2016 Supplemental Summary

Statewide Regional Evacuation Study

This document contains summaries (updated in 2016) of the following chapters of the 2010 Volume 1-11 Technical Data Report:

Chapter 1: Regional Demographics

Chapter 2: Regional Hazards Analysis

Chapter 4: Regional Vulnerability and Population Analysis

Funding provided by the Florida
Division of Emergency Management

Work completed by the
South Florida Regional Council

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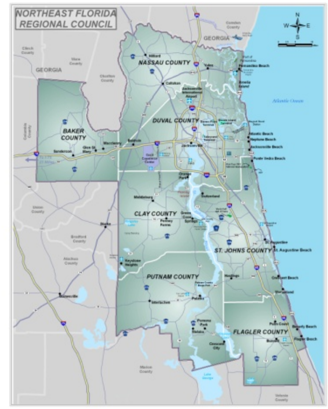
Table of Contents

List of Tables

List of Maps

List of Appendices

I. Regional Demographic Characteristics and Their Implications for Evacuation Dynamics



A. Small Area Dwelling Unit and Population Data

A Regional Evacuation Study and the associated transportation modeling are based upon a set of defined demographic characteristics assembled for each region of the State. This data is referred to as Small Area Data. The data is gathered for three time periods – 2010, 2015, and 2020.

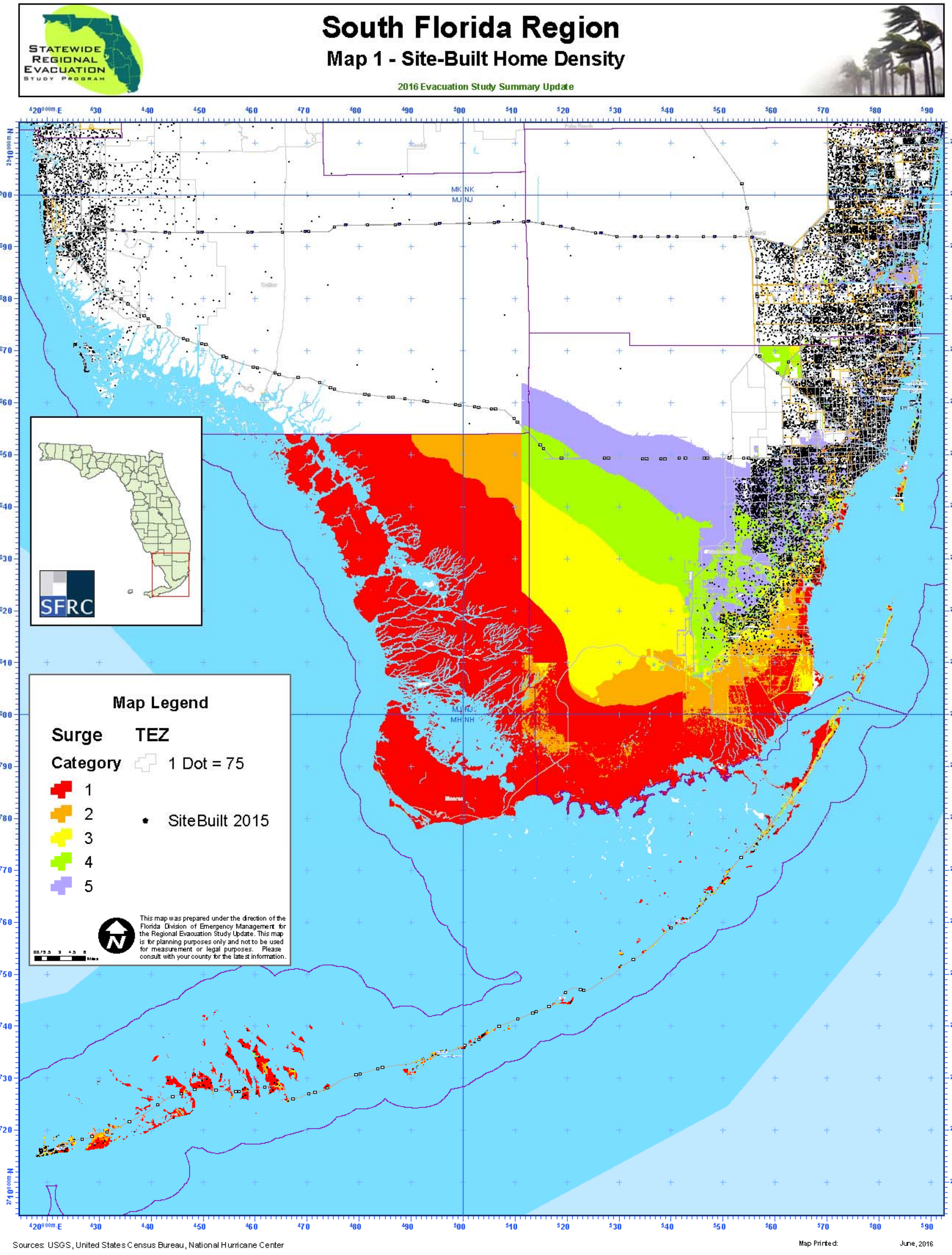
Data for 2010 was developed using block group level data from the 2010 Census and the 2006-2010 American Community Survey (ACS). The 2010 Census (the short-form collected for 100% of housing units) was used to obtain the total number of occupied and vacant dwelling units and the permanent resident population. Sample data from the 2006-2010 ACS was used to obtain general housing and population characteristics not available from the 2010 Census. For example, the 2010 Census data did not provide information regarding the number of single-family and multi-family (site-built) dwelling units or the number of mobile home units, as well as the number of vehicles that would be available to each housing unit type. This level of detail is found in the ACS. Using BEBR medium projections as the control variable for total population (years 2015 and 2020), the number of projected housing units by type was calculated for the corresponding future years. Absent specific direction from the counties that some block groups might be expected to grow more or less than the others, a proportionate factor from 2010 was used to distribute dwelling unit and population growth by block group. This method also established the percent of mobile and site-built homes. However, if any information was available to direct more growth into some areas of the counties than others (because the counties themselves project growth that way), it was incorporated (on a county-by-county basis).

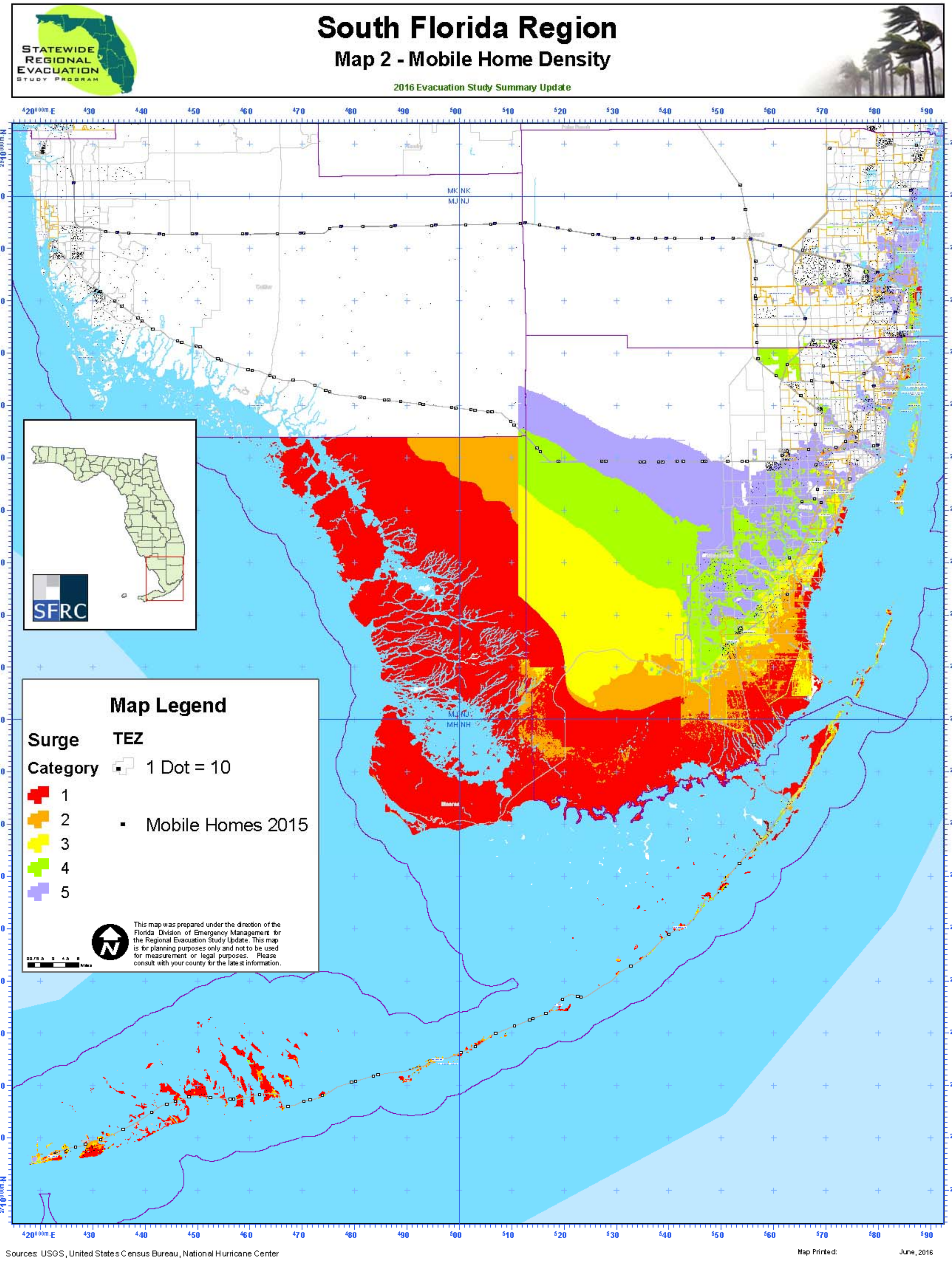
In South Florida, Monroe County provided specific input into the projected growth by census block group, based on the County's Rate of Growth Ordinance. The distribution of projected growth for Miami-Dade and Broward Counties was developed using interpolations for Traffic Analysis Zones (TAZs) built into the Southeast Regional Planning Model (SERPM 7.0), maintained by the Florida Department of Transportation, District 4.

