MIAMI-DADE COUNTY

LMS

LOCAL MITIGATION STRATEGY

Whole Community Hazard Mitigation

Part 1: The Strategy

July 2020

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INTRODUCTION

The Local Mitigation Strategy (LMS) is a whole community initiative designed to reduce or eliminate the long-term risk to human life and property from hazards. The LMS Plan is a multi-volume Plan that documents the planning process and addresses mitigation measures in relation to the hazard risk and vulnerability assessment of Miami-Dade County. This is a living document which is revised in order to integrate and reflect current and projected issues, as identified and to track mitigation measures and actions that have occurred, are presently occurring, are planned for and/or are desired. This Plan is a compendium of efforts of the whole community, integrating governmental and non-governmental agencies such as non-profits, private sector, educational and faith-based organizations, as well as communities, families and individuals. As of 2019, the National Institute of Building Sciences estimates that their national benefit of $11 saved for every $1 invested.[1]

This version of the Plan is the five-year update that was last approved in 2015. The 2015 version included initiatives that integrate climate change, sea level rise, and additional measures to address floodplain management through the Community Rating System (CRS). This Plan was open for public review and the comments received were integrated in the Plan prior to submission to the Florida Division of Emergency Management (FDEM) and Federal Emergency Management Agency (FEMA) for review and approval. Upon receiving Federal approval, the LMS Plan will be presented to the Miami-Dade Board of County Commissioners (BCC) for adoption in 2020.

A review of the changes that have been made to the LMS since its last adoption in 2015 is provided in LMS-Part 1 under Section “LMS Revisions since Last Adoption” and LMS-Part 4: Appendix A.

Purpose

The purpose of the LMS is to develop a comprehensive approach to effectively reduce the impact of current and future hazards and risk faced by local communities within Miami-Dade County. [2]

The LMS accomplishes this through the following measures:

- A planning process that encourages whole community participation and input;
- Review and incorporation of community plans, local, state and federal regulations and guidance, studies, reports and technical information;
- Overview of past and present occurrences and projected future hazard events;
- Linkage of mitigation measures and actions to the Threat and Hazard Identification and Risk Assessment (THIRA);

[1] National Institute of Building Sciences Natural Hazard Mitigation Saves Study: https://www.nibs.org/page/mitigationsaves
[2] EMAP 2016 Standard 4.2.1

- Identification of measures and actions as LMS Projects are accomplished, are planned for implementation, or identified as potential or future initiatives;
- Identification of potential or actual funding sources;
- Integration of GIS to provide maps to illustrate hazard and risk areas, consequence analysis and mitigation measures;
- Semi-annual reviews and updates of all strategy components;
- Regular meetings, informational bulletins, trainings and workshops to engage the mitigation participants;
- An identified process for monitoring the overall progress of mitigation strategies and documentation of completed initiatives.

This strategy will continuously evolve to address current and future risk and vulnerability.

How to use this Plan

The LMS is divided into seven (7) parts:

Part 1 – The Strategy (LMS-Part 1) – Provides an overview of the LMS and identifies how the program is implemented, the integration and update of plans, identifies authorities and references that guide the program, and sets forth the goals and objectives for specific measures and actions to address the threats and hazards faced by our communities.

Part 2 – The Projects (LMS-Part 2) – Contains the list of projects identified by the LMS Working Group members for mitigation measures/actions they have completed, are pursuing or one-day hope to implement, and the methodology for how projects are initially prioritized.[3]

Part 3 – Funding (LMS-Part 3) – Identifies potential funding sources for mitigation projects.

Part 4 – Appendices (LMS-Part 4) – This section contains a number of supportive documents including:

- List of Updates made to the plan since the last adoption
- List of LMS members including Steering Committee, Working Group and Sub-Committees
- Miami-Dade Resolution Adopting the LMS
- State Letter approving the LMS
- FEMA Letter approving the LMS
- Local Charter information for Metropolitan form of Government
- Integration Document
- THIRA – Demographic

[3] EMAP 2016 Standard 4.2.3

- Economic Assessment
- Maps

Part 5 – Meeting Notes (LMS-Part 5) – Contains meeting notes and attendance since the beginning of the program.

Part 6 – Completed Projects (LMS-Part 6) – Contains a description of some of the completed projects.

Part 7 – Flooding: The National Flood Insurance Program and CRS (LMS-Part 7) – Contains information specific to flood management plans and identifies activities in support of the CRS program.

