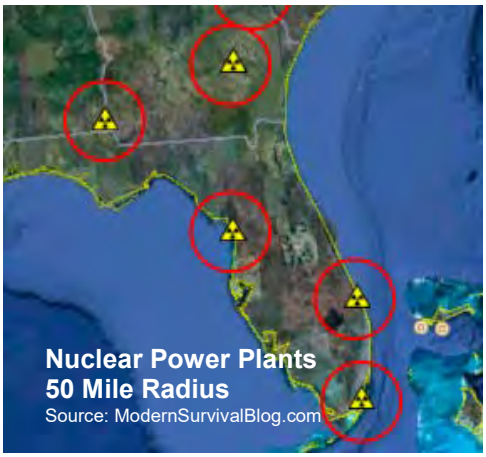
Impacts to the Population

The primary impact is a significant, long-term health risk. This occurs through the contamination of livestock and agriculture and may not be evident for years. Department of Health officials and many other agencies will monitor the area should a release occur.

Should evacuees stop in Osceola County after evacuation, their mode of transportation may require decontamination and monitoring. The evacuees would also need decontamination and possible treatment for radiation exposure.

Impacts to the Built Environment

The built environment is not generally affected, except that facilities required to decontaminate may undergo extensive decontamination and be rendered useless until complete.



Impact to Essential Facilities

There is no direct impact from a facility plant release. The most significant impact is the demand for resources and still maintaining appropriate resources for the normal routine.

Economic Impacts

Agricultural and livestock economies may be impacted for years. Production will halt and when it does return, constant monitoring is required to ensure there is no extended threat. Additionally, a decline in tourism is possible as prospective visitors may view the area as unsafe and may not have appropriate information about the event. Any alteration in transportation may increase costs for the consumer.

Environment Impacts

Soil and water are the top two environmental considerations. A release of nuclear material into the atmosphere producing fallout creates a potential for contamination. The material must be cleaned up, but prior to the completion, the hazardous material may make its way into the surface and ground water.

The soil also will take on the fallout and render unusable for anything. There three factors regarding protection for radiation, time, distance and shielding. The soil and water cannot be shielded and to cover the contamination will only delay cleanup. Any radioactive material making its way into the ground water can have grave consequences.

Duration/Intensity and Predictability

The initial duration may be short-lived and the intensity is relative to the type incident. Predictability is a factor that remains undetermined. The consequences of a fallout contamination will have long-lasting effects.

Risk Assessment

Risk is the application of the hazard as applied to the vulnerability. In applying this to pandemic, there is a high risk, primarily as a result of the factors assessed in the table below. The entire population is vulnerable whether simultaneously or in time-phased increments.

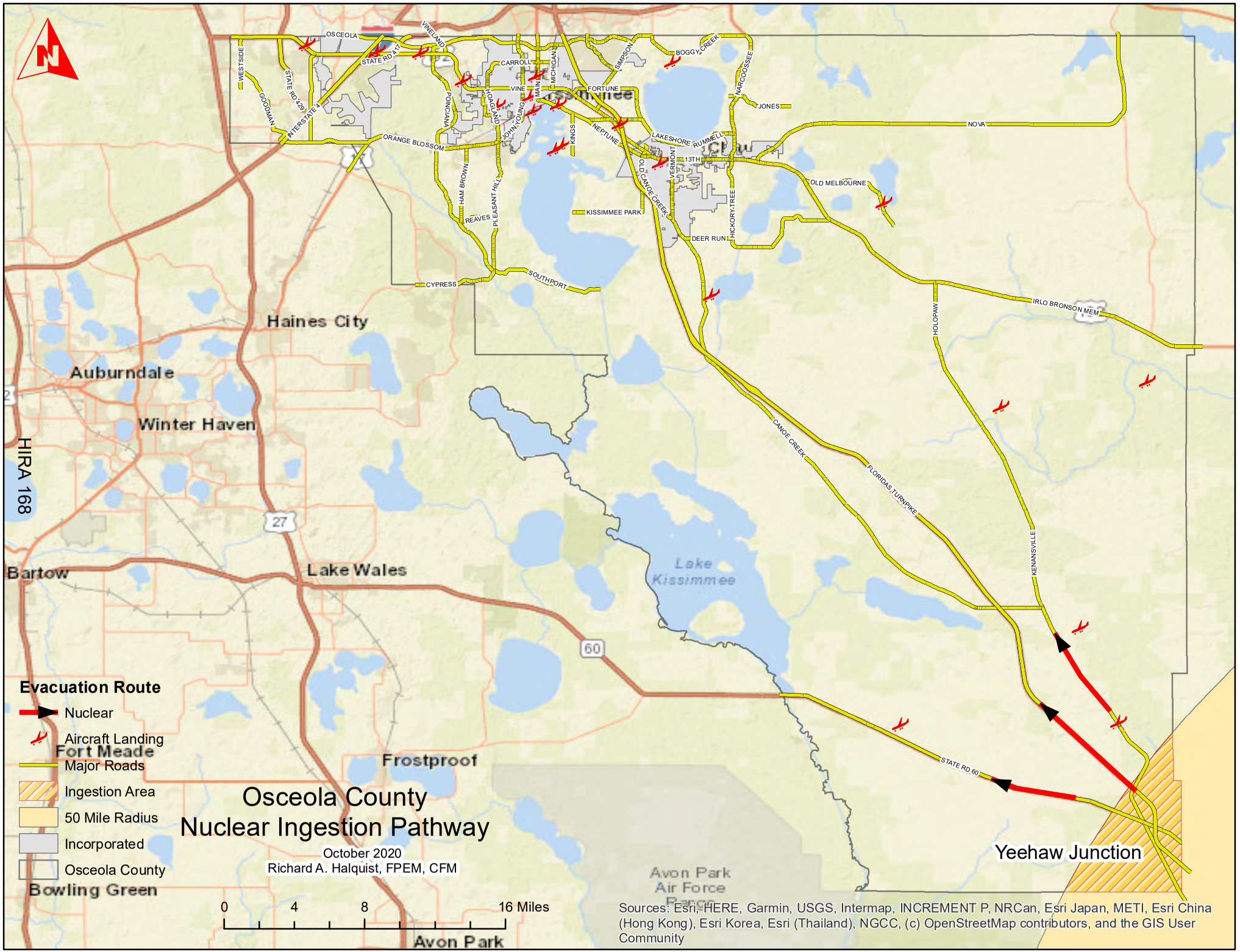
NUCLEAR FACILITY INCIDENT (Rating: 36)

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence					1	
Capacity to cause damage				2		
Geographic Impact				2		
Speed of onset (warning time)		4				
Percent of population affected		4				
Potential for causing casualties			3			
Potential for causing negative economic impact			3			
Duration of event			3			
Seasonal pattern						0
Environmental impact		4				
Predictability of hazard					1	
Impact mitigation potential (reverse rating)		4				
Warning system capability						0
Corollary effects	5					
TOTAL	5	16	9	4	2	0

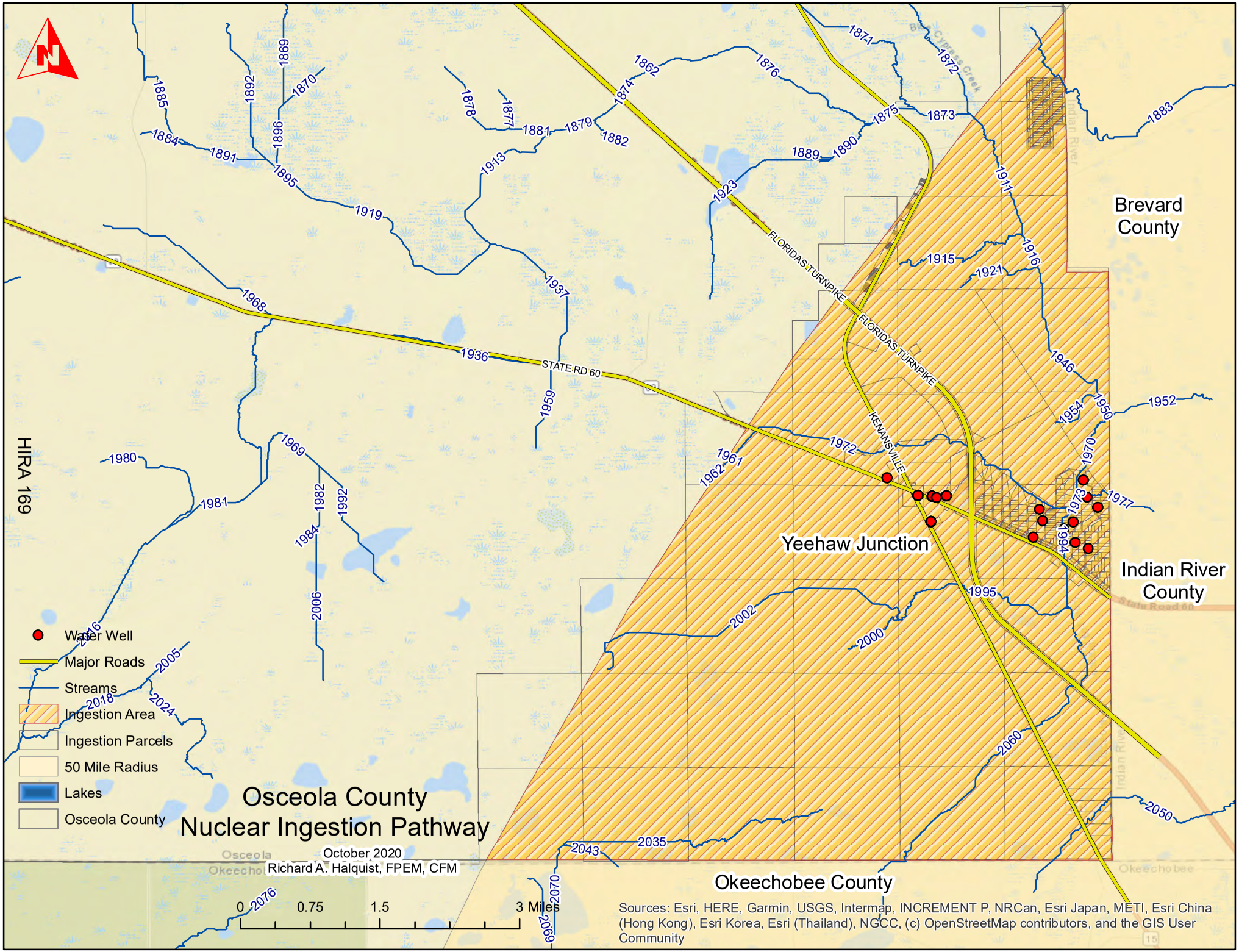
=36

Geographical Impact Resource Maps

- County Nuclear Ingestion Pathway



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community


Brevard County
Indian River County
Okeechobee County
Yeehaw Junction
FLORIDAS TURNPIKE
STATE RD 60
KENANSVILLE
HIRA 169
Water Well
Major Roads
Streams
Ingestion Area
Ingestion Parcels
50 Mile Radius
Lakes
Osceola County
Osceola County
Nuclear Ingestion Pathway
October 2020
Richard A. Halquist, FPEM, CFM
0 0.75 1.5 3 Miles
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Mitigation Measures

Mitigation measures are strategies in which the LMS Working Group can support in implementing to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures for the impact of nuclear power plan emergencies.

The U.S. Nuclear Regulatory Commission issued a Mitigation Strategies Order on March 12, 2012, requiring all U.S. nuclear power plants to implement strategies that will allow them to cope without their permanent electrical power sources for an indefinite amount of time. Below are some of the mitigation strategies that can be implemented.

Nuclear Plant Hardening

Identify and implement additional strategies that keep the nuclear reactor core and spent fuel cool, as well as protect the thick concrete containment buildings that surround the reactor.

- Installation of portable backup pumps, hoses and diesel generators at nuclear power facilities.
- Installation of battery banks and pumps at nuclear power facilities.
- Coordinate regional response of supplies from offsite and regional response centers.
- Installation of severe accident capable hardened vents.

Educate the Public

Maintain public awareness of the impacts a nuclear power plant emergency would generate. Include the following in community outreach events, social media and other public media outlets:

- Map illustrating the impact zone of a nuclear release.
- Provide information on procedures to follow during a release.

2020

Man-Made Hazard

Civil Unrest

Risk and Vulnerability Rating: 33

Civil Unrest *(HIGH RATING: 33)*

Civil unrest generally relates to an incident or event that includes the element of mass gatherings (which may sometimes limit access to facilities or transportation corridors), acts of disobedience, looting, and the defacing or destruction of property. This may be the result of multiple events or circumstances. Controlling such activities is a law enforcement function, and while emergency planners view civil unrest as primarily a corollary event as opposed to a causative agent, they recognize the need for the community to be prepared and take mitigating actions.

In this analysis, civil unrest includes a variety of incidents that may also be known under many various terms, including the following:

- Civil Disorder
- Demonstration
- Assembly
- Riot
- Uprising
- Unlawful Assembly
- Civil Disobedience
- Unnoticed Event
- Spontaneous Event

It should be understood that for the purposes of scoring this assessment, civil unrest is any incident resulting in damage and the disruption of services, regardless of cause, wherein the jurisdiction may be overwhelmed.