Table 1. South Florida Demographic Characteristic Summary

County	Characteristic	Year		
		2010	2015	2020
Monroe	Occupied site-built homes	28,028	28,674	30,108
	Population in site-built homes	61,126	69,094	72,631
	Occupied mobile homes	4,601	4,483	4,137
	Population in mobile home	9,944	10,052	9,340
	Hotel/motel units	13,765	13,751	13,751
Miami-Dade	Occupied site-built homes	853,802	900,184	947,847
	Population in site-built homes	2,284,122	2,393,577	2,506,494
	Occupied mobile homes	13,520	13,505	13,505
	Population in mobile home	38,087	37,319	36,484
	Hotel/motel units	46,159	47,922	49,805
Broward	Occupied site-built homes	667,690	691,332	714,425
	Population in site-built homes	1,598,591	1,645,560	1,692,369
	Occupied mobile homes	18,343	19,092	19,720
	Population in mobile home	36,726	39,410	41,954
	Hotel/motel units	32,226	32,182	32,182
South Florida	Occupied site-built homes	1,549,520	1,620,190	1,692,380
	Population in site-built homes	3,943,839	4,108,232	4,271,494
	Occupied mobile homes	36,464	37,080	37,362
	Population in mobile home	84,757	86,781	87,778
	Hotel/motel units	92,150	93,856	95,739

Source: South Florida Regional Council (small area data developed for 2010) and CDM Smith (small area data as reflected in the TIME model for 2015 and 2020)


South Florida Region
Map 1 - Site-Built Home Density
2016 Evacuation Study Summary Update
Map Legend
Surge Category
1
2
3
4
5
TEZ
1 Dot = 75
SiteBuilt 2015
This map was prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only and not to be used for measurement or legal purposes. Please consult with your county for the latest information.
SFRC
Sources: USGS, United States Census Bureau, National Hurricane Center
Map Printed: June, 2016


Statewide Regional Evacuation Study Program
South Florida Region
Map 2 - Mobile Home Density
2016 Evacuation Study Summary Update
SFRC
Map Legend
Surge Category
1
2
3
4
5
TEZ
1 Dot = 10
Mobile Homes 2015
This map was prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only and not to be used for measurement or legal purposes. Please consult with your county for the latest information.
Sources: USGS, United States Census Bureau, National Hurricane Center
Map Printed: June, 2016

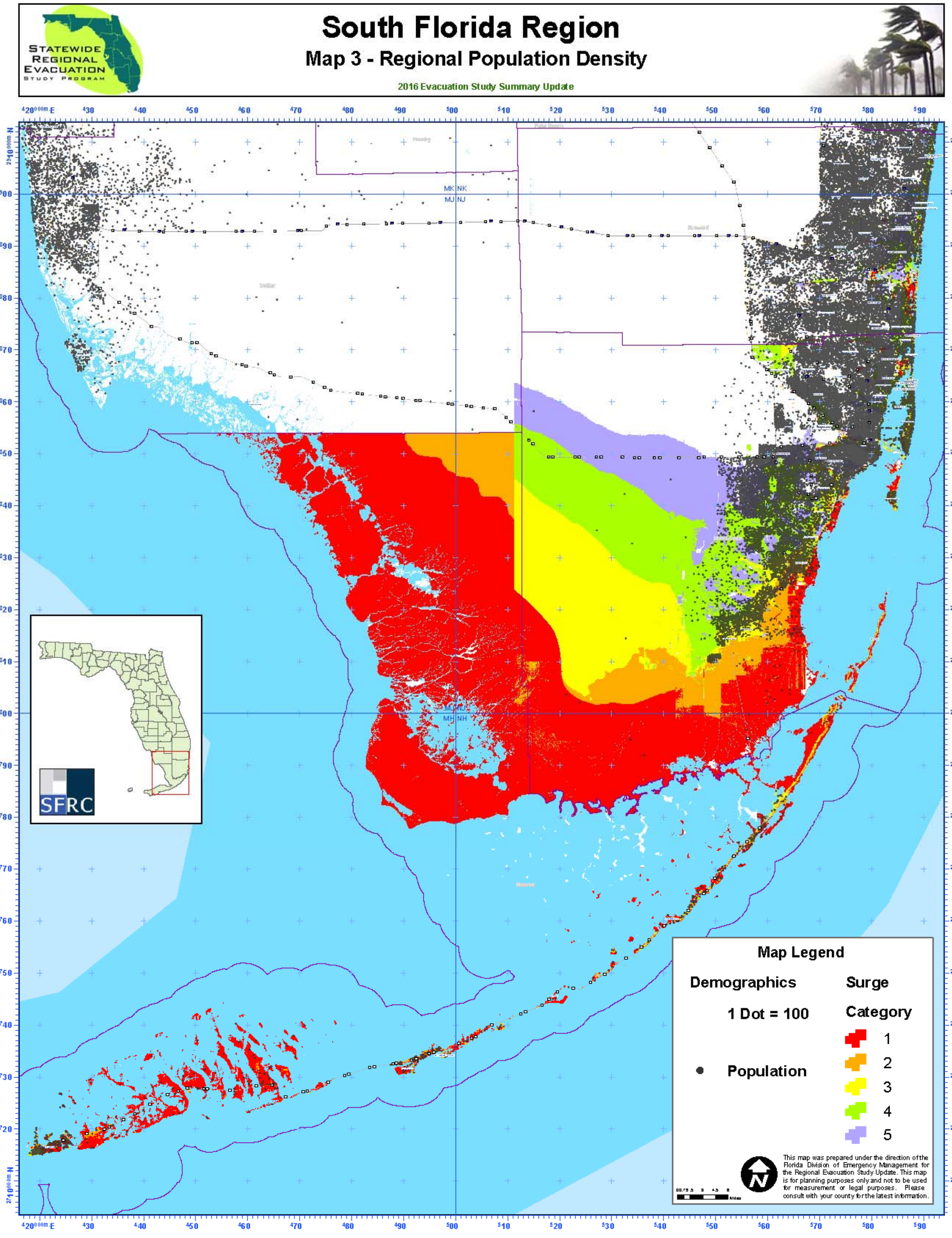
B. Overall Population

The University of Florida's Bureau of Economic and Business Research (BEBR) projected that the permanent resident population of South Florida on April 1, 2015 (Table 1) would be 4,536,605, up from 4,317,613 in the 2010 Census, which represents an increase of 218,992 (5.1%). Miami-Dade County is projected to lead the region's growth, adding 147,369 new residents, a pace of 5.9% in 5 years. Broward County is close behind, with a projected increase of 70,612 new residents, an increase of 4.0%. Monroe County's growth is subject to the County's Rate of Growth Ordinance, and is projected to be 1,011 (1.4%) over the 5-year period.

Table 2. South Florida Population by County, 2010 and 2015

County	April 1, 2015 Population Projection	April 1, 2010 Census Population	Total Change
Monroe	74,101	73,090	1,011
Miami-Dade	2,643,826	2,496,457	147,369
Broward	1,818,678	1,748,066	70,612
South Florida	4,536,605	4,317,613	218,992

Source: University of Florida, Bureau of Economic and Business Research (BEBR): Population Projections by Age, Sex, Race, and Hispanic Origin for Florida and Its Counties, 2015–2040, With Estimates for 2014 (June, 2015)


Statewide Regional Evacuation Study Program
South Florida Region
Map 3 - Regional Population Density
2016 Evacuation Study Summary Update
SFRC
Map Legend
Demographics
1 Dot = 100
Population
Surge Category
1
2
3
4
5
This map was prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only and not to be used for measurement or legal purposes. Please consult with your county for the latest information.
Sources: USGS, United States Census Bureau, National Hurricane Center
Map Printed: June, 2016

C. Hotel/Motel Units

According to licensing records of the Florida Department of Business and Professional Regulation (Table 3), in 2015 there were 552 hotels with 70,786 rooms, 502 motels with 19,087 rooms, and 69 bed and breakfast inns with 568 rooms in South Florida. These units house a portion of the seasonal population that is in addition to the permanent resident population estimated above. Considering that many of these units are in vulnerable areas, hotel/motel units that are occupied at any point in time will have an important impact on the total population that may participate in an evacuation.

By way of example, the DBPR inventory identifies 47 hotels with 3,623 rooms and 138 motels with 4,544 rooms in Monroe County. For storms of Level C or higher, all hotel/motel visitors are ordered to evacuate 24 hours prior to a general evacuation order, along with other non-residents in the Florida Keys.

Table 3. Licensed Public Lodging Facilities, 2015

South Florida Lodging Facilities	Facilities	Rooms/Units
Hotels	552	70,786
Motels	502	19,087
Transient Apartments	396	5,615
Non-Transient Apartments	7,910	257,871
Bed and Breakfast Inns	69	568
Resort Condominiums - Single	427	2,516
Resort Condominiums - Group	124	6,783
Resort Condominiums - Collective	92	1,199
Resort Dwellings - Single	701	1,103
Resort Dwellings - Group	31	303
Resort Dwellings - Collective	158	1,550
Total	10,962	367,381

Source: Florida Department of Business and Professional Regulation, Division of Hotels and Restaurants: Count of Active Licenses, Fiscal Year 2014-15 County Summary (July 1, 2015)

D. Vehicles per Household

Census Bureau estimates for 2014 indicate that there were 148,151 households in South Florida that had no vehicle (9.7% of all households). The proportion of renter-occupied units with no vehicle was 16.7%, while only 4.7% of owner-occupied units had no vehicle (Table 4). This represents a significant number of households that could need transportation assistance in the event of a major evacuation.