All parts of the LMS are published separately to allow for intermittent updates.

All of these sections are published on the LMS website and are open for public comment at any time, the plan is at: http://www.miamidade.gov/fire/mitigation.asp and comments can be sent to: mdlms@miamidade.gov.

LMS ORGANIZATIONAL STRUCTURE

The LMS is a compilation of initiatives that are identified and supported by the LMS Coordinator, LMS Co-Chair, the LMS Steering Committee, the LMS Working Group (LMSWG) and LMS Sub-Committees (LMSSC) and ultimately adopted by local elected officials. A complete list of the participants of the LMS are listed in LMS-Part 4 Appendices B and C.

LMS Coordinator/Chair

The Whole Community Mitigation Planner of the Miami-Dade Office of Emergency Management (OEM), serves as the LMS Coordinator. The LMS Coordinator is responsible for the monitoring, updating and maintenance of the LMS Plan, as well as the coordination of meetings, trainings, review and archiving of LMS Projects, and dissemination of information pertinent to the mitigation goals and objectives set forth in the LMS.

The LMS Coordinator serves as the Steering Committee Chair. This involves scheduling the LMS meetings and presiding over the meetings. The LMS Coordinator participates in workshops, trainings and conferences throughout the year to benefit the LMS. Additionally, the LMS Coordinator maintains a distribution list of individuals interested in mitigation and is responsible for the website updates.

LMS Co-Chair

The LMS Co-Chair is an appointed position by the LMS Steering Committee and assists the Chair with review and development of documents, provides consultation to the Chair and is responsible to stand in for the Chair in case of any unforeseen absences.

LMS Steering Committee

The LMS Steering Committee acts as a "Board-of-Directors" and is responsible for the development of policy guidance. Members of the Steering Committee are representative of the organizations found within the larger Working Group (i.e. municipal, county, educational, not-for-profits, private sectors and individuals). The Steering Committee acts as a review committee for the establishment of this LMS and the prioritization of the projects therein when a limited funding source is available. Membership on any committee shall be voluntary and subject to the review and approval of the LMSWG. A committee member who fails to attend a reasonable number of committee meetings may be dropped from participation in the committee by a majority vote of the other members of that committee.

Currently, any planning and program development issues are addressed through as-needed Steering Committee meetings and in an open forum through the quarterly meetings.

LMS Working Group

The LMSWG is composed of representatives from eight main groups:

- Municipalities
- County Departments
- Colleges and Universities
- Hospitals and Health Care
- Private Non-Profit
- Private Sector/Businesses
- Regional, State and Federal Partners
- Other Stakeholders, including private citizens

The makeup of the LMSWG is not limited to any particular organization or jurisdiction. Numerous others have expressed the desire to participate in the LMS and are welcome to do so. Each organization is encouraged to solicit participation and commentary from its citizens, employees and members.[4]

To be considered a participant of the LMS and receive the benefits thereof, a municipality, County Department or any other organization must attend at least two (2) of the four (4) quarterly meetings held each year. The LMSWG endorsed this policy unanimously on September 20, 2001. However, any organization may substitute regular participation and attendance on an active LMS committee or subcommittee in lieu of attendance at the quarterly meetings. The agencies that are participating in the LMSWG are identified in LMS-Part 4 Appendix B.

[4] EMAP 2016 Standard 4.4.1(2)

Municipal Participation
Within Miami-Dade County the following municipalities are active participants of the LMS.

City of Aventura	City of Homestead	City of Opa-locka
Bal Harbour Village	Village of Key Biscayne	Village of Palmetto Bay
Town of Bay Harbor Islands	Town of Medley	Village of Pinecrest
Village of Biscayne Park	City of Miami	City of South Miami
City of Coral Gables	City of Miami Beach	City of Sunny Isles Beach
Town of Cutler Bay	City of Miami Gardens	Town of Surfside
City of Doral	Town of Miami Lakes	City of Sweetwater
Village of El Portal	Miami Shores Village	Village of Virginia Gardens
Florida City	City of Miami Springs	City of West Miami
Town of Golden Beach	City of North Miami	Indian Creek Village
City of Hialeah Gardens	North Bay Village	Miami-Dade County (unincorporated areas)
City of Hialeah	City of North Miami Beach	

For the sake of this document, municipalities will be referred to by only the name and not the full title (e.g. City of Coral Gables will be referred to as Coral Gables).