Hazard History

There are many examples of civil unrest throughout the world as well as throughout time. During the editing of this document, there are daily occurrences of civil unrest rising to a significantly notable level. These situations have resulted in hundreds of millions of dollars in damages and have also resulted in numerous deaths. It has become a daily visual in the media and exposure is compounded by the use of social media.

Most recently, groups known as ANTIFA (Anti-fascist) and BLM (Black Lives Matter) have made headlines in promoting civil unrest resulting in riotous behavior in some the nation's largest cities including; Atlanta, Chicago, Los Angeles, Portland and Washington DC. The protests have made their way even into the smaller communities nationwide to include Orlando, Saint Cloud, and Kissimmee.

Locally, there have been no reported damages despite peaceful marches. During the summer months of 2020, some protests sought to halt traffic but did not escalate to violence and despite the minor skirmishes nearly all have gone without incident.

Vulnerability Analysis

The County is vulnerable to civil unrest in several ways. Political ideology and natural distaste for the government may result in an incident of civil unrest. Central Florida is a multicultural and diverse community with many international visitors every year. A traveler bringing a message of violence or incitement can spurn unrest potential.

Even in the course of day-to-day activity, law enforcement activities as well as actions by other citizens can incite unrest. This is particularly evident in the famous Trevon Martin incident where a portion of the community believed there was injustice in the lack of arrest of an individual responsible for the death of a black youth. While most of the protests remained peaceful, the event extended through the trial creating community tension and the potential for violent uprising.

Impacts to the Population

A civil uprising can have a significant community impact. The term may be long and consequences grave. The face of a community may be changed forever following a single large-scale uprising. Civil uprising or unrest can spread to other communities, locally as well as nationally and even internationally. These long term effects can injure many and even result in fatalities.

Impacts to the Built Environment

The built environment is notably vulnerable. Those persons inciting and participating lash out against residential, business, and government facilities. Their emotions are manifest in destroying property. There is no measurable determination on what portion of the built environment may be subject to the violence. It is fair to assess that the built environment will be the target of a large civil unrest event.

Impact to Essential Facilities

Critical facilities, particularly those representative of government, may be significantly impacted. Malicious attacks on infrastructure are common. These include power and communications facilities as well as healthcare facilities, fire/ rescue services, law enforcement resources, traffic control devices, and public services, such as parks and equipment. Emergency response vehicles and equipment are also a common target. All of these attacks result in service interruption to the public-at-large.

Economic Impacts

In the wake of an event, businesses may be forced to close, some forever. Pillage of stores and businesses creates a shortfall in the ability to provide service in the area of impact. Osceola County may be subject to a decrease in tourism with widespread media coverage, should an event occur. These are short and long-term impacts that effect the entire community.

Environment Impacts

The environment impacts may be wide-ranging, including the introduction of hazardous materials in the onslaught of a civil uprising. Damage to infrastructure may result in sewer spillage and result in a cascading health concern.

Duration/Intensity and Predictability

The initial duration may be short-lived and the intensity is relative to the initiating incident. Predictability is a factor that remains undetermined. The consequences of a civil unrest may have long-lasting effects.

Risk Assessment

Risk is the application of the hazard as applied to the vulnerability. In applying this to civil unrest, there is a high risk, primarily as a result of the factors assessed in the table below. The entire population is vulnerable, although greater impacts would more likely occur in areas with higher population density and higher-trafficked areas of commerce.

Civil Unrest (Rating: 33)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence				2			
Capacity to cause damage			3				
Geographic Impact					1		
Speed of onset (warning time)		4					
Percent of population affected				2			
Potential for causing casualties					1		
Potential for causing negative economic impact		4					
Duration of event				2			
Seasonal pattern					1		
Environmental impact					1		
Predictability of hazard			3				
Impact mitigation potential (reverse rating)			3				
Warning system capability		4					
Corollary effects				2			
TOTAL	0	12	9	8	4	0	**=33**

Mitigation Measures

Mitigation measures are strategies which the LMS Working Group can support in implementing to reduce the loss of life and property from a civil unrest incident. These include:

Timely and Effective Communications

Efficient communications to responders, stakeholders, and the public can greatly mitigate the impacts of civil unrest by getting key information to those who need it most. Examples include notifying the public of transportation corridors that are impassable so that alternate routes may be taken in order to avoid further congestion and frustrations, identifying specific incident locations to allow for better allocation of response resources, and providing specific messaging to quell further uprising and instill public confidence in local leadership.

- Maintain accurate contact information for key partners and media outlets.
- Establish a positive image of information sharing with the community to achieve buy-in and public trust in messaging. This can be accomplished through building relationships between local leadership and the public by providing consistent, accurate, transparent, and useful messaging via social media and other outlets.
- Foster relationships within the Public Information community and identify those partners suitable for inclusion when it is necessary to activate a Joint Information System.

System and Service Redundancies

The impact of activities associated with civil unrest may render essential systems and services inaccessible or inoperable. Redundancy measures must be in place, especially in regards to critical infrastructure and critical facilities so that may continue to operate.

- Ensure that a Continuity of Operations Plan (COOP) is prepared for all key facilities, agencies, and partners.

Resource Scalability

The impacts of large-scale civil unrest incidents and associated corollary events may extend beyond the local response capabilities. Access to additional resources must be readily available.

- Establish mutual-aid agreements with partner agencies and jurisdictions to ensure that necessary resources are easily accessible when the need arises for an expanded response or when the scope of an incident grows beyond local capabilities, such as a shortfall in uniformed personnel to provide crowd control.
- Secure contracts with resource and service providers, such as traffic control equipment and emergency medical service companies.

2020

Man-Made Hazard

Mass Migration

Risk and Vulnerability Rating: 30

MASS MIGRATION *(MEDIUM RATING: 30)*

Mass migration is the influx of a large group of people and may occur over the long-term or within a short time-frame. It may be the result of a distant disaster or groups of people no longer willing to tolerate oppression or conditions in the society from which they choose to escape. Osceola County adopts the State of Florida's position and methodology for mitigation and must prepare and take mitigation actions.

Hazard History

The Haitian Earthquake of 2010 resulted in many displaced citizens. These people were in need of care and the United States offered to help by providing shelter and medical care on US soil. Special induction sites were established to handle the incoming refugees. As a regional partner, Osceola County supported the event, and did receive some refugees following the Haitian Earthquake, but the reception occurred at the Sanford International Airport.

Most recently, Osceola County received an influx of individuals and families from Puerto Rico and the US Virgin Islands following the impacts of Hurricane Maria in 2017. The impact was felt most by the Osceola County Human Services Office, as they worked with limited resources to provide housing assistance and other services. Additionally, the School District of Osceola County received over 2,500 new student enrollees from the islands.

Vulnerability Analysis

Mass Migration is a possibility in Osceola County due to its geographic location in relation to those countries in the Caribbean and Gulf of Mexico regions. The close proximity to major air and sea ports including accessibility via major roads and rail systems provide ideal conditions for mass migration. A mass influx to the local population has many direct and corollary effects, including a strain on housing inventories, emergency services, local service provision, and social service support programs.

Impacts to the Population

The greatest impact to the local population from mass migration is the provision of essential services and access to resources, as demand and need may greatly exceed the local or regional supply. If appropriate reception procedures, shelter facilities, and assistance programs are not readily available or sufficient for the influx of people, the incoming population may suffer from a lack of services, resources, and housing availability, especially as they will most likely not have an existent social support network. Such stress and potential poor living conditions may exacerbate existing medical conditions or have other ill-effects on both the short-term and long-term health of the individuals seeking refuge.

Impacts to the Built Environment

Facilities may be asked to operate beyond their means, which can have a variety of corollary effects. This may include converting facilities to be used in ways for which they were not designed, such as reception centers or sheltering, limiting their capacity

to accommodate their other normal functions and uses. Increased use and foot-traffic through facilities may result in greater wear and tear.

Impacts to Essential Facilities

Healthcare, fire/rescue services, law enforcement, and traffic facilities may all be asked to operate beyond their means in an attempt to accommodate and serve the influx of people. Potential work force fatigue may occur as employees are asked to work extended hours and/or in expanded capacities. This may impact the facility's ability to operate efficiently and effectively.

Economic Impacts

A large influx of people will greatly affect the balance of supply and demand, which may greatly affect supply chains and lead to shortages of a variety of essential goods and services. Additionally, price gouging may become a concern as individuals and businesses look to capitalize on the situation. In the long-term, more expansive economic impacts may materialize, such as increased housing prices.

Environment Impacts

Depending on the method of travel, migrants may bring with them a variety of flora and fauna for various reasons, which may have both short and long-term effects on the local environment, especially as they have the potential to introduce agricultural and livestock pests and diseases. If a lack of housing and shelter options exist for the incoming population, homeless conditions may result in poor sanitary practices and a lack of sewage management, which can have adverse effects to the local environment.

Duration/Intensity and Predictability

The initial duration may be short-lived and the intensity is relative to the initiating incident. Maintaining awareness on current events and disaster impacts occurring around the world may provide some level of predictability, but it is a factor that remains undetermined. The consequences of a mass migration may have long-lasting effects.

Risk Assessment

Risk is the application of the hazard as applied to the vulnerability. In applying this to mass migration, emergency planners assessed it to be a medium risk to the community, primarily as a result of the factors assessed in the table below. The entire population is vulnerable and the impacts are extremely varied.

Mass Migration (Rating: 30)

Hazard Assessment	5	4	3	2	1	0	
Likelihood of Occurrence				2			
Capacity to cause damage				2			
Geographic Impact			3				
Speed of onset (warning time)			3				
Percent of population affected				2			
Potential for causing casualties					1		
Potential for causing negative economic impact					1		
Duration of event	5						
Seasonal pattern					1		
Environmental impact					1		
Predictability of hazard				2			
Impact mitigation potential (reverse rating)			3				
Warning system capability					1		
Corollary effects			3				
TOTAL	5	0	12	8	5	0	=**30**

Mitigation Measures

Mass migration poses many potential impacts at the County level, but emergency planners recognize Osceola County's role in serving as a participant in the State's Mitigation Response Plan. The County will look to work with regional and State partners in a coordinated response, however the State may deem necessary. This may include assisting in the State's support of a Federal response in the following six primary operational areas, as identified in the State of Florida Mass Migration Annex to the State of Florida Comprehensive Emergency Management Plan:

Enforcement (Intelligence sharing, command and control, mobile command vehicles, and coordination of law enforcement resources)

Apprehension (Check point operations and traffic control)

Processing (Transportation, medical support transportation, crowd/traffic control, and supplies/materials)

Transportation (Movement escort, migrant transportation and resource coordination)

Detention (Space coordination and facilities, medical support, transportation, juvenile care and placement, elderly care, traffic/crowd control, supplies/materials)

Unified Command (Emergency response teams)

Locally, Osceola County can mitigate the potential impacts of a mass migration incident by ensuring that relationships with human services providers are fostered and programs/procedures are well-established in advance of any potential need, in a manner that they may act effectively and in a timely manner when called-upon to do so.

2020

Man-Made Hazard

Transportation Incident

Risk and Vulnerability Rating: 28

TRANSPORTATION INCIDENT *(MEDIUM RATING: 28)*

Osceola County chose to group transportation incidents into a single category encompassing all potential modes of travel. This analysis encompasses road, rail, and air travel hazards, and while each of these may have separate outcomes, each provides a similar impact and subsequent mitigation strategy.

A transportation incident is any incident that occurs outside the normal operational role or ability of the modality. The most common types of incidents relate to crashes such as an aircraft crash or a train vs. vehicle collision at rail crossings. A different example for a train incident is a derailment. Trains derail for different reasons, but most occur because of a track obstruction such as a vehicle or other equipment.

A passenger bus incident most probably is the result or a crash either with another vehicle or with a stationary object. Downed aircraft also have a great potential for casualties and property damage. Other incidents include fires or explosions and can relate to any of the transportation modalities. Only incidents that may have a major impact are relative to this analysis.

Hazard History

The most significant rail incident in Osceola County since reliable records began is the 1993 incident involving an Amtrak train that collided with a stranded truck-borne gas turbine.

While transporting 103 passengers from Tampa, Florida to New York, an Amtrak train derailed after colliding with a tractor-trailer, resulting in 80 injured individuals.

There are regular occurrences of typical rail crossing incidents and with the expected increasing traffic from SunRail, incidents are expected to rise. Since 1945, there have been only two major reported train incidents located within Osceola County. In both instances, the trains derailed due to human error.

In the past 50 years, there have been over 100 aircraft incidents or accidents within Osceola County. Over one third occurred off of airport property, resulting in more than twenty fatalities. All of these accidents involved general aviation aircraft. There has never been a commercial aircraft accident within Osceola County despite Orlando International Airport, the nation's 10th busiest airport with 50.6 million passengers in 2019, lying directly to the north of the County.

Vulnerability Analysis

Transportation incidents typically have the potential to produce a mass-fatality/causality situation. Osceola County is susceptible to roadway, rail, and air traffic incidents, as the jurisdiction is heavily trafficked by all three modes. Increased use of the transportation

infrastructure results in degradation of the existing facilities. If maintenance and improvement plans do not keep up with the increased demand, the quality and safety of the transportation facilities deteriorates, increasing the potential for transportation incidents.

Osceola County roadways experience high-traffic volumes, particularly in the northwest portion of the county where Interstate 4, the Florida Turnpike, and several toll-road segments connect with the local roadway network. Many residents travel to neighboring counties for work, making use of personal vehicles and increasing congestion in the major corridors. Plans are in place for continued expansion of the local roadway network as well as additional toll-roads and highways to connect to other areas of the Central Florida region.