Table 4. Vehicles Available by Tenure, 2014

Households	South Florida	
	Estimate	%
Owner occupied:	906,013	100.0%
No vehicle available	42,840	4.7%
1 vehicle available	319,712	35.3%
2 vehicles available	371,343	41.0%
3 vehicles available	126,538	14.0%
4 vehicles available	35,487	3.9%
5 or more vehicles available	10,093	1.1%
Renter occupied:	623,524	100.0%
No vehicle available	105,311	16.9%
1 vehicle available	306,578	49.2%
2 vehicles available	174,498	28.0%
3 vehicles available	29,719	4.8%
4 vehicles available	5,887	0.9%
5 or more vehicles available	1,531	0.2%
Total:	1,529,537	100.0%
No vehicle available	148,151	9.7%
1 vehicle available	626,290	40.9%
2 vehicles available	545,841	35.7%
3 vehicles available	156,257	10.2%
4 vehicles available	41,374	2.7%
5 or more vehicles available	11,624	0.8%

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates, Tenure by Vehicles Available (Table B25044)

E. Age Composition

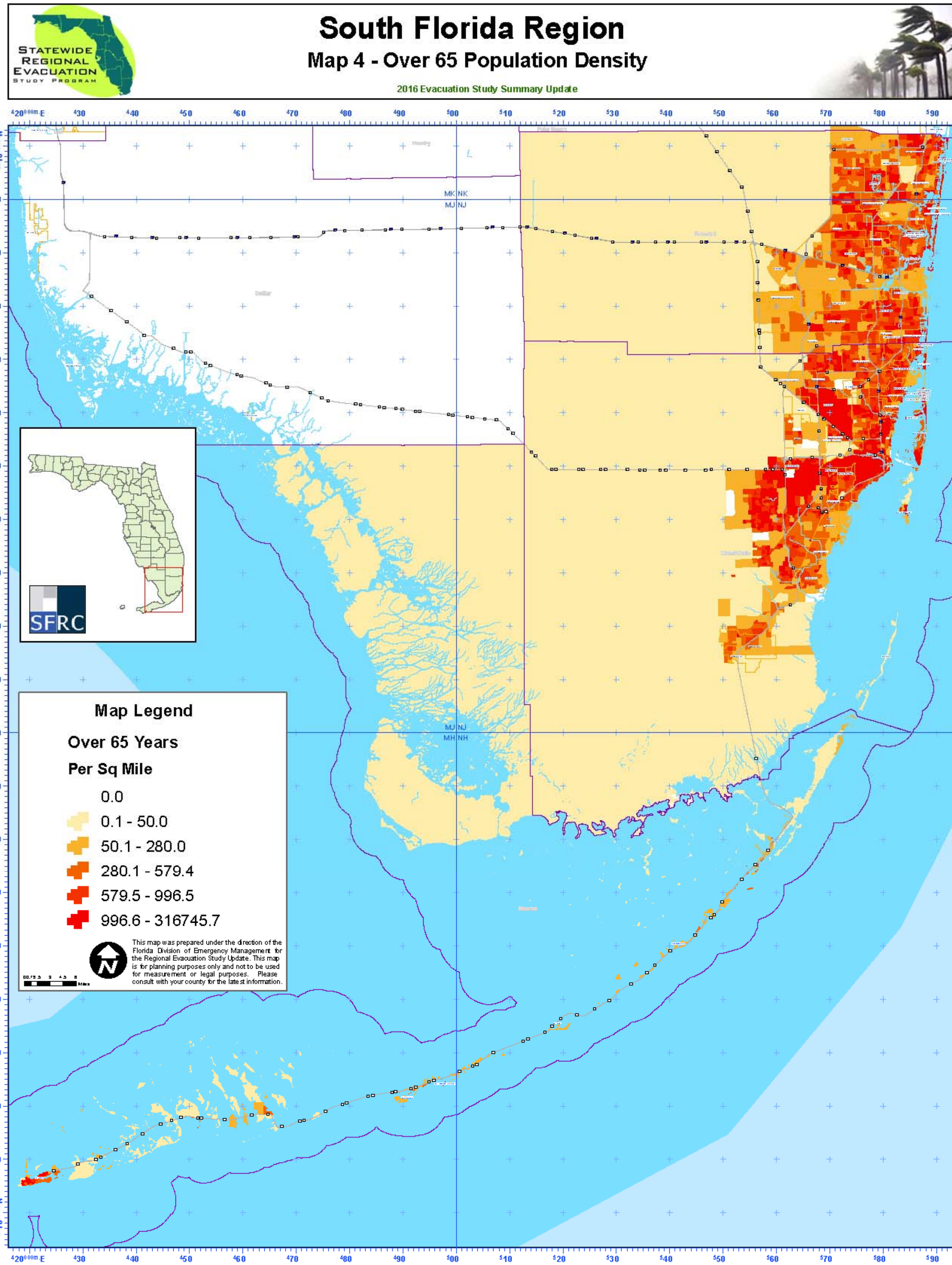
In 2010 (Table 5), the elderly population in South Florida reached 613,909, and its share of the total population was 14.2%. It is projected to increase to 832,314 (17.5% of the total) by 2020. During the same period, the number of children under 18 is expected to increase more slowly, decreasing slightly from 22.0% to 20.7% of the population.

The elderly population is particularly vulnerable in an evacuation and has impacts on the sheltering needs within a county. Special considerations must be given during an evacuation to populations like the elderly and the very young that could require assistance and additional resources.

Table 5. Resident Population by Age, 2010, 2015 and 2020

South Florida	Absolute Number			% of Total Population		
Age Categories	Census 2010	BEBR Projection 2015	BEBR Projection 2020	2010	2015	2020
Age under 5 years	256,384	261,838	267,210	5.9%	5.8%	5.6%
Age 5 to 17 years	691,699	704,607	717,292	16.0%	15.5%	15.1%
Age 18 to 24 years	399,511	416,542	403,015	9.3%	9.2%	8.5%
Age 25 to 54 years	1,864,083	1,884,456	1,911,953	43.2%	41.5%	40.1%
Age 55 to 64 years	492,027	557,370	630,723	11.4%	12.3%	13.2%
Age 65 to 79 years	433,565	504,572	599,218	10.0%	11.1%	12.6%
Age 80 years and over	180,344	207,220	233,096	4.2%	4.6%	4.9%
Total	**4,317,613**	**4,536,605**	**4,762,507**	**100.0%**	**100.0%**	**100.0%**
Age under 18 years	948,083	966,445	984,502	22.0%	21.3%	20.7%
Age 65 years and over	613,909	711,792	832,314	14.2%	15.7%	17.5%

Source: University of Florida, Bureau of Economic and Business Research (BEBR): Population Projections by Age, Sex, Race, and Hispanic Origin for Florida and Its Counties, 2015–2040, With Estimates for 2014 (June, 2015)



Sources: USGS, United States Census Bureau, National Hurricane Center

Map Printed: June, 2016

F. Limited English Speaking Households

The concept of “linguistically isolated households” reported in the data in 2010 has been renamed by the Census Bureau to “Limited English speaking households.” As in 2010, this concept refers to "Households in which no one 14 or over speaks only English at home, or speaks a language other than English and speaks English very well."

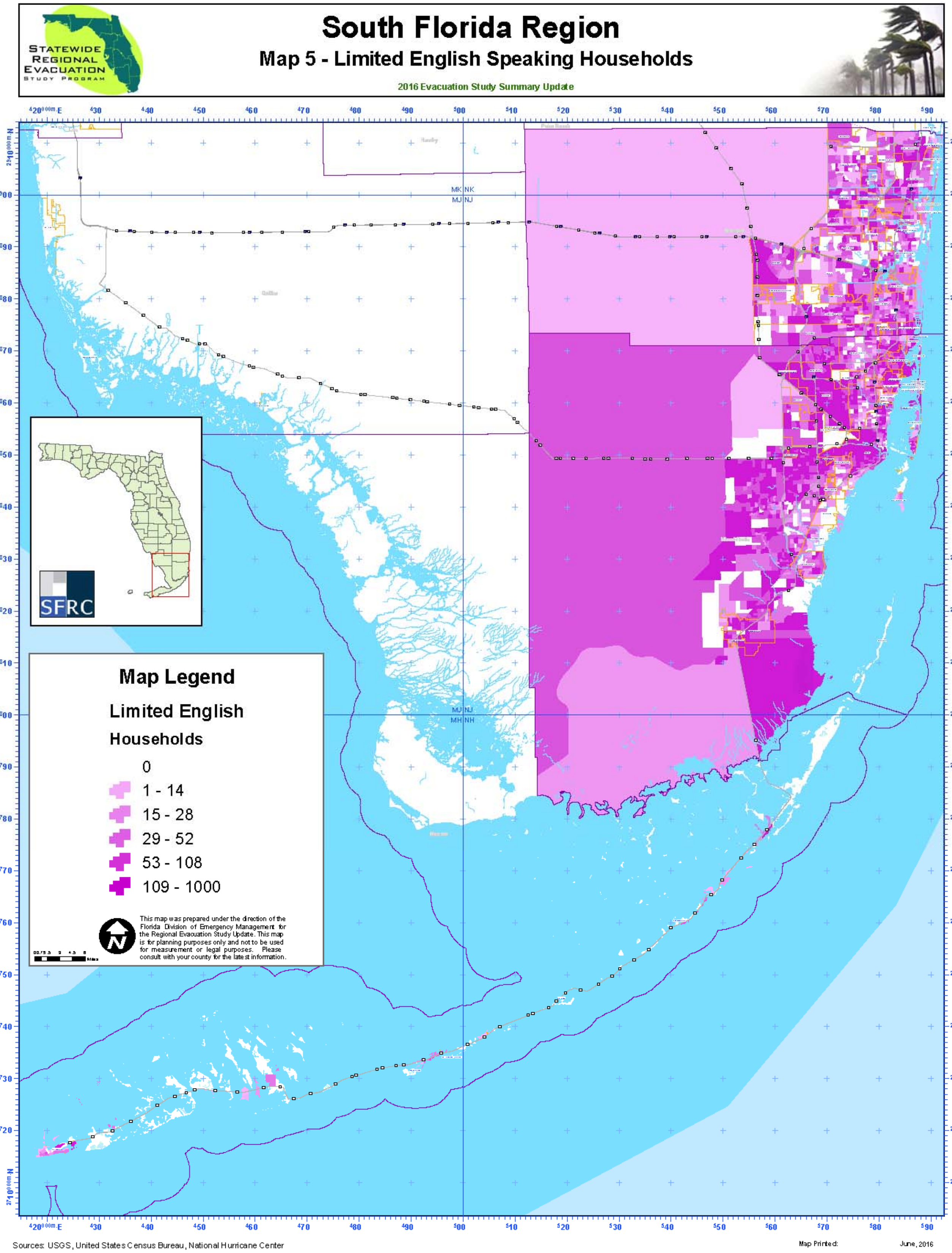
This dataset is important in evacuation planning as it helps to determine the types of evacuation orders that will be most effective in each county. Evacuation orders may need to be translated to several different languages and communicated in a variety of ways (television, print, radio, etc.).

In South Florida, in 2014, there were 270,094 Limited English speaking households, which represented 17.7% of all households. In Miami-Dade County, one out of every 4 households was classified as limited English speaking, while the proportion was 8.6% in Broward and 5.5% in Monroe. Although Spanish was spoken in the vast majority of limited English speaking households (85%), there were 41,367 limited English speaking households where another language was spoken.