LMS Sub-Committees

In order to streamline the LMSWG's activities, various sub-committees may be formed, each addressing an area of concern, as needed. Initially, committees were formed to deal with flooding, evacuations, funding, community education, external policy, agriculture and wildfires. The formation and disbandment of sub-committees is done in correlation with the trending issues that should be addressed by the LMSWG members. A current list of sub-committees can be found in LMS-Part 4 Appendix C.

Meetings

The Steering Committee and LMS Sub Committee meet as needed and the LMSWG meets once each calendar quarter. Meeting announcements are posted on the LMS webpage, announced in the LMS Information Bulletins (quarterly) and emails are sent to the LMS Distribution List which is maintained by the LMS Coordinator.

The representatives are encouraged to post meeting notifications prominently, on community bulletin boards or in some other way, to notify the public or other interested parties at least 30-days prior to each meeting. Meeting times, dates and locations will also be posted on the LMS website: https://www.miamidade.gov/global/emergency/projects-that-protect.page.

A listing of meeting notes and attendance records are kept in LMS-Part 5.

PLANNING PROCESS[5]

In the spring of 1998, the State of Florida contracted with and provided funding to each of the counties within the State to develop an LMS. Community members embraced the LMS as the devastation of Hurricane Andrew was still fresh in their memories. The first meetings were set and development of the original LMS began. The Plan has evolved over the years to encompass the changes in our communities and the progression of hazards and risks.

The LMS Coordinator with the assistance of the LMS Steering Committee, and input from the LMSWG, LMSSC, and the general public incorporates updates and maintains the Plan. Updates will be based on factors such as recent disaster events, changes in Local, State, and Federal policies and legislation, changes in development and comments and input provided on the Plan. The LMS takes into consideration emerging issues such as aging infrastructure and new development (residences and businesses) projects impact Miami-Dade County communities.

The LMS Coordinator includes a listing of the revisions made to the Plan in relation to these factors, which is documented in the section titled “LMS Revisions since Last Adoption”.

Annual Updates

The LMS is updated on an annual basis. Any proposed changes will be reviewed and compared against LMS and Comprehensive Emergency Management Plan (CEMP) crosswalks provided by FDEM, the Emergency Management Accreditation Program (EMAP) Standards, the Community Rating System (CRS) Coordinator’s Manual, and the Threat Hazard Identification and Risk Assessment (THIRA). An annual update to the LMS is provided to the State by January 31st, every year and the documents are subsequently posted on the Miami-Dade County website.

As of March 2015, the LMSWG voted to have the LMS Projects updated annually by October 31st through the WebEOC LMS Board. LMS Members that have not updated their Projects will be notified that their Projects will be made “Inactive”. See LMS-Part 2 for more information on Project updates and maintenance.