Osceola County has the longest stretch of the Florida Turnpike without an exit, as the major thoroughfare bisects the county starting at the southeast boundary. An incident may render the roadway impassable, impacting not only local residents, but individuals from other jurisdictions traveling through. As the Florida Turnpike serves as an evacuation route for jurisdictions to the south, any delays on this stretch of the road can have detrimental, cascading impacts. This is also true of any potential impacts to Interstate 4, as it also serves as an evacuation route for jurisdictions to the south and west.

The potential implementation of autonomous vehicle services and individual use adds a new facet of transportation safety that must be accounted for. This is especially true in the highly trafficked tourism corridor at the northwest portion of the County, where drivers and pedestrians unfamiliar with the area and a high amount of congestion increase the chances for an incident to occur.

While there is no specific history of major passenger bus incidents, planners believe the right combination of transit conditions could result in a large-scale, long-term situation. This is especially true as population growth and tourism increases drive the potential expansion of public transit development, including new routes, increased ridership, and additional traffic of all modes, including rail.

Rail incidents in Osceola County currently only pose a threat to the central and western portions. There is only one rail corridor transecting the City of Kissimmee from north to south and curving west in the historic downtown area. The system continues west and south through Campbell and Intercession cities (unincorporated), including the Poinciana Industrial Park before exiting the county on the western flag at Loughman.

The main rail line, along with several spurs, were historically owned and operated by CSX Transportation. In July 2018, the Florida Department of Transportation took ownership of the rail line in Osceola County from the Orange County line to just west of Poinciana Boulevard for the SunRail commuter rail project. SunRail has three stations within Osceola County including the Osceola Parkway station, the Kissimmee Station, and the Poinciana station. The Kissimmee station is shared with Amtrak and the Poinciana station has a small maintenance spurline.

SunRail contains 20 southbound trains and 20 northbound trains running from 5:30am to 11:30pm. This line also continues to operate as a major thoroughfare for freight and passengers through the State of Florida. The Kissimmee Train Station in downtown serves two regularly scheduled Amtrak services, the Palmetto and Silver Service, both consisting of a north and southbound daily trip totaling four trains.

These combined services increase risk despite the efforts of coordination. Additional traffic on the line itself coupled with additional passengers provides the mechanism to increase potential causalities. This is primarily due to increased passengers, but also due to the increased traffic on the rail and the roadways intersecting the rail.

In addition to the Kissimmee Gateway Airport, Osceola County is also exposed to air traffic incidents due to its location within the flight paths of the Orlando International Airport, as well as the planned development of a seaplane base in the City of Saint Cloud, which aims to draw increased visitors to the area. This creates a prime opportunity for commercial aircraft crashes. The Patrick Air Force base in Brevard County lies just to the east of the county and the Avon Park Bombing Range to the south, providing many opportunities for military aircraft mishap.

Impacts to the Population

A transportation incident affects the population in several different ways. There is the initial impact as related to the casualties and secondarily, the potential to cause evacuations and even general frustration of an inability to use service. A transportation incident on a rail line carrying hazardous materials directly affects the immediate population both in the short and long-term.

A hazardous agent release may require a long-term evacuation resulting in the need for housing beyond sheltering. This will uproot the persons in the community and the trickle-down affects, including a potential loss of property may be irrecoverable. While the causative agent is the material release, the rail line bares the cleanup responsibility and reputation damage.

Aircraft crashing into a populated area may have a similar impact to that of the rail incident, except that a community might expect a quicker return to some normalcy. With an airliner crash, the thoughts and visions of the deceased in an area may make it impossible for residents to return. Additionally, the loss of life on the ground may be greater from such an incident.

Impacts to the Built Environment

The impact on the built environment is directly related to the mechanism of the incident. An airliner and train may present similarly when impacting a physical building, while a bus may have virtually no impact at all.

Rail incidents will most likely bring about the most significant impact in that the shear mass of a locomotive engine derailing and striking or gouging the infrastructure and built environment will have a longer-term impact. The 1993 Amtrak incident dug an earthen trench to just inches from rupturing a large-diameter high-pressure natural gas line and immediately adjacent to that a liquid fuel transport line as well.

An aircraft crashing and burning in a residential area brings significant impact as well; however, the path of destruction may be longer but with less intense results. The likelihood of significant hazardous material onboard a crashed jetliner is minimal; however, the same materials may exist in a downed military aircraft. Consideration for live munitions is also possible onboard military aircraft.

Impact to Essential Facilities

Impact to essential facilities relates to the demand for service placed on the response community. The expertise may not exist organizationally and a need for outside assistance is expected. Mass transit incident impacts of any real magnitude may be long-term, depending on the location and complexity. These factors are considered in relation to essential facilities.

Demands on medical providers and morgue facilities will be great. There is insufficient appropriate storage for the dead following a significant incident of any kind much less the unexpected transit incident. The need for outside resources is again a large factor related to incidents such as these.

Economic Impacts

Economic impact or loss relates to the location of the incident. Since rail service is fixed with a determined path, it is possible to measure the impact. Services along and in the immediate area of a rail crash are the objects of direct impact. If other transportation, such as roads, is impacted, businesses along the travel routes can expect impact.

Aircraft, while following specific routes, are more apt to crash anywhere. An aircraft crashing into a major theme park area will have a greater economic impact than one that crashes in a remote area of the jurisdiction. The results are similar to a rail incident in that the exposed businesses will receive a negative impact, but tourism overall may also be reduced from the psychological affect.

Environment Impacts

Rail incidents pose the greatest environmental impact. The freight services on rail bring about exposure to many various hazards. Chemicals of all types are delivered by rail and in nearly all cases, it is done safely. In rail travel, there is always the possibility of derailment resulting in a spill of whatever commodity the train is carrying. Some chemicals may have a very long-term impact to the environment and even potentially cause community disruption for years.

Air transport crashes may have some hazardous substances and the fuel payload can impact the environment, but generally for a lesser term than with rail chemicals.

Environmental cleanup following an aircraft incident may only take a short time to remove the harmful substances.

Duration/Intensity and Predictability

The duration of a transportation incident ranges from a few hours to many months and the intensity relates to the amount of damage and casualty rate. The varying investigative agencies work on a timeline and the incident clean-up is the guiding time factor.

There is no predictability to a transportation incident and the expectation is always there. With increasing traffic and increasing payload, including passengers, the potential exists for catastrophic results.

Risk Assessment

A number of criteria provide the foundation in determining the level of risk in a transport incident. Risk is the estimated impact to people, services, facilities, and structures within the County, as well as the likelihood an incident will result in adverse conditions causing injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated to determine the level of risk a transportation incident has on Osceola County.

Transportation Incident (Rating: 28)

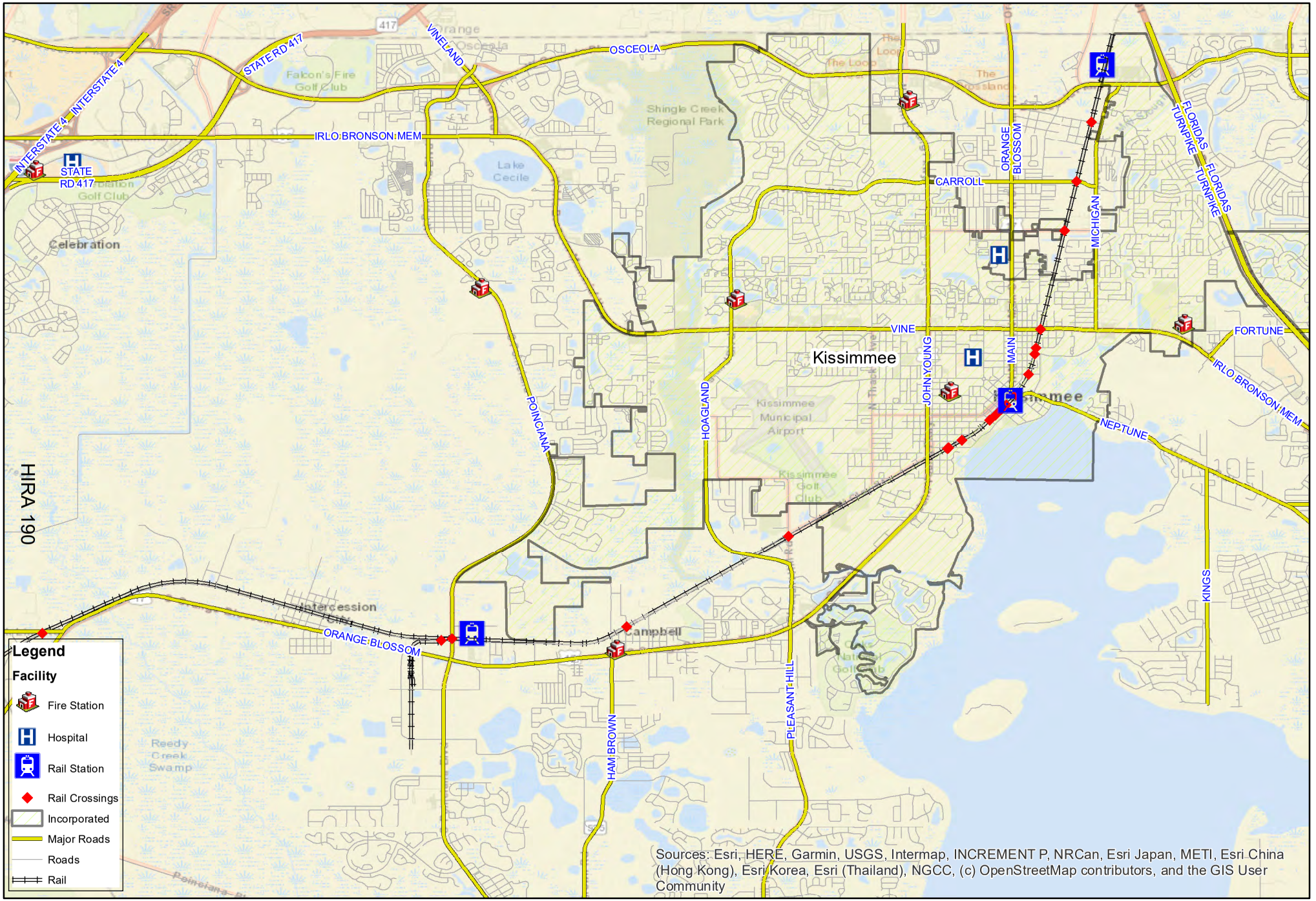
Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence			3			
Capacity to cause damage				2		
Geographic Impact				2		
Speed of onset (warning time)	5					
Percent of population affected				2		
Potential for causing casualties			3			
Potential for causing negative economic impact				2		
Duration of event					1	
Seasonal pattern						0
Environmental impact					1	
Predictability of hazard					1	
Impact mitigation potential (reverse rating)					1	
Warning system capability			3			
Corollary effects				2		
TOTAL	5	0	9	10	4	0

=28

Transportation incidents happen regularly. Incidents referred to in this analysis relate to those incidents with catastrophic results. Aircraft initially appears the most devastating and rail has the longest term affect. In all cases, transportation mishaps bring a wide range of similarities, all of which affect the community as well as the service and patrons involved.