Table 6. Limited English Speaking Households, 2014

Language Spoken	Total	Limited English	% Limited English
Total Households	1,529,537	270,094	17.7%
English Only	641,394		
Spanish	706,601	228,727	32.4%
Other Indo-European languages	145,485	34,185	23.5%
Asian and Pacific Island languages	21,213	5,041	23.8%
Other languages	14,844	2,141	14.4%

Sources: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates (Table B16002)


South Florida Region
Map 5 - Limited English Speaking Households
2016 Evacuation Study Summary Update
Statewide Regional Evacuation Study Program
SFRC
Map Legend
Limited English
Households
0
1 - 14
15 - 28
29 - 52
53 - 108
109 - 1000
This map was prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only and not to be used for measurement or legal purposes. Please consult with your county for the latest information.
Sources: USGS, United States Census Bureau, National Hurricane Center
Map Printed: June, 2016

II. Regional Hazards Analysis

A. Hazards Identification and Risk Assessment

Traditionally, the regional evacuation studies in Florida have focused specifically on the hurricane hazard. Considering our vulnerability to tropical storms and hurricanes, as well as the complex nature of the evacuation and the emergency response and recovery, the priority of hurricane planning remains a necessity. However, history has also demonstrated a need to address other significant hazards, which have the potential for initiating major evacuations.

The Statewide Regional Evacuation Study (SRES), utilizing the ***Statewide Hazard Mitigation Plan*** (SHMP, 2013), identified the major hazards facing the state, and further focused on those hazards, which had the potential for initiating a multi-jurisdictional evacuation. A number of factors were considered in assessing the risk of each hazard event, including the frequency of occurrence, the severity of the event and the areas vulnerable to its impact.

Local Mitigation Strategies (LMS) are an important source of information regarding hazards specific to a County. Each of the 67 counties in Florida have in place an approved LMS document, which includes detailed risk assessments for each County.

Eleven major natural hazards were identified including floods, tropical cyclones; severe storms and tornadoes; wildfire; drought; extreme heat; winter storms and freezes; erosion; sinkholes, landslides and seismic events; tsunamis; and solar storms. These hazards are detailed in the table below and include a summary of if the hazard may require a regional evacuation of the population affected.

For purposes of the SRES, the potential evacuation from (1) Tropical Cyclones, (2) Inland/Riverine floods (including related potential for dam failure) and (3) Wildfires and the Urban Interface will be analyzed in detail.

The hazards and vulnerability analysis shall identify the potential hazards to the region and shall include investigations of:

- General Information about each hazard (Hazards Profile);
- A geo-spatial analysis of the potential effects of the hazard, i.e. inundation areas, wind fields, dam locations, urban interface, etc.
- Human and social impacts including the identification of the population-at-risk, potential shelter and mass care demands, evacuee behavioral assumptions and the vulnerability of critical facilities.

Table 7: Hazards Identified in Florida[1]

Hazard	Methodology of Identification	Significant Concerns	Potential to Initiate a Regional Evacuation
Floods (including potential for dam failure and sea level rise)	Review of past disaster Declarations. Review of Federal Flood Insurance Rate Maps (FIRMs) Input from state floodplain manager. Identification of NFIP repetitive loss properties in the state. Research including new media and Internet resources	Florida is affected by flooding nearly every year. Floods have caused extensive damage and loss of life in the state in the past. There are a number of dams in the state, the breach or failure of which could impact the nearby population. Sea level rise could affect coastal structures and lead to higher water levels.	Yes; although more difficult to determine which areas are vulnerable to a particular event.
Tropical Cyclones	Review of past disaster declarations. Review of National Climatic Data Center (NCDC) Severe Storms Database. Review of National Oceanographic and Atmospheric Association (NOAA) climatology data Research including new media and the Internet Research including the National Hurricane Center	Hurricanes and coastal storms affect Florida every year. Hurricanes have caused extensive damage and loss of life across the state for the last 50 years. 12 out of the last 15 federally declared disaster events in Florida were tropical storms or hurricanes. The most recent federally declared disaster event in Florida (October 18, 2012) was Hurricane Isaac. Potential risk to offshore oil and gas exploration and production infrastructure.	Yes; this hazard requires the evacuation of coastal areas and mobile home residents, even in minor tropical storm events. Major hurricanes can have catastrophic impacts.
Severe Storms & Tornadoes	Review of past disaster declarations. Review of National Climatic Data Center (NCDC) Severe Storms Database. National Weather Service input and data. Public input including newspapers and media. Research including new media and Internet resources	Florida experiences a tornado nearly every year. Tornadoes have caused extensive damage and loss of life to county residents. The two most recent federally declared disaster events in Florida (May 27, 2009 and April 21, 2009) were severe storms with flooding, tornadoes and straight-line winds.	No; these events provide little to no warning and the specific areas cannot be determined prior to the event. Exceptions: Tornado warnings can send residents to safe rooms or mobile home parks' community centers, etc.
Wildfire	Florida Forest Service statistics and input. USDA Florida Forest Service mapping of Fire, fuel, and Wildland Urban Interface (WUI). Input from DEM about wildfires and the EOC activations. Public input including newspapers and media.	Florida experiences wildfires every year. Development in much of the state is occurring at the Wildland-Urban Interface (WUI). Cyclical drought patterns result in increases of brush and other dry materials. This increases the overall risk for significant fires. As of May 29, 2012, there have been 2,032 wildfires affecting 93,338 acres on state and federal land during the 2012 calendar year.	Yes; while we can determine areas that may be more vulnerable and plan accordingly, it is difficult to predict where a wildfire may ignite.

[1] ***Statewide Hazard Mitigation Plan*** (SHMP), 2013

Hazard	Methodology of Identification	Significant Concerns	Potential to Initiate a Regional Evacuation
Drought	National Weather Service data. National Oceanographic and Atmospheric Association (NOAA) paleoclimatology data. The US Drought Monitor Keetch Byram Drought Index (KBDI) Agricultural community throughout the state.	Significant drought trends during the last 10 years including the driest back to back calendar years in 2006-2007 Drought has a severe economic impact on the state due to the large amounts of citrus, agriculture and livestock.	No; this event does not typically initiate an evacuation.
Extreme Heat	National Weather Service data. Research including new media and Internet resources	Significant impact to the population From 1994-2003, on average more people died from excessive heat than hurricanes, flooding, tornadoes and lightning combined.	No; this event does not typically initiate an evacuation; although shelters may be opened.
Winter Storms and Freezes	Review of past disaster declarations. Review of NCDC Severe Storms Database. National Weather Service input and data. Public input including newspapers and media.	Florida is affected by winter storms cyclically Significant freezes particularly during the 1980s that affected the citrus industry There have been six federally declared disasters relating to winter storms and freezes since 1971 The population is unprepared for cold weather with many having inadequate heating capabilities.	No; this event does not typically initiate an evacuation; although cold weather shelters may be opened for homeless, citizens with special needs or those with no power.
Erosion	Coordination with the Florida Department of Environmental Protection – Bureau of Beaches and Coastal systems. SHMPAT interview and input. Evaluation of Erosion Hazards, the report from the Heinz Center that was presented to FEMA in April 2000. Looking at shoreline change maps Public input including newspapers and media.	Due to the gradual, long-term erosion, as many as one in four houses along the coast, could fall into the ocean in the next 60 years Fifty-nine percent of Florida's beaches are currently experiencing erosion. Significant economic impact for the state due to property damages, loss of actual beach front real estate and effects on tourism	No; this event does not typically initiate an evacuation, but it may result in a retreat from the coast over long period of time or following a major coastal storm.
Sinkholes, Landslides and Seismic Events	Coordination with the Florida Geographical Survey The Florida Subsidence Incident Report (SIR) database Coordination with the Florida Department of Transportation Input from the Central United States Earthquake Consortium	Sinkholes are a common feature of Florida's landscape 3,378 sinkholes have been reported in the state since the 1940s, 175 of those developed because of Tropical Storm Debby. Issues arise as development continues in high-risk areas. Impact on the roads and physical infrastructure of the state Localized lowering of groundwater table for agricultural pumping can trigger sinkholes. Historical earthquake events impact Pensacola, FL previously.	Earthquake is considered a very low risk. Sinkholes, while prevalent, will not initiate an evacuation at a regional scale.

Hazard	Methodology of Identification	Significant Concerns	Potential to Initiate a Regional Evacuation
Tsunamis	Input from the NOAA Center for Tsunami Research Coordination with the Florida Division of Emergency Management Input from the United State Geological Survey	Tsunamis commonly occur in large bodies of water Almost all perimeters of Florida's boundaries are made up of large bodies of water Recent Tsunamis from around the world have caused widespread destruction Residential and commercial development along Florida's coastlines are at risk to the effects of Tsunamis Tsunami and rogue wave occurrence in Florida is rare with approximately four documented events (1755,1886,1992,1995) Potential tsunamis generation is pollable by mass wasting events in the Canary and Cape Verde Islands based on geological evidence of their conjectured past impact on the east coast of the Bahamas.	This event has an extremely low probability of occurrence. If a Cumbre Vieja-related tsunami event were to occur, it could have a catastrophic impact on the east coast of Florida. A maximum of 6 hours would be available for evacuations. Typically, there is little to no warning.
Solar Storms	Coordination with Division of Emergency Management. Research including new media and Internet resources	Emerging threat, which could significantly interfere with the electrical grid and critical infrastructure functionality.	No; this event does not typically initiate an evacuation.
Technological	Coordination with the State Emergency Response Commission Interaction with the Local Emergency Planning Committees (LEPC) Coordination with the Nuclear Regulatory Commission (NRC) Communications with the FL Department of Environmental Protection	Numerous accidental hazardous material releases occur every year Potential for human and environmental impacts Threat of radiation from a nuclear related incident	Yes, these incidents may initiate evacuations, but it is impossible to predict precise location, extent, and timing. Nuclear power plant evacuation planning conducted w/NRC
Terrorism	Coordination with FEMA and Department of Homeland Security Coordination with the Florida Department of Law Enforcement (FDLE) Interaction with local law enforcement agencies	National priority with federal government requirements Potential for devastating impacts to life and infrastructure Protection for the citizens of Florida and the USA	Yes, these incidents may initiate evacuations, but it is impossible to predict precise location, extent and timing.
Mass Migration	Coordination with the US Citizens and Immigration Service (USCIS) Data from local law enforcement	Historic precedence for migration to Florida by boat Large amounts of unpatrolled coastlines	No; evacuation is not the problem.

1. Tropical Cyclones

Coastal Storms/Hurricane Hazard Profile

A hurricane is defined as a weather system with a closed circulation developing around a low pressure center over tropical waters. The winds rotate counterclockwise in the Northern Hemisphere (clockwise in the Southern Hemisphere). A tropical cyclone refers to any such

circulation that develops over tropical waters. *Tropical cyclones act as a safety valve limiting the build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes* (*Statewide Hazard Mitigation Plan*, SHMP 2013). Tropical cyclones are named when their winds reach tropical storm strength (sustained 39 mph).