Monthly Updates

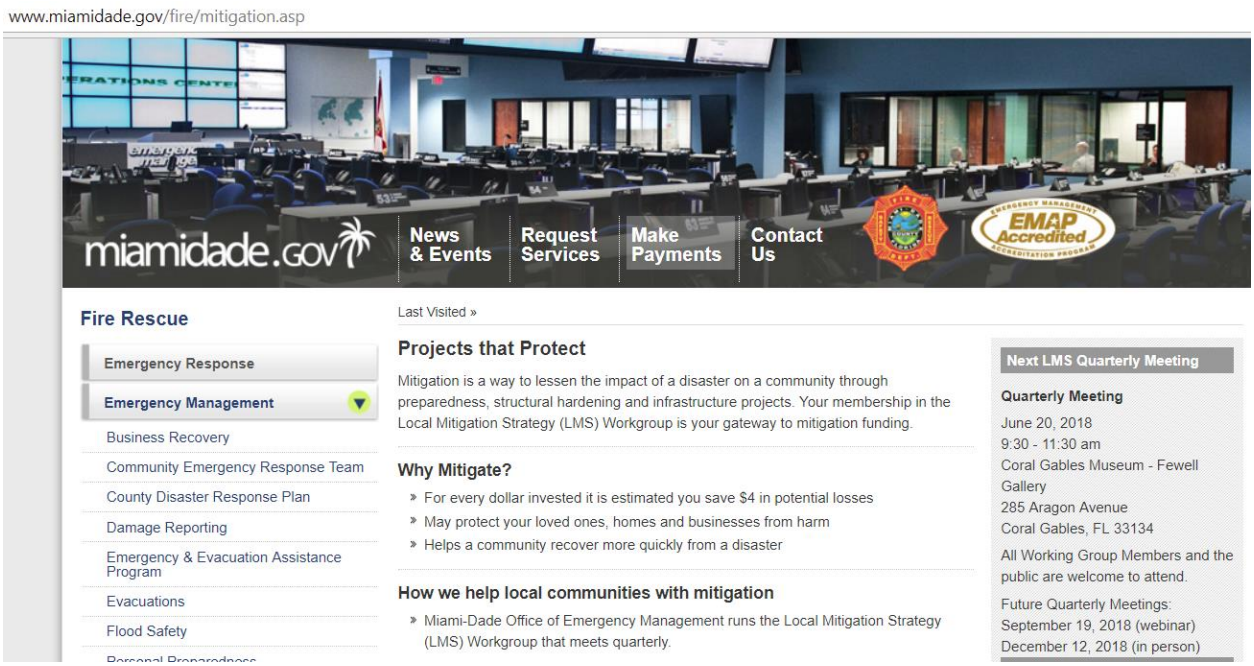
LMS-Part 7 may be utilized by CRS Communities to post their Annual Activity 510 Progress Reports. CRS Communities are responsible for sending this information to the LMS Coordinator for inclusion, as needed. An update to LMS-Part 7 will be posted online by the last calendar day of any month during which time a 510 report was received. It is the responsibility of the CRS community to provide their reports to the LMS Coordinator at

[5] EMAP 2016 Standard 4.2.1.(2)

least 10 working days, in advance of the end of the month, to allow for incorporation and posting on the website.

Public Review and Comment

The latest published version of the LMS is posted on the Miami-Dade County website: https://www.miamidade.gov/global/emergency/projects-that-protect.page– for public review and commentary. Any comments received through this medium will be incorporated through the revision process identified above. Comments can be sent to the following email address mdlms@miamidade.gov.



OEM will post messages via the different social media platforms and the Miami-Dade County website to encourage Miami-Dade community members to review and comment on the LMS draft.

Five-Year Update

A complete State and Federal review and approval of this Plan is conducted on a five-year cycle. The Plan has undergone review and approval from FDEM and FEMA every five (5) years since the year 2000. The five-year review process incorporates the annual updates and a review of the FDEM LMS Crosswalk. FDEM notifies the LMS Coordinator 12-months in advance of the Plan expiration date. The LMS is updated and prepared for the third quarterly meeting of the fourth year for public review and comments on the Plan. Once all comments are reviewed and incorporated, the updated LMS will be submitted to FDEM, by the LMS Coordinator for review approximately six (6) months prior to its expiration date.

FDEM will review the LMS Plan and provide comments, and if needed, the LMS Coordinator will make revisions to satisfy any State LMS Crosswalk deficiencies. Once the Plan has been approved by the State, it is then sent to FEMA for their review and approval.

LMS Implementation

The LMS Coordinator will be responsible for the annual monitoring of how the LMS plan is implemented. This effort is a coordinated effort led by the LMS coordinator with the LMS partners. This includes evaluation of LMS projects (completed, started, etc.) and the review of the LMS goals and objectives to ensure they are addressing the present and future needs of the LMS.

LMS Effectiveness Review

On an annual basis the LMS Coordinator will review how effective the plan has been in reducing the County's vulnerability to the hazards listed in the plan. This review will include reviewing new and existing projects and when they were completed. It will also evaluate how many projects were completed and what funding sources were utilized. Finally this review will involve discussions with the LMS partners on their opinions of whether or not the LMS purpose and goals were achieved or not.