Geographical Impact Resource Maps

- Rail Crossings
- Air Transportation Facilities and Special Planning Areas

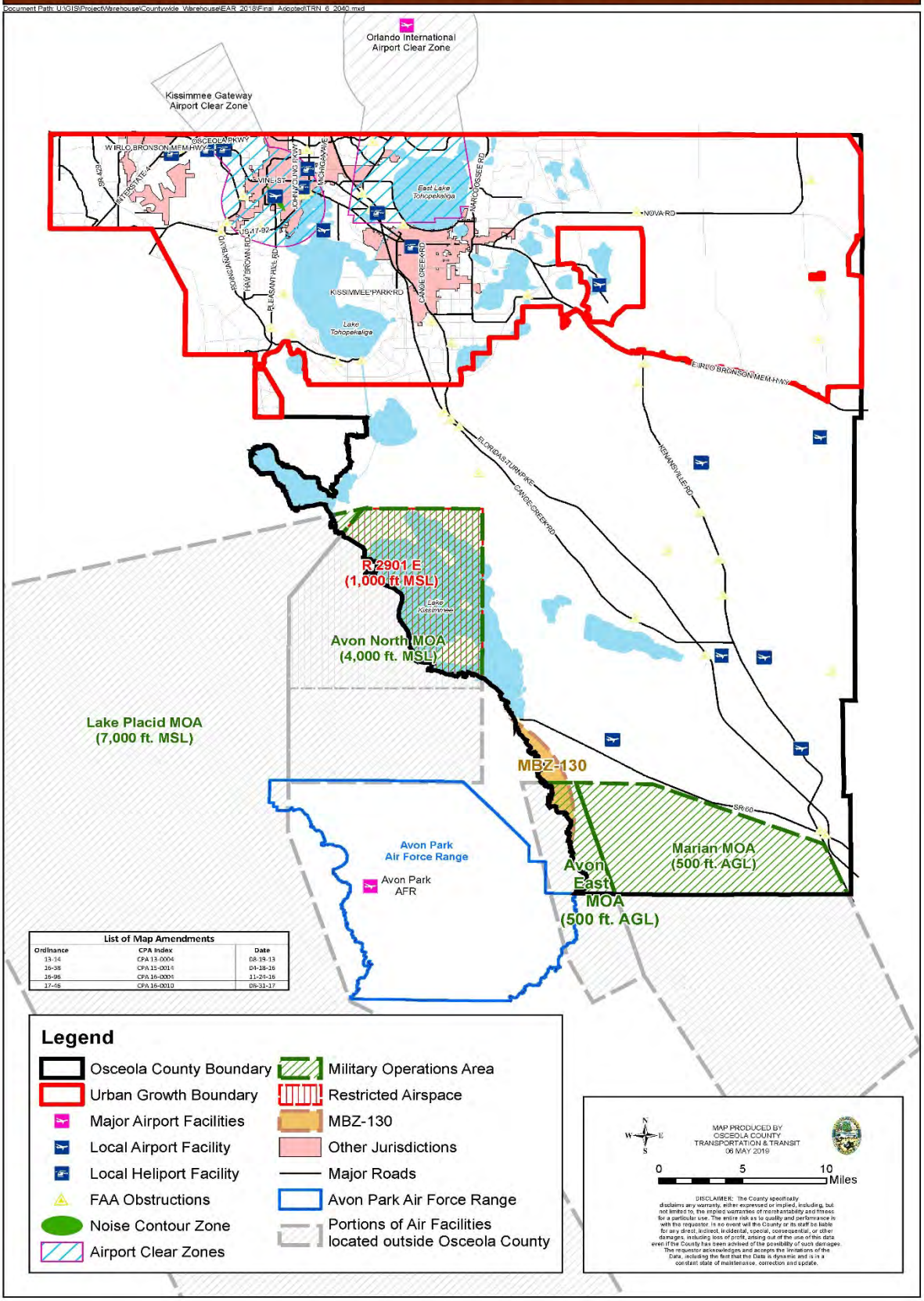


Osceola County Railways

0 0.75 1.5 3 Miles

Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
December 2020

TRN 6: Air Transportation Facilities & Special Planning Areas - 2040



Mitigation Measures

Mitigation measures are strategies which the LMS Working Group can support in implementing to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures for the impact of transportation incidents.

Public Education

Increase public awareness through the following:

- Educating motorists about safety and using caution around rail, major intersections, and high speed roadways.

Transportation Monitoring System

Transportation can be regularly monitored with the following:

- Having a 24-hour video monitoring system with full-time staff to monitor conditions and correct any technical failures with traffic signals or other traffic controlled operations.

Transportation Facility Maintenance and Improvements

The quality and safety of transportation facilities can be improved through regular, comprehensive maintenance efforts:

- Maintaining roadways, pedestrian pathways, and rail crossings.
- Regular bridge and rail inspections.
- Increase corridor capacities as required to ensure that a high level of service is maintained and the degradation of infrastructure is limited.

2020

Man-Made Hazard

Hazmat Release

Risk and Vulnerability Rating: 27

HAZARDOUS MATERIAL RELEASE *(MEDIUM RATING: 27)*

A hazardous material (HAZMAT) is any item or agent (biological, chemical, and physical) which has the potential to cause harm to humans, animals, or the environment, by itself or through interaction with other factors. Chemical manufacturers are one source of hazardous materials, but there are others, including service stations, hospitals, and hazardous materials waste sites.

Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released from transportation accidents or because of chemical, manufacturing or power plant accidents. There is a phenomenon known as chemical suicide whereby the subject mixes two household chemicals together in an enclosed space, such as a vehicle. These incidents have rapid effective results and pose a threat to responders.

Hazard History

There have been over 505 hazardous materials calls reported in Osceola County since records began being kept in 1995. The majority of the reports are related to unknown odors such as gas and smoke. Of the total calls, only 51 were determined to be a potential hazardous material and required the engagement of a HAZMAT team.

At this time, all hazardous materials responses requiring a trained HAZMAT team require Osceola County Fire Rescue HAZMAT to respond. The municipalities request the HAZMAT response through local mutual aid.

Osceola County is home to eighteen (18) fixed SARA Title III facilities containing a threshold quantity of extremely hazardous materials. In recent years, most water treatment facilities have eliminated chlorine gas as a disinfectant mechanism and have opted to use the less hazardous sodium hypochlorite in their chlorination process.

Vulnerability Analysis

Vulnerabilities and impacts are dependent on the type of chemical, volume released, the environment in which the release occurred, and meteorology. Without over complicating the circumstances, a release in the right situation will have deleterious effects. As such, hazardous materials are ever-present in our transportation system and this is the primary concern.

Osceola County contains the longest stretch of the Florida Turnpike without exits. An accident involving hazardous materials in these conditions provides many challenges, the primary of which is accessibility. Osceola County's portion of U.S. Hwy 192, a primary east-west connector, also provides a primary route for hazardous materials. Finally, the central Florida Rail corridor traverses from the west county boundary east and north through the City of Kissimmee and provides hazardous materials transport.

These factors coupled with the eighteen (18) known hazardous chemical sites serve to increase the population vulnerability to a hazardous materials incident.

Impacts to the Population

The population is at risk due to the ease in availability of hazardous materials. The impacts to the population range from life threatening to minimal. As stated earlier, a release in the right situation can threaten hundreds of homes. Many circumstances require sheltering in place; however, evacuation may also be required. Should the right chemical release, the impacted area may not be able to return to their homes for quite some time perpetuating the need for housing beyond an initial shelter phase.

Impacts to the Built Environment

The built environment is subject to the actions of the chemical involved. In a radioactive release, the built environment may take years to recover. Agriculture and livestock are also subject to the specifics of the chemical release and while not a category for scoring, those agricultural facilities subjected to a hazardous substance release will also be impacted in the long-term.

Impact to Essential Facilities

Essential facilities are particularly vulnerable in that structured operational center may be forced to move operations. If the facility has no plans or capability to operate outside the confines of the structure, the operation will need to be transferred or terminated creating an increased workload on alternate operations.

Depending on the chemical action, infrastructure damage may occur. Sensitive electronics and even copper wire may be unusable or require significant repair as a result of a release.

Economic Impacts

In the wake of a material release, the businesses in the area must cease operations, if the event is long-term, the economy can suffer gravely. If transportation is shut down from a release, commerce transportation is delayed impacting even distant businesses.

Environment Impacts

The impacts in this category can be years to overcome. Some materials can kill vegetation with no potential for regrowth until a complete removal of all chemically affected soil. Waterways are at risk as well and can act as a transference mechanism spreading the release material to distant areas compounding the situation. A release in the right circumstances can seep into the aquifer damaging the ability to use the water.

Duration/Intensity and Predictability

The duration and intensity are dependent on the release material. A short-lived chemical release, while hazardous may dissipate quickly and be of no consequence. A different chemical or radioactive substance may have lifelong impact including all environments and to those affected.

There is no definite predictability to a release except to say that they will occur. Transportation incidents and human or equipment error will result in a release.

Risk Assessment

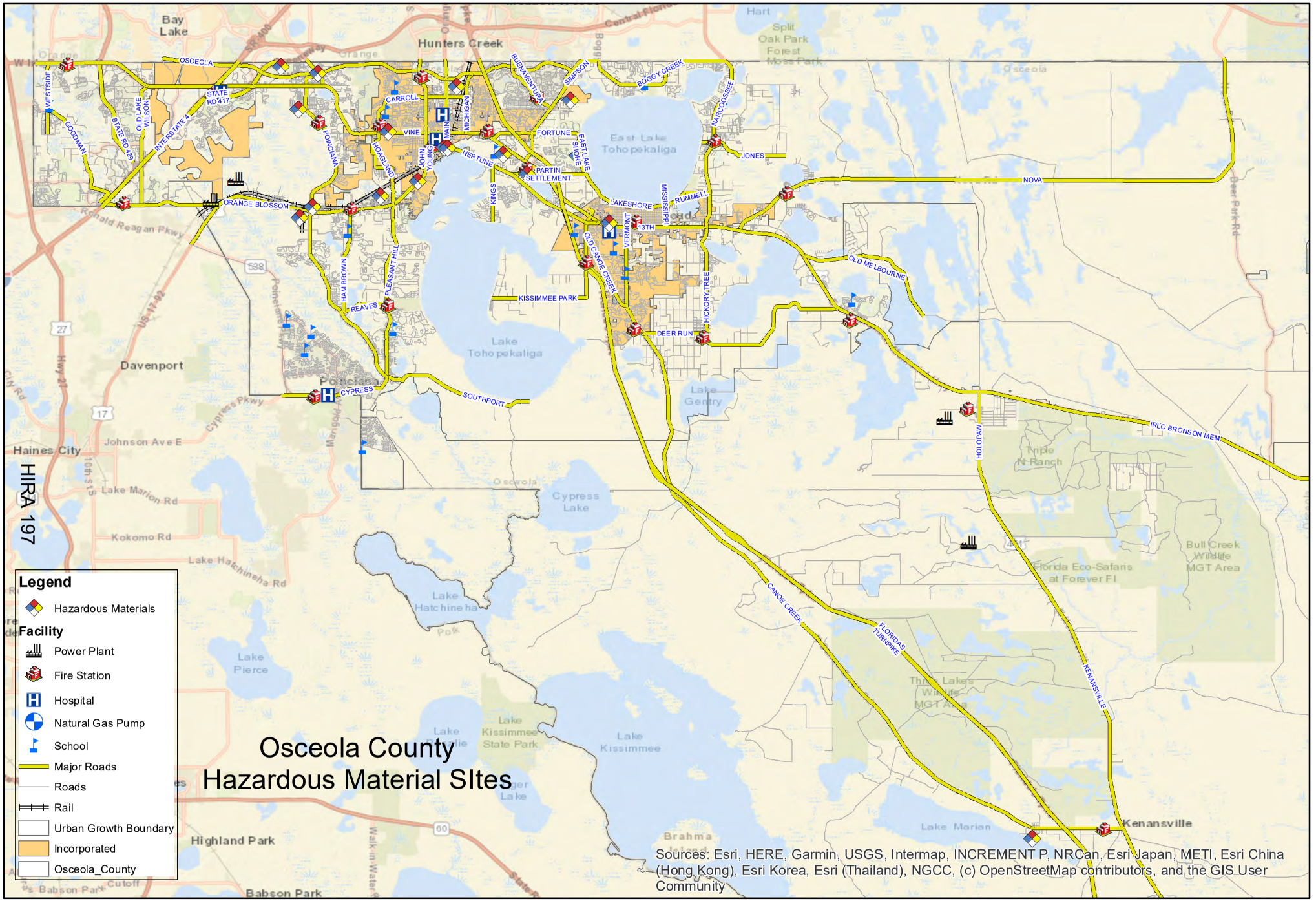
A number of criteria provides the foundation in determining the level of risk in a hazardous material release incident. Risk is the estimated impact to people, services, facilities, and structures within the County as well as the likelihood an incident will result in adverse conditions causing injury or damage. The criteria also include any corollary effect attributed directly to the assessed event. Below is a table that includes each criterion evaluated to determine the level of risk a hazardous material release event has on Osceola County.

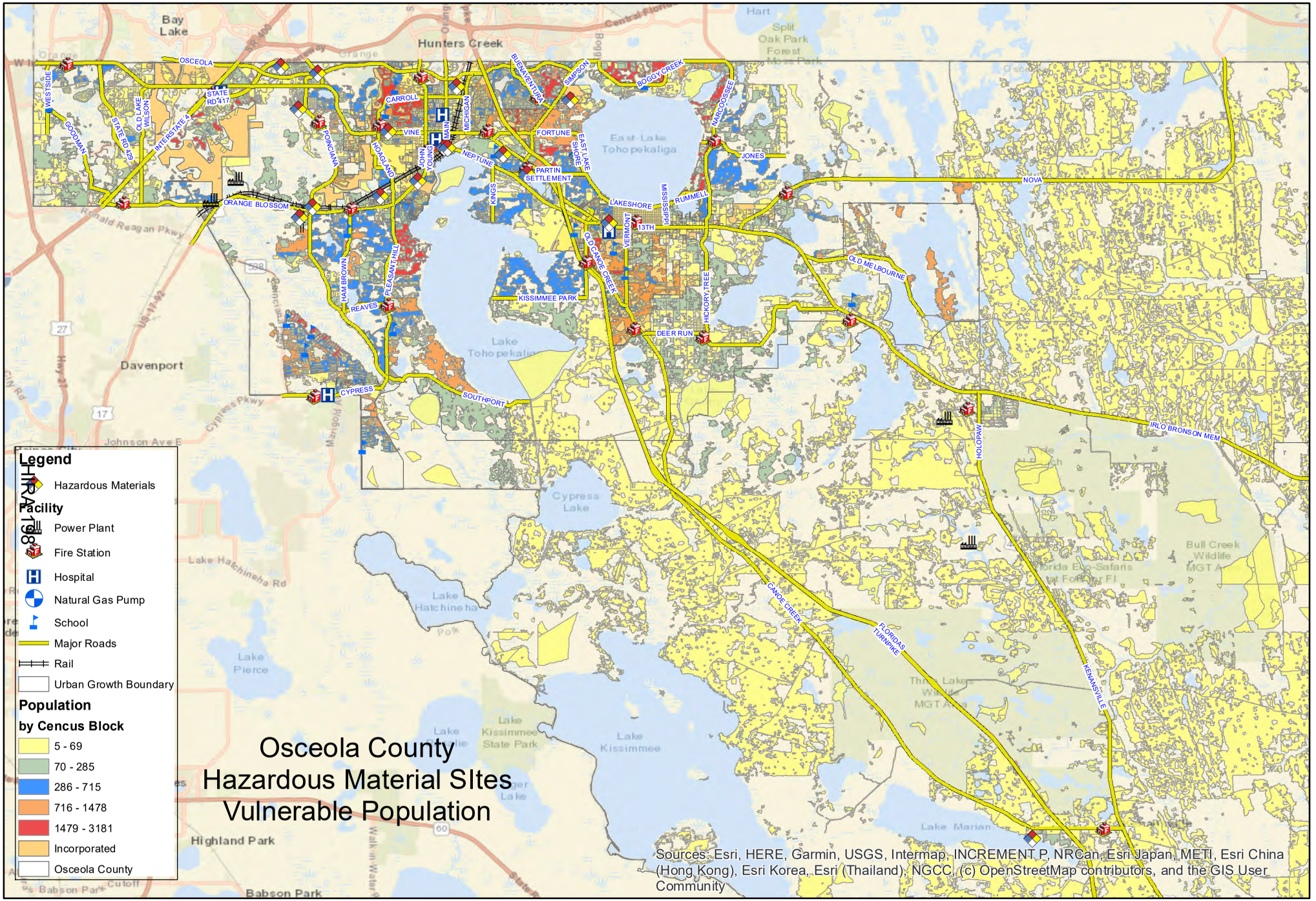
Hazardous Material Release (Rating: 27)