- **Tropical Depression**: The formative stages of a tropical cyclone in which the maximum sustained (1-minute mean) surface wind is <38 mph.
- **Tropical Storm:** A warm core tropical cyclone in which the maximum sustained surface wind (1-minutes mean) ranges from 39 to <73 mph.
- **Hurricane:** A warm core tropical cyclone in which the maximum sustained surface wind (1 minute mean) is at least 74 mph.

The table below displays the Saffir-Simpson Scale used to define and describe the intensity of hurricanes. The central pressure of the hurricanes is measured in millibars or inches. The wind speed is also a significant indicator in determining the category of the storm. The wind speed is tied to both wind damage and potential storm surge and resulting coastal flooding damages.

It should be noted that the range of storm surge is highly dependent upon the configuration of the continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf or one that drops steeply from the shoreline and subsequently produces deep water in close proximity to the shoreline tends to produce a lower surge but higher and more powerful storm waves. This is the situation along the Atlantic Ocean side of the state. However, the Gulf Coast of Florida has a long gently sloping shelf and shallow water depths and can expect a higher surge but smaller waves. South Miami-Dade County is an exception to these general rules due to Biscayne Bay (wide shelf and shallow depth). In this instance, a hurricane has a larger area to "pileup" water in advance of its landfall. Nowhere is the threat of storm surge more prevalent than in Apalachee Bay region. The Big Bend region of the state extends out into the Gulf of Mexico creating a naturally enclosed pocket. This area has some the highest computer projected storm surge heights in the entire nation.

Hurricanes Dennis, Katrina and Ike also demonstrated that the size of the hurricane can significantly impact the potential storm surge. These storms which had particularly large radii of maximum winds produced storm surge comparable to much more intense categories of storm if measured using only wind speeds. This storm characteristic will be modeled to determine its impact on the ultimate storm surge.

Table 8: Saffir-Simpson Hurricane Wind Scale

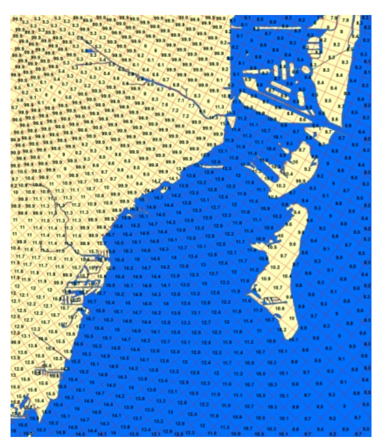
Category	Wind Speeds	Potential Damage
Category 1	(Sustained winds 74-95 mph)	Very dangerous winds will produce some damage
Category 2	(Sustained winds 96-110 mph)	Extremely dangerous winds will cause extensive damage
Category 3	(Sustained winds 111-130 mph)	Devastating damage will occur
Category 4	(Sustained winds 131-155 mph)	Catastrophic damage will occur
Category 5	(Sustained winds of 156 mph and above)	Catastrophic damage will occur

The storm surge is the abnormal rise in water level caused by the wind and pressure forces of a hurricane or tropical storm. Storm surge produces most of the flood damage and drowning associated with storms that make landfall or that closely approach the coastline. Of the hurricane hazards, the storm surge is considered the most dangerous as nine out of ten hurricane-related deaths are caused by drowning.

Storm Scenario Determinations

The SLOSH model is the basis for the "hazards analysis" portion of coastal hurricane evacuation plans. Thousands of hypothetical hurricanes are simulated with various Saffir-Simpson Wind categories, forward speeds, landfall directions, and landfall locations. An envelope of high water containing the maximum value a grid cell attains is generated at the end of each model run. These envelopes are combined by the NHC into various composites, which depict the possible flooding. One useful composite is the MEOW (Maximum Envelopes of Water) which incorporates all the envelopes for a particular category, speed, and landfall direction. Once surge heights have been determined for the appropriate grids, the maximum surge heights are plotted by storm track and tropical storm/hurricane category. These plots of maximum surge heights for a given storm category and track are referred to as Maximum Envelopes of Water (MEOWs). The MEOWs or Reference Hurricanes are used in evacuation decision-making when and if sufficient forecast information is available to project storm track or type of storm (different land falling, paralleling, or exiting storms).

SLOSH Grid with surge values



The MEOWs provide information to the emergency managers in evacuation decision making. However, in order to determine a scenario, which may confront the county in a hurricane threat 24-48 hours before a storm, is expected, a further compositing of the MEOWs into Maximums of the Maximums (MOMs) is usually required.

The MOM (Maximum of the Maximums) combines all the MEOWs of a particular category. The MOMs represent the maximum surge expected to occur at any given location, regardless of the specific storm track/direction of the hurricane. The only variable is the intensity of the hurricane represented by category strength (Category 1-5) and the type (land falling, paralleling, or exiting).

The MOM surge heights, which were furnished by the National Hurricane Center, were run at astronomical high tide. All elevations are now referenced to the NAVD88 datum. These surge heights were provided within the SLOSH grid system as illustrated in the figure above. The range of maximum surge heights for each county in the region based upon the model is provided for each category of storm on Table 9. It should be noted again that these surge heights represent the maximum surge height recorded in the county including inland and back bay areas where the surge can be magnified dependent upon storm parameters.

In order to determine the inundation depth of surge flooding at a particular location, the ground elevation (relative to NAVD88) at that location must be subtracted from the potential surge height. It is important to note that one must use a consistent vertical datum when post-processing SLOSH storm surge values.

Table 9: Potential Tide Height(s) ** By County
(In Feet above NAVD88)

*Storm Strength	Monroe	Miami-Dade	Broward
Category 1	Up to 7.9'	Up to 5.0'	Up to 3.1'
Category 2	Up to 12.2'	Up to 8.2'	Up to 4.7'
Category 3	Up to 16.4'	Up to 11.4'	Up to 6.2'
Category 4	Up to 20.0'	Up to 14.2'	Up to 8.3'
Category 5	Up to 23.3'	Up to 16.5'	Up to 9.5'

** Based upon the category of storm on the Saffir-Simpson Hurricane Wind Scale*
*** Surge heights represent the maximum values from SLOSH MOMs*

Variations to Consider

Variations between modeled versus actual measured storm surge elevations are typical of current technology in coastal storm surge modeling. In interpreting the data, emergency planners should recognize the uncertainties characteristic of mathematical models and severe weather systems such as hurricanes. The storm surge elevations developed for this study and presented in the Storm Tide Atlas should be used as guideline information for planning purposes.

Storm Surge & Wave Height

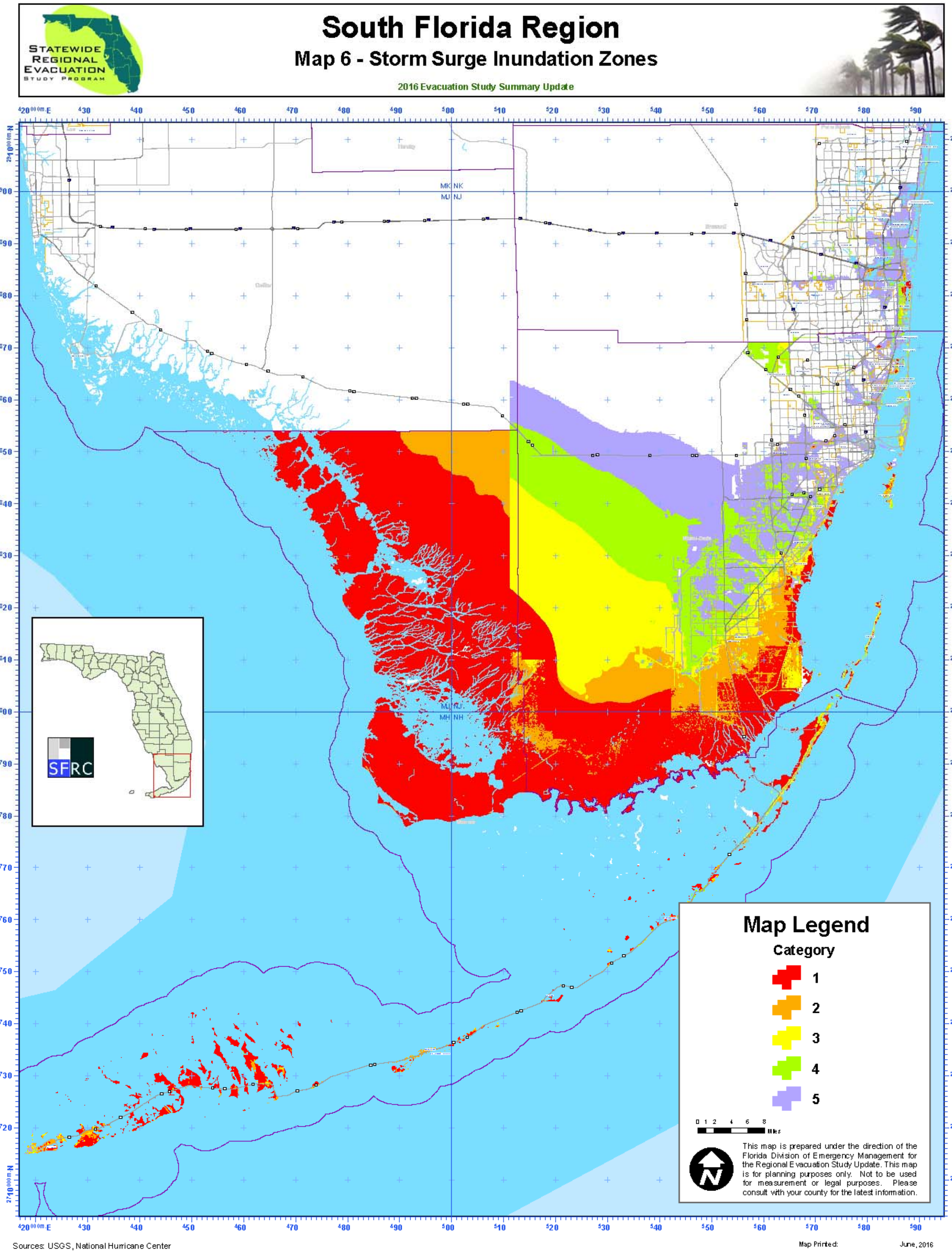
Regarding interpretation of the data, it is important to understand that the configuration and depth (bathymetry) of the Ocean or Gulf bottom will have a bearing on surge and wave heights. A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water in close proximity to the shoreline, tends to produce a lower surge but a higher and more powerful wave. Those regions having a gently sloping shelf and shallower normal water depths, can expect a higher surge but smaller waves. The reason this occurs is that a surge in deeper water can be dispersed down and out – away from the hurricane. However, once that surge reaches a shallow gently sloping shelf, it can no longer be dispersed away from the hurricane. Consequently, water piles up as it is driven ashore by the wind stresses of the hurricane. Wave height is NOT calculated by the SLOSH model and is not reflected within the storm tide delineations.