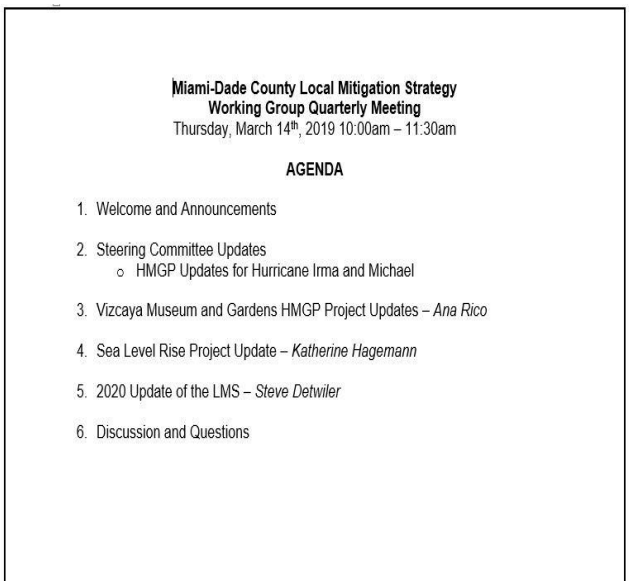
Partner Participation in Planning Process

Updating the LMS annually and for the five-year update includes the LMS working group members and partner agencies. Multiple efforts are made to involve a diverse groups of partners in updating the LMS. Below are some of the annual efforts that are used:

2020 LMS Kick-Off

The planning process for the 5-year update for the LMS began at the March 14, 2019 Quarterly Meeting. At this meeting the LMS Coordinator discussed with the LMS partners the schedule of updating the LMS and the information that would likely be requested from them. Appendix 5 includes the March 14th meeting minutes.

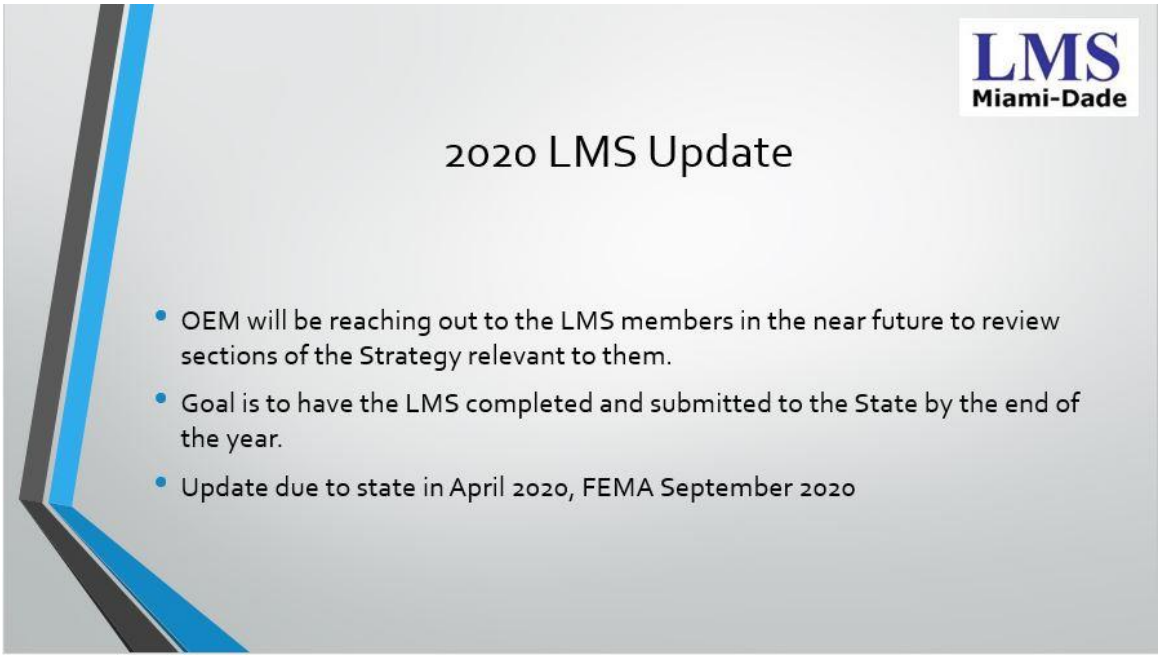
2020 LMS Update Discussion



Miami-Dade County Local Mitigation Strategy
Working Group Quarterly Meeting
Thursday, March 14th, 2019 10:00am – 11:30am

AGENDA

1. Welcome and Announcements
2. Steering Committee Updates
   - HMGP Updates for Hurricane Irma and Michael
3. Vizcaya Museum and Gardens HMGP Project Updates – *Ana Rico*
4. Sea Level Rise Project Update – *Katherine Hagemann*
5. 2020 Update of the LMS – *Steve Detwiler*
6. Discussion and Questions



Quarterly LMS Working Group Meetings

These meetings are held once a quarter and during the annual and five-year update planning cycles the LMS Coordinator frequently provides updates on the planning process. LMS members are also requested to provide comments on portions of the Plan that pertain to their agency and/or organization.