Hazard Assessment	5	4	3	2	1	0
Likelihood of Occurrence				2		
Capacity to cause damage			3			
Geographic Impact					1	
Speed of onset (warning time)		4				
Percent of population affected				2		
Potential for causing casualties				2		
Potential for causing negative economic impact					1	
Duration of event			3			
Seasonal pattern						0
Environmental impact				2		
Predictability of hazard						0
Impact mitigation potential (reverse rating)				2		
Warning system capability			3			
Corollary effects				2		0
TOTAL	0	4	9	12	2	0

=27

Hazardous materials exist to promote a better life such as in the treatment of other hazardous substances. These materials are a fact of life and as such, appropriate training and handling is required at all time. It is when circumstances remove the normal safeguards that an incident can escalate resulting in a threat to the community. Since hazardous substances exist everywhere, the community remains at risk when an accidental or intentional release occurs.


Osceola County
Hazardous Material SItes
HIRA 197
Legend
Hazardous Materials
Facility
Power Plant
Fire Station
Hospital
Natural Gas Pump
School
Major Roads
Roads
Rail
Urban Growth Boundary
Incorporated
Osceola_County
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
0
3.5
7
14 Miles
Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
October 2020


Legend
HIRA 1988
Hazardous Materials
Facility
Power Plant
Fire Station
Hospital
Natural Gas Pump
School
Major Roads
Rail
Urban Growth Boundary
Population
by Cencus Block
5 - 69
70 - 285
286 - 715
716 - 1478
1479 - 3181
Incorporated
Osceola County
Osceola County
Hazardous Material SIte
Vulnerable Population
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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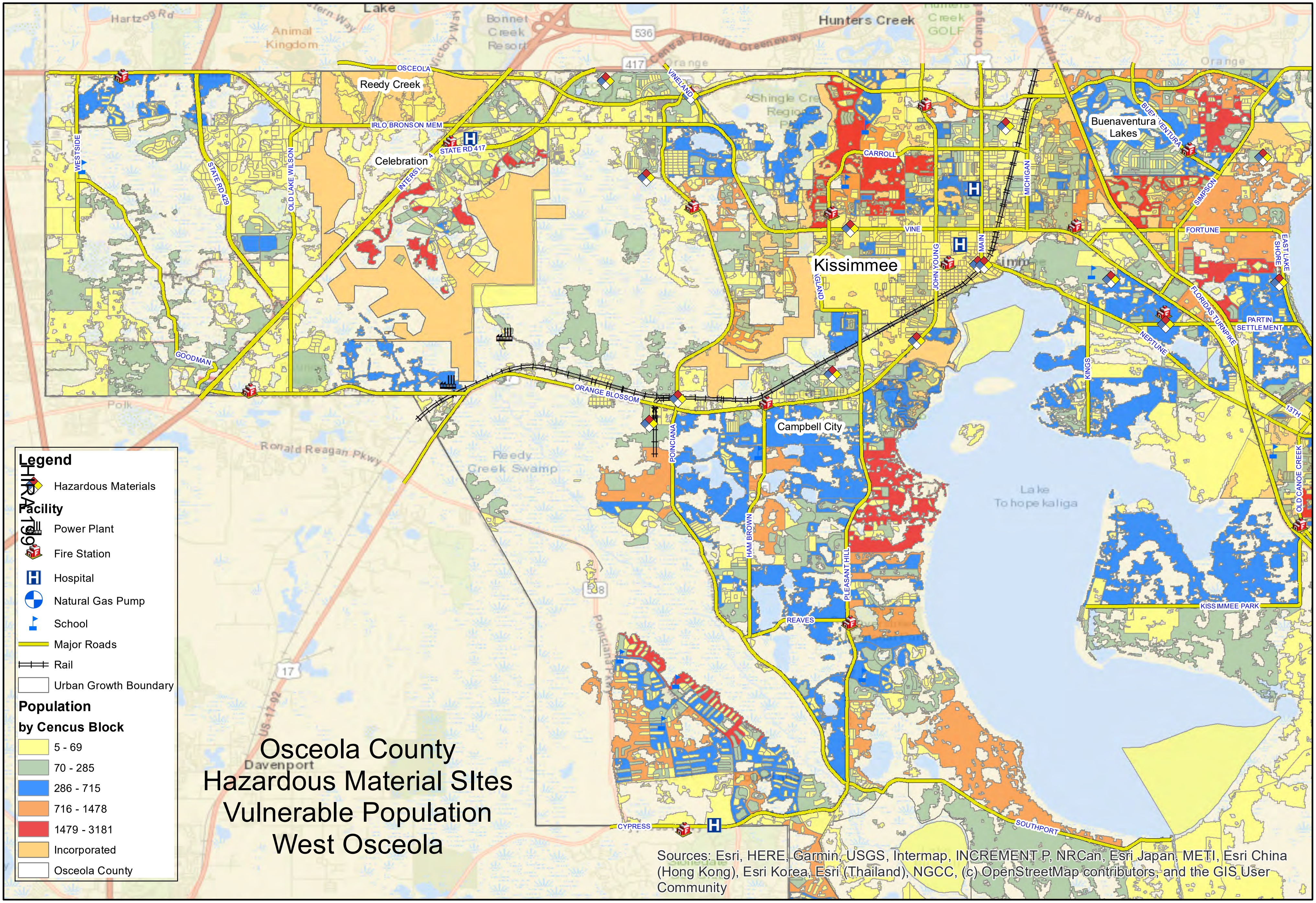

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Osceola County
Office of Emergency Management
Richard A. Halquist, FPEM, CFM
October 2020

Mitigation Measures

Mitigation measures are strategies to support implementing measures to reduce the loss of life and property from a disaster. This section of the report provides mitigation measures for the impact of hazardous material emergencies

General Mitigation Measures

Considerations the following:

- Implement plans for hazardous materials management, waste management, spill prevention and response, stormwater management, and pesticide management. Train employees to promptly contain, report, and/or clean up any oil or hazardous material spill.
- Educate the public on how and where to dispose of hazardous household and commercial chemicals.
- Maintain a database of hazardous materials within the county and provide to emergency first responders.
- Identify areas of impact from each hazardous material used/stored in the county. This can be illustrated using free computer software provided by the Florida Division of Emergency Management.

Appendix A:
List of Revisions

LIST OF REVISIONS

LIST OF REVISIONS

Changes made to the Mitigation Plan from 2015 to 2020 are provided in the table below for quick reference. Each change is listed by Section.

SECTION OF PLAN	NARRATIVE OF CHANGES
EXECUTIVE SUMMARY	No changes.
INTRODUCTION & OVERVIEW	Revised based upon changes in growth and development.
COMMUNITY PROFILE	Revised document with most current available data. Included HIRA scoring and hazard table. Updated maps. Updated references to transportation projects. HIRA maintained as Appendix (K).
PLANNING PROCESS	Updated LMS Working Group membership summary. Included reference to special public hearing for the plan revision process.
PLAN ADOPTION & MAINTENANCE	Included plan integration, monitoring, maintenance, and updates.
NFIP PARTICIPATION	Jurisdictions updated NFIP data. Repetitive Loss Properties map revised.
APPENDIX A	Updated list of plan revisions.
APPENDIX B	Included updated mitigation project list and revised listing of completed, deleted and deferred projects.
APPENDIX C	Included revised LMS Working Group Bylaws and membership roster with titles.
APPENDIX D	Included LMS Working Group meeting documentation from 2016 through 2020.
APPENDIX E	Included public and stakeholder comments on the 2020 Plan update.
APPENDIX F	Included annual LMS updates between 2016 and 2020.
APPENDIX G	Included most current essential/critical facilities map.
APPENDIX H	Provided new adoption resolutions for the 2020 Plan update **PENDING**
APPENDIX I	Included jurisdiction Floodplain Ordinances.
APPENDIX J	Provided jurisdictions most currently adopted Land Development Regulations.
APPENDIX K	Complete rewrite of the HIRA based upon changes in hazards that threaten the community, including updated tables and maps. Scored three previously unrated hazards (Cyber Attack, Civil Unrest, and Mass Migration).

Appendix C:
LMS Working Group Bylaws & Membership Roster

BYLAWS & MEMBERSHIP ROSTER

Local Mitigation Strategy (LMS) Working Group

Bylaws

Originally Approved: 12/15/04

Amended 3/16/05 to exclude Special Vote language.

Amended 5/13/09 to allow for restructuring during the LMS rewrite.
Removal of "Task Force" and "Steering Committee."

Amended 2/25/15 to allow for changes in organizational structure
Replace "Ad Hoc Committees" with "Sub Committees"
Amending verbiage "good standing" for membership
Public Membership

Amended 8/10/17 to allow for a clarification by changing the wording
from as "deemed by the Chairperson" to "as deemed by
the Working Group" within Article V Section B

Amended 6/11/2020 to define membership, quorum requirements, voting rights, and funding rights.
Removed "Technical Working Groups". General format and language revisions.

Bylaws of the Osceola County LMS Working Group
For Local Mitigation Strategy Development

ARTICLE I. PURPOSE OF OSCEOLA COUNTY LMS WORKING GROUP

The purpose of the Osceola County LMS Working Group is to decrease the vulnerability of the citizens, governments, businesses and institutions of Osceola County, Florida, to the future human, economic, and environmental costs of disasters through the development and maintenance of a Local Mitigation Strategy. The LMS Working Group develops, monitors, and maintains a local strategy for hazard mitigation and post-disaster redevelopment. Establishing and maintaining a Local Mitigation Strategy and formal LMS Working Group is required by Chapter 9G-22 of the Florida Administrative Code for any county electing to participate in the Hazard Mitigation Grant Program.

ARTICLE II. ORGANIZATIONAL STRUCTURE

The organizational structure for the Local Mitigation Strategy Working Group shall be follows:

A. The LMS Working Group

The LMS Working Group shall consist of designated representatives according to Article 27P-22 of the Florida Administrative Code and Title 44 Code of Federal Regulations s201.6. The LMS Working Group shall include Member representation from the following:

- Osceola County Office of Emergency Management
- Various agencies of Osceola County government which may include, but not be limited to, Planning and Zoning, Roads, and Public Works
- Each Osceola County municipality
- Interested entities such as Independent Special Districts, Non-Profit Organizations, Native American Tribes or Authorized Tribal Organizations, School Districts, and Water Management Districts that are approved by the LMS Working Group
- Other interested individuals from the general public that are approved by the LMS Working Group

B. Membership

Participation in the Osceola County LMS Working Group is voluntary by all participating entities. Membership in the Osceola County LMS Working Group is open to all jurisdictions, organizations and individuals supporting its purposes. With the exception of those individuals from the general public that are approved by the LMS Working Group to participate, a Member shall be considered to be the recognized organization and not a specific person or position within that organization.

A list of Members shall be maintained by Program Staff. This list shall be reviewed and approved annually by the LMS Working Group at the last meeting of the calendar year. Any suggested changes to the Member list and approval of the list shall be made by a majority vote of the LMS Working Group.

Primary representatives and up to two (2) alternate representatives for each LMS Working Group Member organization are to be appointed by the manager of their organization to serve as the official representative and spokesperson for the jurisdiction or organization regarding the activities and decisions of the Osceola County LMS Working Group. Designated governmental voting members are appointed by the managers of their jurisdiction by an official letter of designation.

C. Program Staff

The Osceola County Office of Emergency Management will provide and/or coordinate for an individual to serve as the program staff to provide administrative support to the LMS Working Group.

Bylaws of the Osceola County LMS Working Group
For Local Mitigation Strategy Development

ARTICLE III. OFFICERS

The Chairperson of the LMS Working Group shall be the Director of Osceola County's Office of Emergency Management, unless he/she chooses to appoint the Chairperson from the Emergency Management Staff. If the Office of Emergency Management is without a Director, the appointment shall stand unless a new Director elects to serve in the capacity of Chairperson.

The Chairperson presides at each LMS Working Group meeting and is responsible for the organization of meetings, public notices, establishing Subcommittees, and assigning the personnel to staff them.