Forward Speed

Under actual storm conditions, it may be expected that a hurricane moving at a slower speed could have higher coastal storm surges than those depicted from model results. At the same time, a fast-moving hurricane would have less time to move storm surge water up river courses to more inland areas. As an example, a minimal hurricane, or a storm further off the coast which stalls off the coast for several tidal cycles, could cause extensive beach erosion and move large quantities of water into interior lowland areas. In the newest version of the South Florida SLOSH model, for each set of tracks in a specific direction, storms were run at forward speeds of 5, 15, and 25 mph.

Astronomical Tide

Surge heights were provided for high tide. The tide level is referenced to North American Vertical Datum of 1988. The storm tide limits reflect astronomical high tide in the region.


Statewide Regional Evacuation Study Program
South Florida Region
Map 6 - Storm Surge Inundation Zones
2016 Evacuation Study Summary Update
SFRC
Map Legend
Category
1
2
3
4
5
This map is prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only. Not to be used for measurement or legal purposes. Please consult with your county for the latest information.
Sources: USGS, National Hurricane Center
Map Printed: June, 2016

Hurricane Vulnerability

Hurricane Evacuation Zones

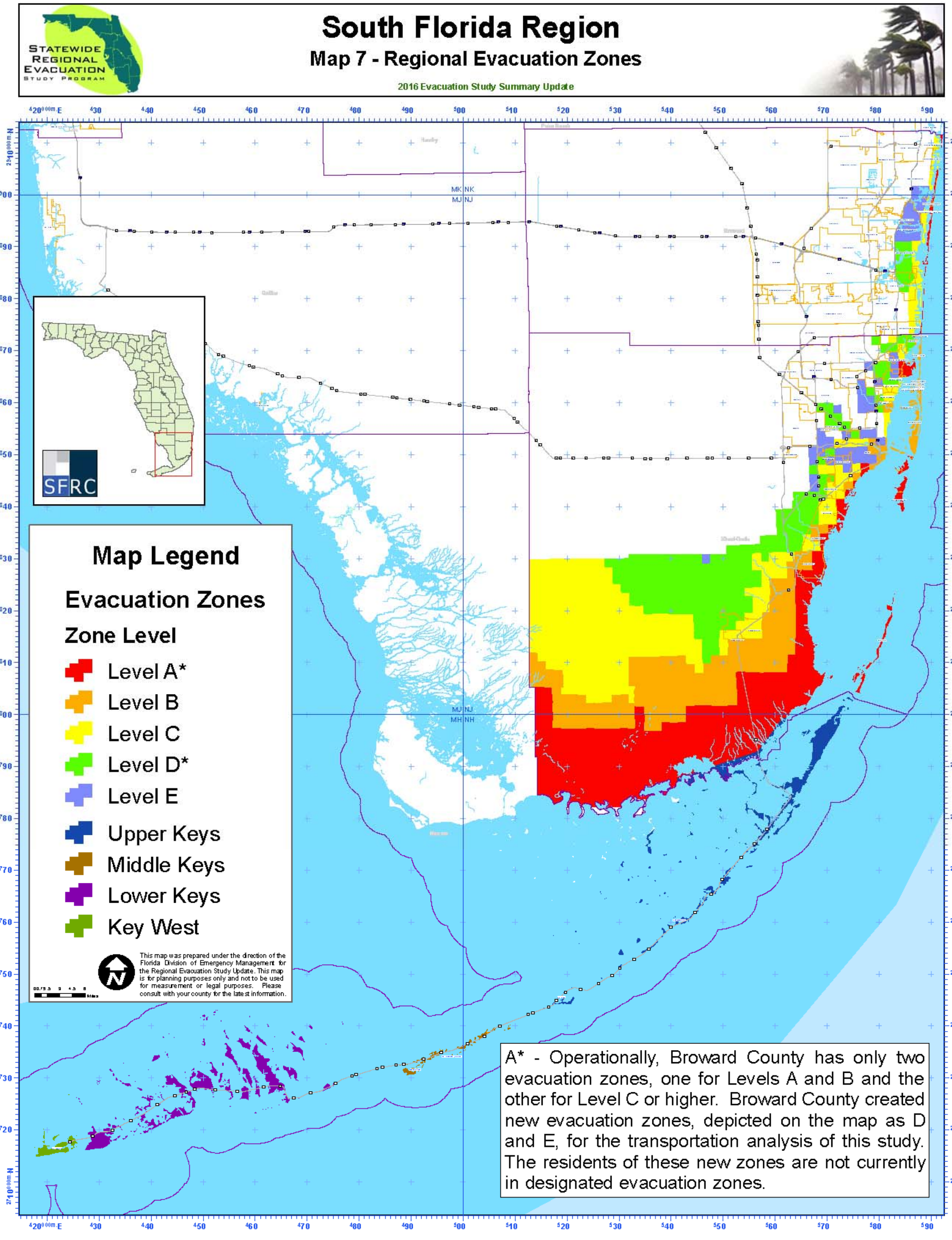
The delineation of evacuation zones is an essential part of any hurricane evacuation plan for two reasons. First, the creation of zones allows for the assignment of population and vehicles for the transportation analysis. Secondly, the creation of zones operationally allows preparedness and response officials to identify areas predicted to receive storm surge that require an evacuation.

The **storm tide limits** were determined using the maximum surge from landfalling hurricanes (Categories 1, 2, 3, 4 and 5). County emergency management agencies delineate the **evacuation zones** based on several factors, including the storm tide limits. However, in order to relay this information to the public in a meaningful way, the emergency management agencies use roadways, waterways and familiar landmarks as boundaries for the evacuation areas. This is a very deliberate process. It requires knowledge of the area, the land use and population density. In determining evacuation zones, judgments must be made about the potential for isolation in areas which may not receive storm surge yet are surrounded by areas which will. Potential freshwater flooding is also a consideration in some cases.

The more detailed storm tide limits coupled with the desire to minimize any potential "over-evacuation" results in tighter more detailed evacuation areas in several counties in the region. This is especially true where the LiDAR elevation data provided very detailed topographic data and where, in such a densely populated county, over-evacuation could affect thousands of residents.

Conversely, the inability to forecast exact hurricane track, intensity, size and forward speed as well as the limitation of the SLOSH model, encourage many county emergency management officials to simplify the evacuation zone patterns. This more flexible concept allows a more generalized zone scheme which may be easier to convey to the public.

County Evacuation Zones in the Region are presented below on Map 7. The Evacuation Zones are also presented in the County Appendices.


Statewide Regional Evacuation Study Program
South Florida Region
Map 7 - Regional Evacuation Zones
2016 Evacuation Study Summary Update
SFRC
Map Legend
Evacuation Zones
Zone Level
Level A*
Level B
Level C
Level D*
Level E
Upper Keys
Middle Keys
Lower Keys
Key West
This map was prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only and not to be used for measurement or legal purposes. Please consult with your county for the latest information.
A* - Operationally, Broward County has only two evacuation zones, one for Levels A and B and the other for Level C or higher. Broward County created new evacuation zones, depicted on the map as D and E, for the transportation analysis of this study. The residents of these new zones are not currently in designated evacuation zones.
Sources: USGS, United States Census Bureau, National Hurricane Center
Map Printed: June, 2016

Population-at-Risk (Vulnerable Population)

In order to quantify the hurricane evacuation times as well as hurricane response and recovery needs, it is essential to know how many persons must be evacuated from the hazards associated with a tropical storm or hurricane -- the **population-at-risk**.

Using a combination of the demographic data, behavioral assumptions, and evacuation zones, the vulnerable population in each county could be determined by evacuation level. For the purposes of the transportation analysis, the vulnerable population, or population-at-risk, is defined as the total population living within the county designated evacuation zones for each evacuation level. This population is living in an area that is at risk for severe flooding during a storm event.

The population-at-risk by hurricane evacuation level for the years 2015 and 2020 is presented on Table 10 and 11.

Table 10: Vulnerable Population in the South Florida Region, 2015

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D	Evacuation Zone E
Monroe County*					
Site-built Homes	69,095				
Mobile/Manuf. Homes	10,052				
TOTAL	79,147				
Miami-Dade County					
Site-built Homes	70,688	358,786	289,508	390,224	280,235
Mobile/Manuf. Homes	815	3,515	4,895	5,715	3,645
TOTAL	71,504	362,300	294,403	395,939	283,881
Broward County*					
Site-built Homes	48,951		97,706	41,104	88,550
Mobile/Manuf. Homes	30		1,032	793	2,972
TOTAL	48,981		98,739	41,897	91,522

Note: Vulnerable population determined using SRESP small area data and county-provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.
** For the purposes of this study, Broward County has a combined A/B zone and all of Monroe County is considered vulnerable.*

Table 11: Vulnerable Population in the South Florida Region, 2020

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D	Evacuation Zone E
Monroe County*					
Site-built Homes	72,632				
Mobile/Manuf. Homes	9,340				
TOTAL	81,972				
Miami-Dade County					
Site-built Homes	75,891	392,899	308,081	401,609	295,978
Mobile/Manuf. Homes	822	3,520	4,715	5,543	3,659
TOTAL	76,713	396,419	312,796	407,153	299,637
Broward County*					
Site-built Homes	50,715		100,357	45,901	91,994
Mobile/Manuf. Homes	30		1,055	827	3,008
TOTAL	50,745		101,413	46,728	95,002

Note: Vulnerable population determined using SRESP small area data and county-provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.
** For the purposes of this study, Broward County has a combined A/B zone and all of Monroe County is considered vulnerable.*

Wind Vulnerability: Manufactured Housing, Mobile Homes & RVs

Manufactured, mobile homes and recreational vehicles are extremely vulnerable to hurricane force winds and severe weather. Statistics document that these types of housing stock receive a disproportionate share of the damage from severe weather, and residents are far more likely to be injured or killed in these structures compared to site built homes.[2]

Because of this vulnerability hurricane evacuation plans in Florida have called for the evacuation of all areas subject to potential storm surge (coastal flooding) and the complete evacuation of all mobile home/RV residents no matter where they are located within the county.