One of the sections of the Plan that is regularly updated by the LMS Municipal partners is the Part 1 Analysis of Existing Policies, Ordinances and Programs. This section includes the Municipal policies and plans that are integrated in the LMS.

Whole Community Quarterly Meetings

This meeting is also held once a quarter by the Miami-Dade County Office of Emergency Management. This meeting includes partners from OEMs diverse programmatic areas and offer an opportunity to share information and collaborate with one another across disciplines and jurisdictions. The LMS Coordinator is regularly asked to provide an update at these meetings on the planning process, new funding opportunities or new programs this position is leading.

Incorporation of Existing Plans and Strategies

The LMS was not created and maintained in a vacuum. The LMS Coordinator reviewed and incorporated numerous plans, ordinances and studies into the annual and 5-year update of the LMS. Below are examples of the plans and strategies incorporated into the LMS:

Miami-Dade Comprehensive Development Master Plan (CDMP), Evaluation and Appraisal Report

This report evaluates the progress in implementing the goals, objectives, policies, maps and text of the CDMP and recommends changes through plan amendments. When preparing the 2020 LMS this report was reviewed and certain aspects of it including sea level rise, coastal high hazard areas and evacuation clearance times were incorporated in the appropriate parts of the LMS.

The LMS Coordinator also regularly participates in reviewing and providing amendments to the Miami-Dade County CDMP. This includes participating in regular meetings with other County Departments facilitated by the RER CDMP Planning Unit. The LMS Coordinator also provides comments to amendments to the Municipal CDMPs, when requested. Any significant changes to the municipal CDMP are also incorporated and added to the LMS.

Miami-Dade County Recovery Plan

In 2018-19 the Recovery Plan was revised based on lessons learned from Hurricane Irma and other disasters around the country. The Recovery Plan is composed of several parts. Part 2 contains 12 Recovery Support Function (RSF) annexes, which include RSF Mitigation Annex.

RSF Mitigation's purpose is to initiate and encourage meaningful actions to incorporate mitigation measures to reduce or eliminate the long-term risk to human life and property from natural hazards throughout the post-disaster recovery and reconstruction process. During Hurricane Irma there was several lessons learned regarding the interaction between recovery and mitigation. These lessons learned were incorporated into RSF Mitigation Annex and the LMS.

Resilient 305 Strategy
This climate strategy has been adopted and implemented by Miami-Dade County, the City of Miami and the City of Miami Beach. This strategy was created to address resilience challenges prioritized through intergovernmental and community collaboration. This strategy contains several projects that have been completed, are in process or are planned. The projects in process or planned have been added into the LMS as potential projects.

Southeast Florida Regional Climate Action Plan (RCAP)
This plan is the guiding document for the Southeast Florida Regional Climate Compact. Its purpose is to coordinate climate action, reduce greenhouse gas emissions and strengthen climate resilience in Broward, Miami-Dade, Monroe, and Palm Beach counties.

The RCAP is regularly reviewed and changes are incorporated into the Miami-Dade LMS. The LMS Coordinator also provides feedback to the Compact on the incorporation of any lessons learned or new projects that should be included in future updates to the RCAP.

State of Florida Hazard Mitigation Plan
This plan was also reviewed to incorporate statewide hazard and risk assessment data into the Miami-Dade LMS.

Plan Adoption

Once the Plan has been approved by FEMA, the Plan will be submitted to the Miami-Dade County Board of County Commissioners (BCC) for adoption. Miami-Dade County has a metropolitan form of government with its own Home Rule Charter (LMS-Part 4 – Appendix G). Once the BCC passes a Resolution, that action automatically includes all the Municipalities within the County. In the event a Municipality does not wish to participate in the action, that Municipality must, through their own Resolution, opt out.

Miami-Dade County communities that wish to utilize the LMS as their Floodplain Management Plan for credit under the CRS Program, must also adopt the LMS. Copies of the local adoption should be sent to the LMS Coordinator to be incorporated into LMS-Part 4.