The Vice-Chairperson of the LMS Working Group is an elected position and will fulfill the duties and responsibilities of the Chairperson in their absence. In such a case when the Vice-Chairperson is serving in the absence of the Chairperson, the Member organization to which the Vice-Chairperson belongs may choose to have another representative from the organization serve in the role of General Member. When this occurs, the Vice-Chairperson shall not have a vote, so as to ensure the Member organization is not allocated an additional vote. If the vote in such a scenario results in a tie, the issue shall die on the floor.

The Vice-Chairperson will serve a term of one year, and be eligible for re-appointment for an unlimited number of terms. The election of the Vice-Chairperson shall be held at the final meeting of each calendar year and take effect at the beginning of the next calendar year.

In such case when both the Chairperson and Vice-Chairperson are not able to attend a regular meeting, and that meeting cannot be rescheduled due to the advance notice requirements described here-in, designated Program Staff shall conduct the meeting with the understanding that no official actions may be taken.

ARTICLE IV. RESPONSIBILITIES

A. LMS Working Group

The LMS Working Group will be responsible for oversight and coordination of all actions and decisions regarding the Local Hazard Mitigation Strategy development. The Working Group is solely responsible for the release of reports, development of resolutions, issuance of position papers, and similar activities. The LMS Working Group makes assignments to Subcommittees, coordinates their work, and takes action on their recommendations.

B. Subcommittees

The Chairperson may designate Subcommittees, as needed. Membership is unlimited and is open to the participating jurisdictions, organizations and individuals. Subcommittees may be established at any time for special purposes by the Chairperson of the Working Group, and their membership designated at that time. Membership in such subcommittees is not restricted to only the membership of the LMS Working Group.

The responsibilities of Subcommittees will be defined at the time they are established by the Chairperson of the Working Group. As an example, there may be a need to assemble a committee for public information efforts to secure public input and comment on the efforts of the Osceola County LMS Working Group. One may also need to inform the public and education programs regarding hazard mitigation or to promote public acceptance of the strategy developed by the Osceola County LMS Working Group. The scheduling of meetings of Subcommittees is at the discretion of its Subcommittee Chairperson.

C. Program Staff

Technical, clerical and other types of support activities to the Working Group and Subcommittee/s will be provided through the Osceola County Office of Emergency Management. The program staff shall be responsible for coordinating LMS Working Group meetings, recording LMS meeting minutes, and maintaining the current project priority list as approved by the LMS Working Group. Other jurisdictions and organizations may also provide such services on a voluntary basis upon request of the Office of Emergency Management and/or the Chairperson of the LMS Working Group.

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Bylaws of the Osceola County LMS Working Group
For Local Mitigation Strategy Development

ARTICLE V. ACTIONS BY OSCEOLA COUNTY LMS WORKING GROUP

A. Authority for Actions

Only the Working Group has the authority to take final actions in the name of Osceola County LMS Working Group. Actions by Subcommittees or program staff are not considered final until affirmed by action of the Working Group.

B. Meetings, Voting, and Quorum

The LMS Working Group meets quarterly but no less than three (3) times per year. All official meetings of the LMS Working Group and Subcommittees shall be public meetings and appropriately advertised in accordance with local policy, as well as any governing statute or authority. Meetings of the LMS Working Group and any Subcommittees will be conducted in accordance with general parliamentary procedure by its Chairperson. Regular meetings of the LMS Working Group will be scheduled quarterly, or as deemed necessary with a minimum of 15 working days' notice, with appropriate official notice given so that the general public and representatives of other interested organizations may attend.

Each Member shall have one (1) vote, assigned to the primary representative. Alternate representatives will have the authority to vote or take other actions on behalf of the designated Member organization in the absence of the primary representative.

All final actions and decisions made in the name of the LMS Working Group will be by affirmative vote of a quorum of the LMS Working Group. All Members have voting status. A quorum shall be fifty one (51) percent of the total number of Members (removed "of the voting LMS Working Group") at the time of the vote. Only Members in good standing may vote. Good standing shall be considered to be having attended two (2) consecutive LMS Working Group general meetings, or to have not missed more than one (1) meeting consecutively. Any Member that has missed two (2) or more consecutive meetings shall be deemed to be in poor standing. A Member in poor standing must then attend two (2) consecutive meetings to once again be considered to be in good standing, allowing them to vote at the next meeting. The Chairperson shall be notified, in advance, in the event a Member organization is unable to provide representation at a meeting, and may be excused to maintain good standing. Voting by proxy, written or otherwise, is not permitted except that an appointed alternate member may vote on behalf of the primary member when attending a voting session.

Only active Members in good standing will be eligible for grant funding. Osceola County Office of Emergency Management shall maintain a current LMS Working Group membership list of active Members in good standing, which shall be announced at the start of each meeting during roll call and the establishment of a quorum.

In the case where a Member is eligible for project funding, but would not be providing matching funds, that Member will not be allowed to participate in the vote regarding the project's inclusion on the LMS Project Priority List.

C. Documentation of Actions

All meetings and other forms of action by the Working Group and Subcommittees will be documented and made available for inspection by the public upon appropriate public records request. Prior to adoption at a Working Group meeting, draft meeting agendas, minutes and all other documentation shall be provided to the Working Group for review at least 7 days prior to a meeting.

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Bylaws of the Osceola County LMS Working Group
For Local Mitigation Strategy Development

ARTICLE VI. ADOPTION OF AND AMENDMENTS TO THE BYLAWS

The Bylaws of Osceola County LMS Working Group may be adopted and/or amended by a simple majority vote of the members. All proposed changes to the bylaws will be provided to each member of the Working Group not less than 5 working days prior to such a vote.

ARTICLE VII. DISSOLUTION OF THE LMS WORKING GROUP

Osceola County LMS Working Group may be dissolved by affirmative vote of 100% of the voting members of the Working Group at the time of the vote, by order of a court of competent jurisdiction, and/or by instruction of the Osceola County Board of County Commissioners. At the time of dissolution, all remaining documents, records, equipment and supplies belonging to the Osceola County LMS Working Group will be transferred to the appropriate entities as noted by the dissolving Working Group or as mandated by the State.

4

Osceola County Local Mitigation Strategy Working Group Membership *(Revised December 2020)*							
	Status	**Name**	**Title**	**Organization**	**E-Mail Address**	**Phone Number**	**Mailing Address**
Osceola County Office of Emergency Management							
1	Non-Voting	**Bill Litton (Chairman)**	Director	Osceola County Emergency Management	Bill.Litton@osceola.org	407-742-9010	2586 Partin Settlement Road, Kissimmee, Florida 34744
2	Non-Voting	**Richard Halquist** (Alt. to Chairman)	Operations Manager	Osceola County Emergency Management	Richard.Halquist@osceola.org	407-742-9016	2586 Partin Settlement Road, Kissimmee, Florida 34744
3	Non-Voting	**Robin Hinson** (LMS Coordinator)	Emergency Management Planner	Osceola County Emergency Management	Robin.Hinson@osceola.org	407-742-9012	2586 Partin Settlement Road, Kissimmee, Florida 34744
4	Non-Voting	**Noelia Rivera** (Recording Secretary)	EM Accounting Specialist	Osceola County Emergency Management	Noelia.Rivera@osceola.org	407-742-9008	2586 Partin Settlement Road, Kissimmee, Florida 34744
Osceola County							
5	Voting	**Carlos Castro**	Civil Engineer II	Osceola County Community Development	Carlos.Castro@osceola.org	407-742-0234	1 Courthouse Square, Suite 1100, Kissimmee, Florida 34741
6	Alt-Voting	**Jose Santiago** (Alt. to Carlos Castro)	Civil Engineer I	Osceola County Community Development	Jose.Santiago@osceola.org	407-742-0238	1 Courthouse Square, Suite 1100, Kissimmee, Florida 34741
7	Voting	**Susan Gosselin (Co-Vice Chairman)**	Stormwater Program Manager	Osceola County Public Works	Susan.Gosselin@osceola.org	407-742-0542	1 Courthouse Square, Suite 3100, Kissimmee, Florida 34741
8	Alt-Voting	**Linette Matheny** (Alt. to Susan Gosselin)	Assistant County Engineer	Osceola County Stormwater Management	Linette.Matheny@osceola.org	407-742-0543	1 Courthouse Square, Suite 3100, Kissimmee, Florida 34741
9	Voting	**Leslie Felix**	Finance Manager	Osceola County Financal Services	Leslie.Felix@osceola.org	407-742-1715	1 Courthouse Square, Suite 2100, Kissimmee, Florida 34741
10	Alt-Voting	**Andrea Outing**	Grants Compliance	Osceola County Financal Services	Andrea.Outing@osceola.org	407-742-1738	1 Courthouse Square, Suite 2100, Kissimmee, Florida 34741
11	Non-Voting	**Jeremy Buchanon**	CRS Coordinator	Osceola County Public Works	Jeremy.Buchanon@osceola.org	407-742-8652	1 Courthouse Square, Suite 3100, Kissimmee, Florida 34741
12	Non-Voting	**Rick Baird**	Lakes Advocate	Osceola County Public Works	Richard.Baird@Osceola.org	407-742-8653	1 Courthouse Square, Suite 3100, Kissimmee, Florida 34741
City of Kissimmee Members							
13	Voting	**Ashley Willis**	Kissimmee City Engineer	City of Kissimmee Public Works	AWillis@kissimmee.org	407-518-2177	101 Church Street, Suite 301, Kissimmee, Florida 34741
14	Alt-Voting	**Nagel Altrui** (Alt. to Ashley Willis)	Stormwater Engineer - CRS Coordinator	City of Kissimmee Public Works	NAltrui@kissimmee.org	407-518-2536	101 Church Street, Suite 301, Kissimmee, Florida 34741
15	Voting	**Jeremy Donovan**	Deputy Fire Chief	City of Kissimmee Fire Department	JDonovan@kissimmee.org	407-518-2239	101 Church Street, Suite 200, Kissimmee, Florida 34741
16	Alt-Voting	**Alex Santos** (Alt. to Jeremy Donovan)	Budget Analyst	City of Kissimmee Finance Department	ASantos@kissimmee.org	407-518-2219	101 Church Street, Kissimmee, Florida 34741
17	Voting	**John Hambley**	Planner	City of Kissimmee Development Services	JHambley@kissimmee.org	407-518-2497	101 Church Street, Kissimmee, Florida 34741
18	Alt-Voting	**Austin Blake** (Alt. to John Hambley)	Asst. City Manager	City of Kissimmee City Manager	ABlake@kissimmee.org	407-518-2319	101 Church Street, Kissimmee, Florida 34741
City of Saint Cloud							
19	Voting	**Cameron Crandell** (Co-Vice Chairman)	St. Cloud City Engineer	City of St. Cloud Public Services	Cameron.Crandell@stcloud.org	407-957-7279	1300 9th Street, Building A - 2nd Floor, Saint Cloud, Florida 34769
20	Voting	**Kevin Felblinger**	St. Cloud City Engineer	City of St. Cloud Public Services	KFelblinger@stcloud.org	407-957-7353	1300 9th Street, Building A - 2nd Floor, Saint Cloud, Florida 34769
21	Alt-Voting	**Dara Hennessey** (Alternate to Cameron)	Deputy Fire Chief	City of St. Cloud Fire Rescue Department	Dara.Hennessey@stcloud.org	407.957.8409	900 Minnestoa Aveune, Saint Cloud, Florida 34769
22	Alt-Voting	**Mike Cortez** (Alternate to Kevin)	Support Services Manager	City of St. Cloud Police Department	MCortez@stcloud.org	407-891-6743	4700 Neptune Road, Saint Cloud, Florida 34769
23	Voting	**Jamie DeMelo**	Grants Administrator	City of St. Cloud Grants	Jamie.DeMelo@stcloud.org	407-957-7352	1300 9th Street, Saint Cloud, Florida 34769
24	Alt-Voting	**Naseem Ghandour**	Public Works Director	City of St. Cloud Public Works	Naseem.Ghandour@stcloud.org	407-957-7108	1300 9th Street, Building A - 2nd Floor, Saint Cloud, Florida 34769
25	Non-Voting	**Leigh Anne Wachter**	Flood Plain Manager	City of St. Cloud Building Department	LeighAnne.Wachter@stcloud.org	407-957-7275	1300 9th Street, Building A - 1st Floor, Saint Cloud, Florida 34769
The School District of Osceola County							
26	Voting	**Rhonda Blake**	Planning Director	SDOC	BlakeRho@osceola.k12.fl.us	321-624-2200	809 Bill Beck Boulevard, Kissimmee, Florida 34744
27	Alt-Voting	**Randy Shuttera** (Alt. to Rhonda Blake)	Director of Safety, Security, Code Compliance, & Emergency Operations	SDOC	Shutterr@osceola.k12.fl.us	407-433-8361	809 Bill Beck Boulevard, Kissimmee, Florida 34744
28	Non-Voting	**Mike McFarland**	Senior Facilities Manager- Design	SDOC	Michael.Mcfarland@osceolaschools.net		
29	Non-Voting	**Tom Phelps**	Deputy Superintendent	SDOC	PhelpsT@osceola.k12.fl.us	407-518-2901	809 Bill Beck Boulevard, Kissimmee, Florida 34744
Private Business Sector							
30	Primary Voting	**John Porter**	Civil Engineer P.E., CEM	Osceola Engineering, Inc.	JPorter@osc-eng.com	407-891-0452	1003 Florida Avenue, Saint Cloud, Florida 34769
31	Alt-Voting	**Broc Althafer** (Alt. To John Porter)	Civil Engineer P.E.	Osceola Engineering, Inc.	BAlthafer@osc-eng.com	407-891-0452	1003 Florida Avenue, Saint Cloud, Florida 34769
32	Alt-Voting	**David Hamstra**	Stormwater Department Manager, P.E., CFM	Pegasus Engineering, LLC	David@pegasusengineering.net	407-247-0003	301 West State Road 434, Suite 309, Winter Springs, Florida 32708
33	Alt-Voting	**Leylah Saavedra** (Alt. To David Hamstra)	Sr. Project Engineer, P.E., CFM	Pegasus Engineering, LLC	Leylah@pegasusengineering.net	407-992-9160	301 West State Road 434, Suite 309, Winter Springs, Florida 32708
Public Representation							
34	Voting	**William "Bill" Peterson**	Citizen	n/a	Bill@governmentresource.com	407-201-8933	Not Available
Non-Profit Organizations							
35	Non-Voting	**Mentha Antoine**	Disaster Program Specialist	Red Cross	Mentha.Antoine@redcross.org	407-388-8253	5 North Bumby Avenue, Orlando, Florida 32803
36	Non-Voting	**Ricardo Sanabria**	Disaster Program Manager	Red Cross	Ricardo.Sanabria@redcross.org	407-784-3937	5 North Bumby Avenue, Orlando, Florida 32803
37	Voting	**Pat Filippone**	Board Member	Osceola REDI	FilipponeP@aol.com	407-709-7188	704 Generation Point, Suite 101, Kissimmee, Florida 34744
38	Alt-Voting	**Blake Seaholm** (Alt. to Pat Filippone)	REDI Chairman	Osceola REDI	BSeaholm@gmail.com	407-592-9380	704 Generation Point, Suite 101, Kissimmee, Florida 34744
39	Non-Voting	**Mark Barglof**	Executive Director	Good Samaritan Society	MBarglof@good-sam.com	407-933-2128	4250 Village Drive, Kissimmee, Florida 34746
40	Non-Voting	**Javier Espinosa**	Campus Administrator	Good Samaritan Society	JEspinos@good-sam.com	407-933-3213	4250 Village Drive, Kissimmee, Florida 34746
Other Representation							
41	Non-Voting	**William "Bill" Graf**	Regional Representative	South Florida Water Management District	WGraf@sfwmd.gov	352-516-5436	3301 Gun Club Road, West Palm Beach, Florida 33406
42	Non-Voting	**Tanya Naylor**	Emergency Manager	Reedy Creek Improvement District	TNaylor@rcid.org	407-560-7355	1900 Hotel Plaza Boulevard, Lake Buena Vista, Florida 32830
43	Non-Voting	**Jai Wei**	GIS Administrator	Reedy Creek Improvement District	JWei@rcid.org	407-828-3838	1900 Hotel Plaza Boulevard, Lake Buena Vista, Florida 32830
44	Non-Voting	**Abby Johnson**	Intergovernmental Coordinator	St. Johns River Water Management District	AJohnson@sjrwmd.com	321-795-6217	601 South Lake Destiny Road, Maitland, Florida 32751
45	Non-Voting	**Dave Dickens** (Alt. to Abby Johnson)	Intergovernmental Coordinator	St. Johns River Water Management District	DDickens@sjrwmd.com	321-676-6606	601 South Lake Destiny Road, Maitland, Florida 32751
46	Non-Voting	**Renee Michel**	Director of Environmntal Health & Safety	University of Central Florida	Renee.Michel@ucf.edu	407-823-3747	3512 Perseus Loop, Building 48, Orlando, Florida 32816