In the 2004 hurricane season it seemed new manufactured homes held up relatively well, even when compared to site-built homes. Since 1999, manufactured homes have been built and installed to tougher standards but not equivalent to the most recent codes for site-built

[2] For example, in February 1998, a tornado destroyed many site-built homes, mobile homes and RVs in the Kissimmee/Orlando central Florida area. There were 42 people killed: 34 resided in mobile homes, 7 in RVs and 1 was in an automobile. No one living in a site-built home died; although there were **more** traditional concrete block and stick-built homes destroyed (385) than mobile homes (373) yet without any fatalities.

structures. As required by HUD all manufactured homes sold in Florida's coastal counties since 1994 are engineered to withstand sustained winds of 110 mph and 3-second gusts of 130 to 150 mph (http://www.builtstronger.com/history.html).

There are several additional factors to consider:

- Unless a structure is permanently attached to a foundation, there is no way to assume that the structure will remain "tied down" in hurricane force winds. With Florida's climate, salt air and sandy soils, tie-down systems would not be expected to perform optimally without constant vigilance.
- Currently, most manufactured homes in the region were built prior to 1999 and do not meet current standards for wind load or anchoring systems.
- Additions, such as carports, siding and cladding, and attached storage units did not perform well in hurricane conditions even on newer units.
- Newer manufactured homes would be at risk from flying debris from older units within the same mobile home park.
- It would be difficult, at best, to implement evacuation orders based on the age and maintenance of individual units.

In addition to residents vulnerable to storm surge, those residents vulnerable to hurricane force winds (74+ mph) must be evacuated in advance of the hurricane. Basically, residents of buildings without traditional structural foundations are more vulnerable to such wind speeds. In the South Florida region, this includes residents of substandard housing, manufactured and mobile homes and visitors in recreational vehicles and travel trailers. Since hurricane force winds can extend inland many miles, all manufactured and mobile home residents and travel trailer/RV visitors must be evacuated, regardless of their location in the region.

Table 12: Mobile Home/RV Parks in the South Florida Region

County	# of MH/RV Parks	# of Mobile Homes Spaces	# of RV Unit Spaces	Sum # of Spaces
Monroe	85	1,899	3,865	5,764
Miami-Dade	56	9,631	1,601	11,232
Broward	113	15,112	4,279	19,391
Region	254	26,642	9,745	36,387

Source: Florida Department of Health, 2016

2. Freshwater Flooding: The 100-Year Flood Plain

Inland / Riverine Flooding Profile

Flooding refers to the general or temporary conditions of partial or complete inundation of normally dry land areas from the overflow of inland or tidal water and of surface water runoff from any source (Statewide Hazard Mitigation Plan, 2013). The State of Florida and the South Florida Region are affected by a large number of weather systems that result in flooding.

Flooding can be divided into two major categories: Coastal and Riverine. As indicated previously, interrelated hazards, such as hurricanes and severe storms, can result in both types of flooding, sometimes in difference locations. Many areas of Florida are susceptible to flooding from both storm surge and watershed runoff.

Coastal flooding is usually the result of a severe weather system such as a tropical cyclone, hurricane, tropical storm, or "northeaster" which contains the element of wind. The damaging effects of coastal floods are caused by a combination of higher water levels of the storm surge, the winds, rains, erosion, and battering by debris. Loss of life and property damage are often more severe since it involves velocity wave action and accompanying winds.

Riverine flooding is associated with a river's watershed, which is the natural drainage basin that conveys water runoff from rain. Riverine flooding occurs when the flow of runoff is greater than the carrying capacities of the natural drainage systems. Rainwater not absorbed by soil or vegetation seeks surface drainage lines following natural topography lines. These lines merge to form a hierarchical system of rills, creeks, streams, and rivers. Generally, floods can be slow or fast rising depending on the size of the river or stream. The rivers in north Florida drain portions of Alabama and Georgia, and excessive rainfall in those states often causes flood conditions in Florida.

Flash floods are much more dangerous and flow much faster than riverine floods. They can result from tropical storms, dam failures or excessive rain and snow. Flash floods pose more significant safety risks because of the rapid onset, the high water velocity, the potential for channel scour, and the debris load.

In Florida, several variations of flooding occur due to the effects of severe thunderstorms, hurricanes, seasonal rain, and other weather-related conditions. The loss of life, personal property, crops, business facilities, utilities, and transportation are major impacts of flooding. Floodwaters present an additional hazard as a public health problem when they inundate drinking water facilities, chemical and waste storage facilities, wastewater treatment facilities, and solid waste disposal sites.

Probability of Flooding: FIRM Maps

The probability of freshwater flooding has been quantified by the Federal Emergency Management Agency (FEMA) through the National Flood Insurance Program. Areas subject to flooding, the Velocity Zone, 100-year flood plain and the 500-year floodplain, have been delineated on Flood Insurance Rate Maps (FIRMs) for every jurisdiction in the region. Moderate to low risk areas include zones B, C and X. High risk areas include zones A, AE, AH, AO, and AR. High risk coastal areas include the Velocity zones (Zones V, VE, V1-V30 and undetermined risk areas (Zone D).

Table 13: Definitions of NFIP Zones

AE Areas with 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 (BFEs) derived from detailed analyses are shown at selected intervals within these zones.

X500 An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from the 100-year flooding.

X Areas outside the 1-percent annual chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone. Insurance purchase is not required in these zones.

A Flood zone area with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths of base flood elevations are shown within these zones.

ANI An area that is located within a community or county not mapped on any published FIRM.

IN An area designated as within a “Special Flood Hazard Area” (or SFHA) on a FIRM. This is an area inundated by 100-year flooding for which no BFEs or velocity may have been determined. No distinctions are made between the different flood hazard zones that may be included within the SFHA. These may include Zones A, AE, AO, AH, AR, A99, V, or VE.

VE Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

UNDES A body of open water, such as a pond, lake, ocean, etc., located within a community’s jurisdictional limit that has no defined flood hazard.

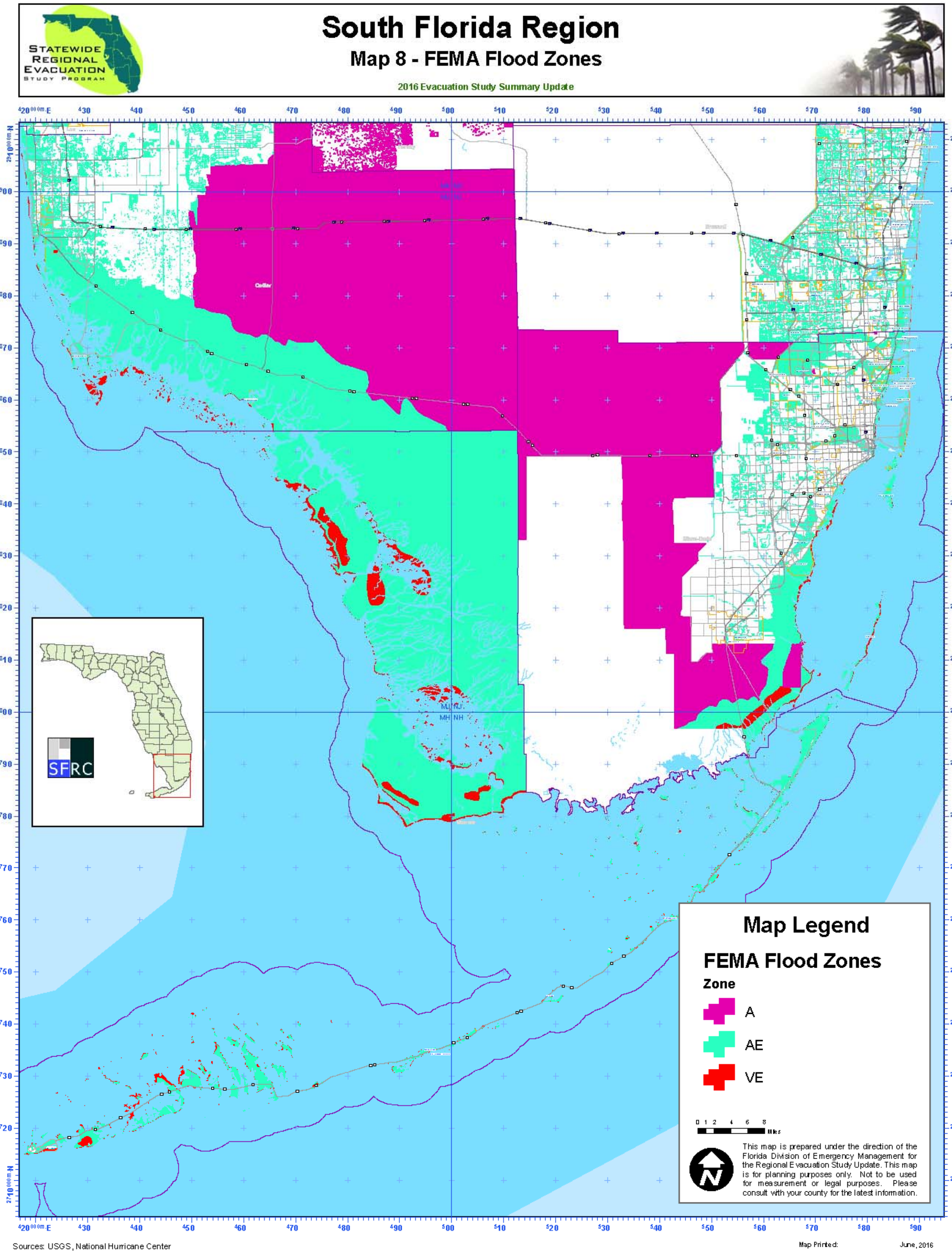
AO River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.

D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
100IC	An area where the 100-year flooding is contained within the channel banks and the channel is too narrow to show to scale. An arbitrary channel width of 3 meters is shown. BFEs are not shown in this area, although they may be reflected on the corresponding profile.

Source: FEMA Map Service Center,
https://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA%2520Flood%2520Zone%2520Designations

The model used to determine the flood plain, like the SLOSH MEOWs or MOMs and the Inland Wind model, is a cumulative model. In other words, it is based on several storm events; no one storm will inundate all the areas within the flood zone. In addition, because there is a return interval (1% or greater chance of flooding in any given year) associated with the flood level; there is a basis for planning and cost-benefit analysis.

In order to identify the potential magnitude of inland flooding, the 100-year flood plain was delineated using FEMA's most recent digital files. County maps illustrating the 100-year flood plain are presented in the Maps sections of Chapter IV Appendices. Within the flood zone, it is recognized that there are areas that have sustained repeated damage from flooding and are extremely susceptible to flood damage. These local neighborhoods should be warned prior to hurricane events that flooding is very probable.