Review and Revision Criteria

The LMS will be updated by the LMS Coordinator with the assistance of the Steering Committee and input from the LMSWG. The majority of revisions made to each section of this document are based upon LMSWG meetings where comments are sought from participants. The public is also given an opportunity to review this document and provide comments through the Miami-Dade County website. Revisions will be incorporated based on recent significant events such as hurricanes, tornadoes or any other occurrence where mitigation could benefit the community. Changes in Federal, State, and Local laws will also be reflected in the updated version of the LMS. The revisions will then be documented and posted online and/or sent out via LMS Information Bulletins by the LMS Coordinator to all relevant partners.

The evaluation criteria includes:

1. Have there been any new mandates from Federal, State or Local agencies that require changes to the LMS? Any new or changing laws, policies or regulations?
2. Are there any societal developments or significant changes in the community that must be added to the current LMS? Does the LMS still reflect the concerns of the community? Are the demographics the same? Has there been any growth or development in hazard areas?
3. Have there been any changes in funding sources or requirements?
4. Are there any recent technological developments that should be reviewed for inclusion in the LMS document?
5. Should the LMS be updated to include any new forms of hazards or areas of vulnerability within Miami-Dade County communities?
6. Have there been any changes in the Comprehensive Development Master Plan (CDMP) or any other form of Standard Operating Procedures (SOPs)?
7. Have any of the mitigation opportunities been implemented? Are the priorities for implementation the same?
8. What are the recommendations or lessons learned from any major incidents that have occurred during the past year?

During the revision process, each criteria is addressed to determine if they are still valid and adjustments are made, as necessary. When satisfied that the criteria are appropriate, each of the outstanding mitigation opportunities is then compared against the criteria. All existing mitigation opportunities that are determined to still be viable projects will remain on the project list. All those that are determined to be no longer workable, will be set aside for further revision or dropped as no longer feasible.

Changes in Program Priorities

Over the last five years there has been numerous hazards that have had an impact on Miami-Dade County. These hazards have challenged the County and required a specialized response and the use of new approaches and technology. However, these hazards have not required any changes in the LMS goals, objectives and priorities.

PROGRAM BENCHMARKS

This section provides an overview of the highlights of the Plan as well as recent updates to the Plan in relation to risk analysis and changes in development. A complete listing of all the meeting minutes from over the past five (5) years can be found in the LMS-Part 5.

1998 – Miami-Dade County began developing a LMS program through funding from the State of Florida.

September 1999 – The Miami-Dade County LMSWG voted to continue the LMS program with or without State funding.

March 2000 – The LMSWG determined that the LMS should be updated two (2) to three (3) times each year and the updates, including the project list for new, updated, completed and deferred projects would be updated twice a year.

June 6, 2000 – The BCC passed Resolution R-572-00 formally adopting the LMS as the official County policy thus further promoting program continuity.

September 13, 2000 – Miami-Dade County, along with its Municipalities and other organizations, were designated by FEMA and the Florida Department of Community Affairs to be a "Project Impact Community."

December 6, 2000 – The LMSWG agreed that they would become the Project Impact Working Group and that the LMS would continue under the auspices of Project Impact. Henceforth, Project Impact and the LMS became synonymous.

December 2000 – The LMSWG determined that the LMS Project List would be updated by June 30th and December 31st of each year.

May 30, 2001 – A formal "signing ceremony" took place at Vizcaya Museum and Gardens for LMSWG members to sign a proclamation to become a "Project Impact Partner." Although FEMA no longer endorses Project Impact, the LMSWG agreed that the Project Impact concept would continue in Miami-Dade County regardless of what it is called.

June 7, 2005 – The BCC passed Resolution R-710-05, which states that grant applications filed under the auspices of the LMS no longer have to be approved by the BCC but, instead authorizes the County Manager to "*Apply for, receive, expend and amend applications for grant funds for projects listed in the LMS."*

June 2008 – The LMSWG celebrated its 10th anniversary with over 300 completed mitigation projects at a value exceeding $250 Million. A listing of completed mitigation projects that have been tracked may be found in LMS-Part 6.

November 2009 – The County Mayor delegated signature authority to the Director of Emergency Management for contract and grant-related documents under the purview of the LMS Program. This was renewed in 2012.

April 10, 2010 – Adoption of the five (5) year update of the LMS by the BCC.

May 5, 2010 – FEMA approved the five (5) year update of the LMS.

September 1, 2015 – Adoption of the five (5) year update of the LMS by the BCC.

September 15, 2015 – FEMA approved the five (5) year update of the LMS.