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Local Mitigation Strategy Working Group

The Osceola County Office of Emergency Management will hold a Local Mitigation Strategy Working Group meeting to present the 2020 LMS Plan update to the public and allow for public input.

This meeting is free and open to the public. Citizens are encouraged to attend and participate in the process. Access to the meeting is also being provided telephonically.

For more information call Osceola County Office of Emergency Management at 407-742-9000.

Agency/Department	Emergency Management
Start	November 12, 2020 9:00 am
End	November 12, 2020
Location	Osceola Heritage Park Events Center St. Cloud Room A, 1901 Chief Osceola Trail, Kissimmee, FL 34744

Individuals with disabilities requiring accommodations (i.e., sign language interpreter or materials in accessible format) in order to participate in these meetings, please contact the Office of the Clerk of the Board, 407-742-2100 or 7-1-1 for the Florida Relay System, at least five (5) business days prior to the meeting.

Live Chat

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OSCEOLA COUNTY
LOCAL MITIGATION STRATEGY WORKING GROUP

11/12/2020 – 9:00 a.m.
Osceola Heritage Park- Events Center
St. Cloud Room A
1901 Chief Osceola Trail
Kissimmee, Florida 34744
www.osceola.org

MEMBERSHIP

Emergency Management
*Bill Litton, Chairman
*Richard Halquist (ALT)
*Robin Hinson, LMS Coordinator

Osceola County Members
Carlos Castro
Jose Santiago (ALT)
Susan Gosselin, Co-Vice Chairman
Linette Matheny (ALT)
Leslie Felix
*Ray Stangle

City of Kissimmee Members
Ashley Willis
Nagel Altrui (ALT)
Jeremy Donovan
Alex Santos (ALT)
John Hambley
Austin Blake (ALT)

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Kevin Felblinger (ALT)
Dara Hennessey
Mike Cortez (ALT)
Charlene Kuhn
Jamie DeMelo (ALT)
*Leigh Anne Wachter

The School District of Osceola County Members
Rhonda Blake
Mike McFarland
Randy Shuttera (ALT)
*Tom Phelps

Not-For-Profit Members
Pat Filippone, Osceola REDI
Blake Seaholm, Osceola REDI (ALT)
*Mentha Antoine, American Red Cross
*Ricardo Sanabria, American Red Cross (ALT)
*Mark Barglof, Good Samaritan Society
*Javier Espinosa, Good Samaritan Society (ALT)

Private Business Sector Members
John Porter, Osceola Engineering, Inc.
Broc Althafer, Osceola Engineering, Inc. (ALT)
*David Hamstra, Pegasus Engineering, LLC
*Leylah Saavedra, Pegasus Engineering, LLC (ALT)

Public Representation
William "Bill" Peterson, Citizen

Other Representation (Non-Voting)
*Tanya Naylor, Reedy Creek Improvement District
*Jai Wei, Reedy Creek Improvement District
*Bill Graf, SFWMD
*Abby Johnson, St. Johns River WMD
*Dave Dickens, St. Johns River WMD (ALT)

***Denotes non-voting member**

AGENDA

Introductions

Discussion Items

- 2020 LMS Draft Presentation
  - LMS Background
  - LMS Working Group
  - LMS Maintenance
  - LMS Update Process
  - Update Summary
  - LMS Approval and Adoption
- Questions and comments from LMS Working Group

Hear the Audience

Citizens wishing to address the Working Group may do so at this time.

Adjournment

- Next LMS meeting date: December 10, 2020

In accordance with Americans with Disabilities Act, persons with disabilities needing a special accommodation to participate in this proceeding should contact the Emergency Management Office, 2586 Partin Settlement Road, Kissimmee, Florida, 34744, telephone (407) 742-9000, not later than five (5) days prior to the proceeding.

Osceola County
Office of Emergency Management

Meeting Name: LMS-2020 Update: Public Workshop Date: November / 12 / 2020

Time: 9:00 Leadership: Litton, Halqvist, Hanson

NAME	Department/Agency	Phone Number	Email Address
Robin Hanson	OEM	4077429012	robin.hanson@osceola.org
Richard Halqvist	OEM	407742 9016	Richard.Halqvist@osceola.org
Bill Litton	OEM	407 742 9010	Bill.Litton@osceola.org
Leigh Anne Wachter	St. Cloud	407 957 7275	leighanne.wachter@stcloud.org
Mike McFarland	SDOC	407-518-2964	Mlanier.mcfarland@osceolaschools.net
William Peterson	Citizen/LMSWG.	407-201-8933	Bill@governmentresources.com
Kevin Feiblinger	St. Cloud	407-957-7553	KFeiblinger@stcloud.org
Susan Gossett	OCPW	407-742-0542	Susan.gossett@osceola.org
Pat & Ray Filippone	REDI	407-709-7188	filipponep@aol.com
Nagel Altruis	City of Kissimmee	407-518-2536	naltruis@kissimmee.org
Jeremy Donovan	"		

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Local Mitigation Strategy
Public Comment Workshop
Call-in Participant List
November 12, 2020

Call Number	Name	Agency	Called To	Role
321-443-0671 (KISSIMMEE, FL)	Karla Wong	Osceola County- Information Technology	LOCAL	Host
321-697-3083 (KISSIMMEE, FL)	OHP Polycom	Osceola Heritage Park	LOCAL	Host
407-742-0238 (KISSIMMEE, FL)	Jose Santiago	Osceola County- Community Development	LOCAL	Attendee
321-443-5237 (KISSIMMEE, FL)	Christopher Brumbaugh	Osceola County- Public Information	LOCAL	Attendee
407-992-9160 (ORLANDO, FL)	David Hamstra	Pegasus Engineering, LLC	LOCAL	Attendee
407-853-7835 (KISSIMMEE, FL)	John Porter	Osceola Engineering, Inc.	LOCAL	Attendee
407-957-7393 (KISSIMMEE, FL)	Jamie DeMelo	City of Saint Cloud- Procurement	LOCAL	Attendee
407-742-9130 (KISSIMMEE, FL)	Margaret Hart	Osceola County- Emergency Management	LOCAL	Attendee

OSCEOLA COUNTY
LOCAL MITIGATION STRATEGY WORKING GROUP

11/12/2020 – 9:00 a.m.
Osceola Heritage Park- Events Center
St. Cloud Room A
1901 Chief Osceola Trail
Kissimmee, Florida 34744
www.osceola.org

MEMBERSHIP

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*Richard Halquist (ALT)
*Robin Hinson, LMS Coordinator

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Jose Santiago (ALT)
Susan Gosselin, Co-Vice Chairman
Linette Matheny (ALT)
Leslie Felix
*Ray Stangle

City of Kissimmee Members
Ashley Willis
Nagel Altrui (ALT)
Jeremy Donovan
Alex Santos (ALT)
John Hambley
Austin Blake (ALT)

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*Leigh Anne Wachter

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*Ricardo Sanabria, American Red Cross (ALT)
*Mark Barglof, Good Samaritan Society
*Javier Espinosa, Good Samaritan Society (ALT)

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*David Hamstra, Pegasus Engineering, LLC
*Leylah Saavedra, Pegasus Engineering, LLC (ALT)

Public Representation
William "Bill" Peterson, Citizen

Other Representation (Non-Voting)
*Tanya Naylor, Reedy Creek Improvement District
*Jai Wei, Reedy Creek Improvement District
*Bill Graf, SFWMD
*Abby Johnson, St. Johns River WMD
*Dave Dickens, St. Johns River WMD (ALT)

***Denotes non-voting member**

AGENDA

Introductions

The meeting was called to order by Chairman Bill Litton at 9:00 a.m.. Mr. Litton welcomed and thanked everyone in attendance, both in person and telephonically. The purpose of the meeting was explained and introductions/roll-call were completed.

Discussion Items

- 2020 LMS Draft Presentation
  - LMS Background
  - LMS Working Group
  - LMS Maintenance
  - LMS Update Process
  - Update Summary
  - LMS Approval and Adoption

LMSWG Coordinator, Robin Hinson, thanked everyone for participating in the meeting and explained the purpose of the meeting. Mr. Hinson presented on the topics identified in the agenda along with LMSWG member Richard Halquist. Questions and comments were fielded from the audience during the presentation. Items highlighted included the recent addition of an LMS page to the County's website where meeting dates and documentation will be posted, changes to the LMSWG bylaws allowing for more representative membership, the plan update process, and updates to the Hazard Identification & Risk Assessment.

LMSWG member Leigh Anne Wachter asked if tornadic activity followed the same seasonal patterns as tropical cyclones. Richard explained tornadic activity within the jurisdiction follows more closely with the wildfire season in winter and early spring in terms of activity intensity.

In accordance with Americans with Disabilities Act, persons with disabilities needing a special accommodation to participate in this proceeding should contact the Emergency Management Office, 2586 Partin Settlement Road, Kissimmee, Florida, 34744, telephone (407) 742-9000, not later than five (5) days prior to the proceeding.

Before discussing the HIRA rating for pandemic hazards, Mr. Hinson invited Mr. Litton to discuss how Osceola's response to the Coronavirus pandemic followed the County's Pandemic Response Plan. Mr. Litton explained as such.

Mr. Hinson explained that the plan's revision included a full rating of the cyber attack hazard, which was identified in the previous version of the HIRA but not rated.

During discussion of the nuclear facility incident hazard assessment, Mr. Litton discussed the County's participation in the upcoming regional radiological ingestion pathway tabletop exercise. Mr. Litton also further detailed the shelter facility planned for construction in the Yeehaw Junction community that would serve local residents during blue skies but also be made available for the County's use as a shelter or reception facility when needed during any incidents.