Statewide Regional Evacuation Study Program
South Florida Region
Map 8 - FEMA Flood Zones
2016 Evacuation Study Summary Update
SFRC
Map Legend
FEMA Flood Zones
Zone
A
AE
VE
This map is prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only. Not to be used for measurement or legal purposes. Please consult with your county for the latest information.
N
Sources: USGS, National Hurricane Center
Map Printed: June, 2016

Flood Plain Vulnerability

The total acreage within the 100-year flood plain by county is presented below, in Table 8. It was calculated using the total acreage as determined by the Census Bureau and the FEMA FIRM Maps as of 2009. Table 14 summarizes the population living in 100 year flood zones in each County in the Region.

Table 14: 100-Year Flood Plain Acreage by County

County	Total Acreage	Flood Plain Acreage	% of Acreage in Floodplain
Monroe	2,392,013	702,338	29.36%
Miami-Dade	1,555,955	545,038	35.03%
Broward	846,630	46,269	5.47%
South Florida	4,794,598	1,293,646	26.98%

Source: Census 2010 SF1 (Land & Water Acreage); FEMA (Digital Inventory of Flood Plain Acreage), 2012.

Table 15: Population-at-Risk from Flooding by County, 2015-2020

County	Site Built Population 2015	Mobile/ Manufactured Home Population 2015	Site Built Population 2020	Mobile/ Manufactured Home Population 2020
Monroe	62,655	9,458	65,724	8,774
Miami-Dade	264,482	5,406	271,663	5,715
Broward	672,219	10,859	710,437	10,694
South Florida	999,356	25,723	1,047,824	25,183

Source: FEMA, South Florida Regional Council

3. Wildfires and the Urban Interface

Florida is home to millions of residents who enjoy the state's beautiful scenery and warm climate. However, few people realize that these qualities also create severe wildfire conditions. Each year, thousands of acres of wild land and many homes are destroyed by fires that can erupt at any time of the year from a variety of causes, including arson, lightning, and debris burning. Adding to the fire hazard is the growing number of people living in new communities built in areas that were once wild land. This growth places even greater pressure on the state's wild land firefighters. As a result of this growth, fire protection becomes everyone's responsibility (Florida Division of Emergency Management, 2008) http://www.floridadisaster.org/bpr/EMTOOLS/wildfire/wildfire.htm

Wildfire Hazard Profile

Wildfire is defined by the Florida Forest Service (FFS) as any fire that does not meet management objectives or is out of control. Wildfires occur in Florida every year and are part of the natural cycle of Florida's fire-adapted ecosystems. Many of these fires are quickly suppressed before they can damage or destroy property, homes, and lives. (SHMP, 2013) There are four types of forest fires:

- Surface Fires: Burn along the forest floor consuming the litter layer and small branches on or near the ground.
- Ground Fires: Smolder or creep slowly underground. These fires usually occur during periods of prolonged drought and may burn for weeks or months until sufficient rainfall extinguishes the fire, or it runs out of fuel.
- Crown Fires: Spread rapidly by the wind, moving through the tops of the trees.
- Wild land/Urban Interface Fires: Fires occurring within the WUI in areas where structures and other human developments meet or intermingle with wild lands or vegetative fuels. Homes and other flammable structures can become fuel for WUI fires.

Approximately 80 percent of all wildfires in Florida occur within one mile of the WUI. Florida has a year round fire season with the most active taking place from April to July. The majority of wildfires in Florida (70-80 percent) are caused by humans with arson and escaped debris burning being the top two causes. The largest number of lightning-caused fires occurs in July. The drier months tend to be January, February and March but this is not always the case depending on drought conditions and frequency of frontal passages. Dry months, combined with low humidity and high wind have the highest number of fires reported.

Each wildfire, especially near development, can threaten human life, structures, and natural resources. Urban development has moved into wild land areas where the hazard is more severe and fire control is more difficult.

Wild land-Urban Interface (WUI)

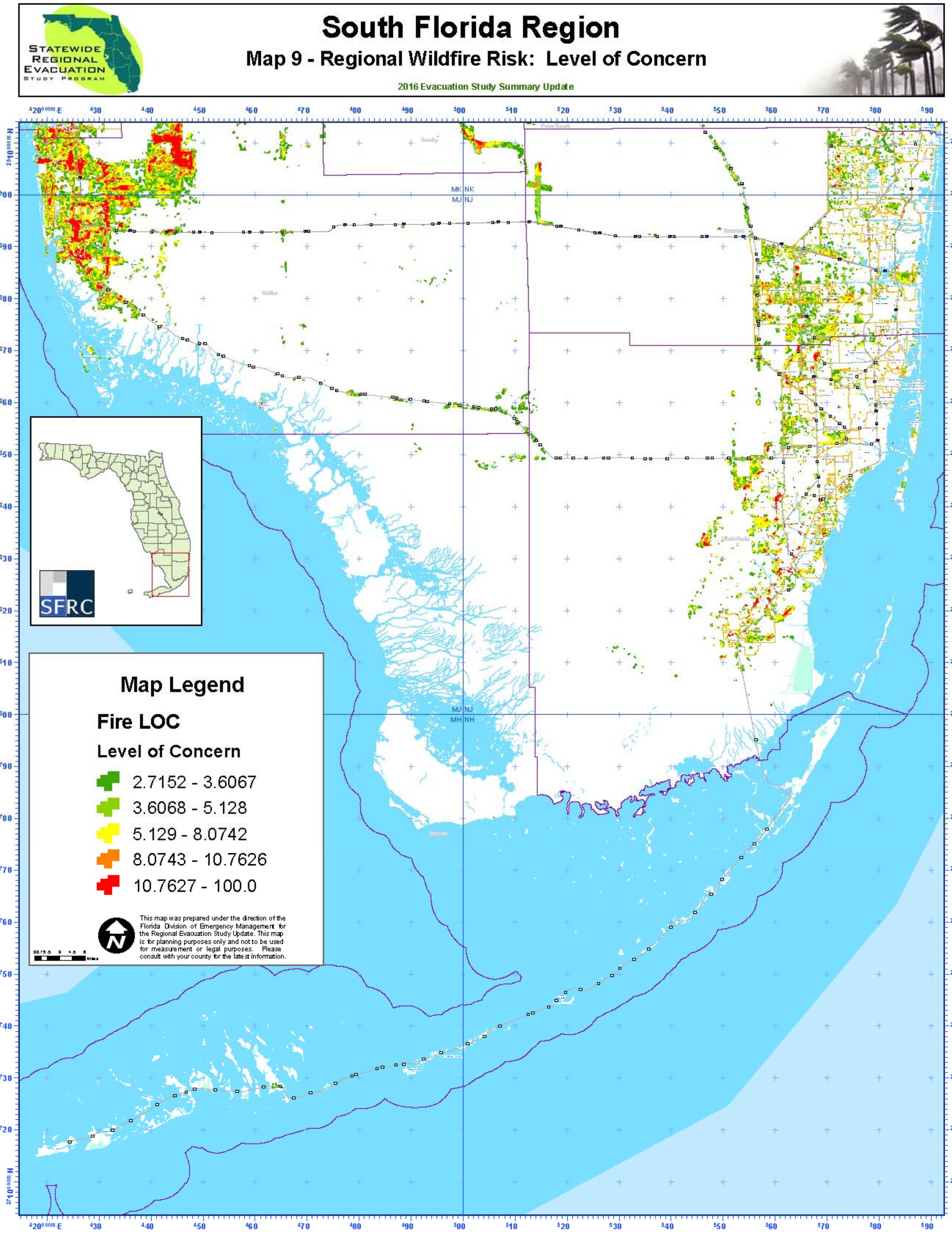
The Florida Forest Service provides risk maps for wildfire. The web-based risk system produces maps for Level of Concern (LOC), Fuels, Wild land Fire Susceptibility Index (WFSI) and the likelihood of the number of fires per 1000 acres per year (FOA).

Methodology

The Wild land Fire Risk Assessment System (FRAS) combines indices of Wild land Fire Susceptibility and Fire Effects to generate a “Level of Concern” map. **Level of Concern (LOC)** is the best measure of wildland fire risk. The Level of Concern is calculated from the likelihood of an acre burning, called the **Wildland Fire Susceptibility Index** (WFSI), and the expected effects of the fire (Fire Effects Index).

LOC is a value between 0 and 100. It is calculated as the Wildland Fire Susceptibility Index (WFSI) times the Fire Effects Index (FEI). The LOC can be used to identify areas where mitigation options may be of value; allow agencies to work together and better define priorities; develop a refined analysis of a complex landscape and fire situations using GIS; and increase communication with local residents to address community priorities and needs.

Map 9 illustrates the risk for wildfire within the region using the data provided by the Florida Forest Service.


STATEWIDE REGIONAL EVACUATION STUDY PROGRAM
South Florida Region
Map 9 - Regional Wildfire Risk: Level of Concern
2016 Evacuation Study Summary Update
SFRC
Map Legend
Fire LOC
Level of Concern
2.7152 - 3.6067
3.6068 - 5.128
5.129 - 8.0742
8.0743 - 10.7626
10.7627 - 100.0
This map was prepared under the direction of the Florida Division of Emergency Management for the Regional Evacuation Study Update. This map is for planning purposes only and not to be used for measurement or legal purposes. Please consult with your county for the latest information.
Sources: USGS, United States Census Bureau, National Hurricane Center
Map Printed: June, 2016

Wildfire Vulnerability

Population-at-Risk

The population–at-risk from wildfires was calculated using the small area data to determine the population the high risk wildfire areas within each County. This analysis can help to identify, categorize and prioritize those communities where tactical analyses and community interaction may be necessary to reduce risk from wildfire. The estimates for the population-at-risk for the Wildland Interface within each county for 2015 and 2020 are presented in Table 16.

Table 16: Population-at-Risk from Wildfire by County, 2015–2020

County	Site Built Population 2015	Mobile / Manufactured Home Population 2015	Site Built Population 2020	Mobile / Manufactured Home Population 2020
Monroe	20	2	22	2
Miami-Dade	94,338	1,546	98,042	1,485
Broward	80,537	1,868	82,737	2,117
South Florida	174,895	3,416	180,801	3,604

Source: Florida Forrest Service, South Florida Regional Council

4. County Critical Facilities Vulnerability Assessment

As indicated previously, the Critical Facility Inventory (CFI) includes a Vulnerability Assessment from (1) Hurricanes and Tropical Storms, (2) evacuation zones and (3) Flood zones and (4) Wildfire risk. This assessment can be found in each County appendix to this document.

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