Mr. Hinson explained that the previous edition of the HIRA grouped civil unrest and mass migration together without a rating, and that the new revision includes a separate profile and rating of each.

- Questions and comments from LMS Working Group

Mr. Hinson asked for any additional comments or questions from the attendees.

Ms. Wachter asked for further clarification about the approval and adoption processes. Mr. Litton explained the process and expected timeline, as well as the intent of having the School District of Osceola County adopt the plan as well, since they can apply for funding as a participating entity.

Hear the Audience

Citizens wishing to address the Working Group may do so at this time.

There were no requests to speak from the general public or call-in participants.

Mr. Hinson made closing comments and invited everyone to provide any feedback to the OEM office for consideration in the LMS revision.

Adjournment

The meeting adjourned at 09:59.

- Next LMS meeting date: December 10, 2020

In accordance with Americans with Disabilities Act, persons with disabilities needing a special accommodation to participate in this proceeding should contact the Emergency Management Office, 2586 Partin Settlement Road, Kissimmee, Florida, 34744, telephone (407) 742-9000, not later than five (5) days prior to the proceeding.

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Live Chat

Local Mitigation Strategy Working Group

The Osceola County Office of Emergency Management will hold a Local Mitigation Strategy Working Group meeting to discuss and identify mitigation strategies to help lessen the impact of natural disasters as required by FEMA and the Florida Division of Emergency Management.

This meeting is free and open to the public. Citizens are encouraged to attend and participate in the process. Members of the public may also listen telephonically by calling 407-205-0551, Conference Code 301797 starting 9am.

For more information call Osceola County Office of Emergency Management at 407-742-9000.

- Agenda - December 10, 2020
- Minutes from September 10, 2020 Meeting
- Projects Priority List
- Basic Plan and Appendix K (Hazard Identification and Risk Assessment)

Agency/Department	Emergency Management
Start	December 10, 2020 9:00 am
End	December 10, 2020 11:00 am
Location	Osceola Heritage Park Events Center St. Cloud Room A, 1901 Chief Osceola Trail, Kissimmee, FL 34744

Individuals with disabilities requiring accommodations (i.e., sign language interpreter or materials in accessible format) in order to participate in these meetings, please contact the Office of the Clerk of the Board, 407-742-2100 or 7-1-1 for the Florida Relay System, at least five (5) business days prior to the meeting.

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OSCEOLA COUNTY
LOCAL MITIGATION STRATEGY WORKING GROUP
Quarterly Meeting
December 10, 2020 – 9:00 a.m.
Osceola Heritage Park Events Center- St. Cloud Room A
1901 Chief Osceola Trail
Kissimmee, Florida 34744
Telephone Conference: 407-205-0551, Conference Code: 301797

MEMBERSHIP

Emergency Management
*Bill Litton, Chairman
*Richard Halquist (ALT)
*Robin Hinson, LMS Coordinator
*Noelia Rivera, Recording Secretary

Osceola County Members
Carlos Castro
Jose Santiago (ALT)
Susan Gosselin, Co-Vice Chairman
Linette Matheny (ALT)
Leslie Felix
Andrea Outing (ALT)
*Jeremy Buchanon
*Ray Stangle
*Rick Baird

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Jeremy Donovan
Alex Santos (ALT)
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Kevin Felblinger
Mike Cortez (ALT)
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Naseem Ghandour (ALT)
*Leigh Anne Wachter

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*Mike McFarland
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*Mark Barglof, Good Samaritan Society
*Javier Espinosa, Good Samaritan Society

Private Business Sector Members
John Porter, Osceola Engineering, Inc.
Broc Althafer, Osceola Engineering, Inc. (ALT)
*David Hamstra, Pegasus Engineering, LLC
*Leylah Saavedra, Pegasus Engineering, LLC (ALT)

Public Representation
William "Bill" Peterson, Citizen

Other Representation (Non-Voting)
*Tanya Naylor, Reedy Creek Improvement District
*Jai Wei, Reedy Creek Improvement District
*Bill Graf, South Florida Water Management District
*Abby Johnson, St. Johns River WMD
*Dave Dickens, St. Johns River WMD
*Renee Michel, University of Central Florida

***Denotes non-voting member**

AGENDA

Call to Order

Attendance

Approval of Agenda

Approval of Minutes from September 10, 2020 LMS Working Group Quarterly Meeting

Hear the Audience - Citizens wishing to address the LMS Working Group may do so at this time.

Discussion Items

- LMS Working Group Membership Approval
- Project Priority List Review and Approval
  - Project List Review and Project Updates
  - Project Priority List Approval
- Local Mitigation Strategy Draft Approval
  - Basic Plan
  - Hazard Identification and Risk Assessment (HIRA)
- Questions? Comments?
- Next Quarterly Meeting: March 11, 2021

Adjournment

In accordance with Americans with Disabilities Act, persons with disabilities needing a special accommodation to participate in this proceeding should contact the Emergency Management Office, 2586 Partin Settlement Road, Kissimmee, Florida, 34744, telephone (407) 742-9000, not later than five (5) days prior to the proceeding.

Osceola County
Office of Emergency Management

Meeting Name: Local Mitigation Strategy Working Group - Quarterly Meeting Date: 12 / 10 / 2020

Time: 09:00 - 11:00 Leadership: Litton/Halquist/Hinson

NAME	Department/Agency	Phone Number	Email Address
Robin Hinson	BOCC OEM	407 742 9012	robin.hinson@osceola.org
Richard Halquist	OSC OEM	4077429016	RICHARD.HALQUIST@OSCEOLA.ORG
Bill Litton	OSC OEM	407 742 9010	Bill.Litton@osceola.org
John Porter	Osceola Engineering (Private Sector)	407-891-0452	JPORTER@OSC-ENG.COM
Blake Sechelm	REDI	407 592 9380	Blake.Sechelm@APlus4gr[illegible].com
Susie Gosnell	OSC PW	407-742-0542	Susie.gosnell@osceola.org
LeighAnne Wachter	St Cloud	407-957-7275	Leighanne.wachter@stcloud.org
Nagel Altmic	City of Kissimmee	407-518-2536	naltmic@kissimmee.org
Cameron Crandall	St. Cloud	407-557-7275	Cameron.crandall@stcloud.org
Jeremy Donovan	City of Kissimmee		

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Local Mitigation Strategy Working Group
Quarterly Meeting
Call-in Participant List
December 10, 2020

Call Number	Name	Agency	Called To	Role
407-785-0047	Manny Cosme	Osceola County- Information Technology	LOCAL	Host
321-697-3083 (KISSIMMEE, FL)	OHP Polycom	Osceola Heritage Park	LOCAL	Attendee
321-218-2587 (DAVENPORT, FL)	Unspecified	Unspecified	LOCAL	Attendee
407-957-7393 (KISSIMMEE, FL)	Jamie DeMelo	City of Saint Cloud- Procurement	LOCAL	Attendee
407-518-2964 (KISSIMMEE, FL)	Mike McFarland	School District of Osceola County- Facilities	LOCAL	Attendee
407-518-2219 (KISSIMMEE, FL)	Alex Santos	City of Kissimmee- Finance	LOCAL	Attendee
407-247-0003 (APOPKA, FL)	David Hamstra	Pegasus Engineering, LLC	LOCAL	Attendee
407-201-8933 (KISSIMMEE, FL)	Bill Peterson	Osceola County citizen	LOCAL	Attendee
321-676-6606 (INDIALANTIC, FL)	Unspecified	Unspecified	LOCAL	Attendee

OSCEOLA COUNTY
LOCAL MITIGATION STRATEGY WORKING GROUP
Quarterly Meeting
December 10, 2020 – 9:00 a.m.
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Kissimmee, Florida 34744
Telephone Conference: 407-205-0551, Conference Code: 301797

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*Dave Dickens, St. Johns River WMD
*Renee Michel, University of Central Florida

***Denotes non-voting member**

AGENDA

Call to Order

LMS Working Group Chairman, Bill Litton, called the meeting to order at 09:05. Mr. Litton then directed Robin Hinson, LMS Working Group Coordinator, to conduct a roll-call.

Attendance

Mr. Hinson led the introduction of the individuals attending in-person and with the assistance of Manny Cosme of Osceola County Information Technology, conducted a roll-call of the call-in attendees.

Approval of Agenda

Mr. Litton called for a motion regarding the approval of the agenda. Susan Gosselin made a motion to approve the agenda. John Porter seconded the motion. The motion passed unanimously.

Approval of Minutes from September 10, 2020 LMS Working Group Quarterly Meeting

Mr. Litton called for a motion regarding the approval of the minutes from the September 10, 2020 LMS Working Group Quarterly Meeting. John Porter motioned to approve the minutes. Nagel Altrui seconded the motion. The motion passed unanimously.

Hear the Audience - Citizens wishing to address the LMS Working Group may do so at this time.

Mr. Litton noted that no requests to speak were submitted in advance of the meeting. Mr. Litton acknowledged call-in participant Bill Peterson, Osceola County citizen, and asked him for any comments. Mr. Peterson stated that he did not have any comments. Mr. Litton thanked him for his attendance. Mr. Hinson noted for record-keeping purposes that Nagel Altrui, LMS Working Group member, and Cameron Crandell, LMS Working Group Co-chair, joined the meeting in-person.

Discussion Items

Mr. Litton directed Mr. Hinson to present on the discussion items identified in the agenda.

- LMS Working Group Membership Approval

Mr. Hinson asked for a motion regarding the approval of the LMS Working Group membership roster. John Porter motioned for approval of the membership roster. Cameron Crandell seconded the motion. The motion passed unanimously.

- Project Priority List Review and Approval
  - Project List Review and Project Updates
  - Project Priority List Approval

Mr. Hinson noted that no changes were made to the project priority list since the last meeting. Mr. Hinson asked for any comments or updates regarding the list. Mr. Porter stated that he would be abstaining from voting on the project priority list to avoid a conflict of interest as his firm has a stake in some of the projects. Mr. Litton directed David Hamstra to serve as Mr. Porter's alternate for any voting. Ms. Gosselin stated that projects #6 and #8 were duplicate entries. Mr. Hinson noted that project #8 would be eliminated and project #6 would keep its position on the priority list. Mr. Hinson thanked Ms. Gosselin for making the correction. Ms. Gosselin noted that the Kempfer Road project (#5) has been funded and is in the design phase. Mr. Hinson noted that the list would be updated to reflect the status change. Mr. Litton noted that the change would result in the project being moved to the funded list (Hurricane Irma) and all projects that followed on the priority list would be moved up one position. Mr. Hinson noted that the status change was noted in the comments section of the list, but the project was not properly moved to the funded list. Mr. Hinson stated that the change would be made. Mr. Crandell provided an update on the two City of Saint Cloud projects on the Hurricane Irma list. Mr. Crandell stated that the Blackberry Creek Pump Station project (#1) has moved to the design phase and should be finished by the end of the year. Mr. Crandell stated that the Esprit Pond Improvements project is in the design procurement stage. Ms. Gosselin stated that the Buenaventura Lakes Stormwater Upgrades project (Hurricane Irma #3) was not approved for funding. Mr. Litton noted that the project would be moved back to the general list. Mr. Crandell noted that he should be listed as the contact for the City of Saint Cloud projects included on the list until the vacancy left by the previous contact is filled. Mr. Litton asked for a motion regarding the approval of the project priority list, inclusive of the changes noted. Ms. Gosselin made a motion to approve the project priority list, inclusive of the changes noted. Mr. Crandell seconded the motion. The motion passed unanimously.

- Local Mitigation Strategy Draft Approval
  - Basic Plan

    Mr. Hinson provided a summary of the LMS update process and highlighted the changes that were made to the Basic Plan. Mr. Hinson asked for a motion regarding the approval of the LMS Basic Plan draft. Jeremy Donovan, LMS Working Group member, motioned for approval. Mr. Hinson acknowledged the motion and noted that Mr. Donovan had joined the meeting in-person, as he was not present for the roll-call. Mr. Crandell seconded the motion. The motion passed unanimously.
  - Hazard Identification and Risk Assessment (HIRA)

Mr. Hinson provided a summary of the updates made to the HIRA and the process that was followed during the review and update process. Mr. Hinson asked for a motion regarding the approval of the HIRA as presented. Leigh Anne Wachter commented that she appreciated all of the work that went into the update and thanked the team for their work. Mr. Hinson thanked Ms. Wachter for her participation in the update process. Mr. Donovan motioned to approve the HIRA as presented. Ms. Gosselin seconded the motion. The motion passed unanimously.

- Questions? Comments?

Mr. Hinson provided a summary of the new LMS Working Group webpage on the County's website that will provide upcoming meeting announcements and documentation from past meetings. Mr. Litton noted that the County has submitted its annual LMS report to the State for approval. Mr. Litton provided an update on the LMS submission and explained the approval and adoption process.

- Next Quarterly Meeting: March 11, 2021

Mr. Hinson noted the meeting dates for 2021, including March 11, June 10, September 9, and December 9.

Adjournment

Mr. Hinson asked for a motion to adjourn the meeting. Mr. Donovan motioned to adjourn the meeting. Mr. Crandell seconded the motion. The motion passed unanimously. The meeting adjourned at 09:31.

In accordance with Americans with Disabilities Act, persons with disabilities needing a special accommodation to participate in this proceeding should contact the Emergency Management Office, 2586 Partin Settlement Road, Kissimmee, Florida, 34744, telephone (407) 742-9000, not later than five (5) days prior to the proceeding.