LMS Revisions since Last Adoption

This section provides an overview of the achievements of the LMSWG to continue to promote and incorporate mitigation measures across the whole community concept and address changes to our risk profile and development as well as re-development.

September 2015

- September 15: Received FEMA and State Approval of the LMS.
- September 16: Quarterly meeting open to the public.

October 2015

- Annual update of LMS Projects due by October 31st.

December 2015

- December 9: Quarterly LMS Meeting open to the public.

January 2016

- January 6: Annual Update submitted to the State.
- Updates to hazards to include events that occurred in 2015.

March 2016

- March 16: Quarterly LMS Meeting open to the public.

May 2016

- Activity 510 and 610 submitted to ISO to obtain CRS credits for communities under the LMS.
- May 18: Statewide Hurricane Exercise with flood component for CRS communities.

June 2016

- June 15: Quarterly Meeting open to the public.

August 2016

- August 8: Mosquito Abatement Training.

September 2016

- September 21: Quarterly meeting open to the public.
- September 27: Mosquito Abatement Training.

October 2016

- Annual update of LMS Projects due by October 31st.

December 2016

- December 14: Quarterly LMS Meeting open to the public
- Part 4 Meeting Notes updated.

- Mapped completed projects in WebEOC.

January 2017
- January 31: Annual Update submitted to the State.
- Updates to hazards to include events that occurred in 2016.
- Part 2 Project lists updated.

March 2017
- March 7: Adaptation Measures C-7 basin meeting.
- March 15: Quarterly LMS Meeting open to the public.
- March 28: FEMA Coastal Flood Study Update.

April 2017
- April 3: Mosquito Abatement Training.
- Miami-Dade Cyber Security Plan created.

May 2017
- May 3: Statewide Hurricane Exercise with flood component for CRS communities.
- May 5: Discussion with RER regarding the update of the Miami-Dade Comprehensive Development Master Plan.

June 2017
- June 13: State Hazard Mitigation Assistance Team meeting.
- June 20: CRS Manual Changes meeting.
- June 21: Quarterly Meeting open to the public.
- June 27: FEMA Mitigation Webinar – Yellow Jackets

July 2017
- Mapped LMS Projects.

August 2017
- August 1: Meeting with County Departments and Regulatory and Economic Resource (RER) Office of Resilience regarding vulnerabilities to flooding, storm surge and sea level rise.
- August 31: Adaptation Action Area for C-7 Basin.

September 2017
- Hurricane Irma impacts Miami-Dade County - EOC activation September 5-17.
- September 27: Mosquito Abatement Training.

October 2017
- Annual update of LMS Projects due by October 31st.

November 2017

- November 15: LMS Quarterly meeting (make up for September) discussion on Public Assistance and Hazard Mitigation Grant Program (HMGP).
- November 30: deadline for update of projects for Hurricane Irma HMGP.

December 2017

- December 7: Meeting with FEMA, U.S. Army Corps of Engineers (USACE), U.S. Department of Homeland Security (DHS) and the State to discuss infrastructure recovery and identified needs from Hurricane Irma.
- December 14: LMS Quarterly Meeting
- LMS-Part 2 and Part 4 updated

January 2018

- January 12: Intent to Apply forms for Hurricane Irma HMGP due.
- January 31: Annual Update submitted to the State.

March 2018

- LMS Quarterly Meeting

May 2018

- Submitted the Miami-Dade LMS projects for HMGP for Hurricane Irma to the State.

June 2018

- LMS Quarterly Meeting

August 2018

- Submitted updated ranking of projects for HMGP for Hurricane Irma to the State.

September 2018

- LMS Quarterly Meeting
- Announcement of Flood Mitigation Assistance (FMA) and Pre-Disaster Mitigation (PDM) grant programs.
- September 14: Request for Infrastructure projects for consideration for CDBG-DR for Hurricane Irma.
- Submitted updated ranking of projects for HMGP for Hurricane Irma to the State.

October 2018

- Annual update of LMS Projects due by October 31st.

December 2018

- LMS Quarterly Meeting

January 2019
- Updates to hazards to include events that occurred in 2017.

February 2019
- Steering Committee meeting that discussed Hurricane Michael HMGP.

March 2019
- LMS Quarterly Meeting

June 2019
- LMS Quarterly Meeting

August 2019
- The new Whole Community Mitigation Planner started on August 26.

October 2019
- LMS Quarterly Meeting
- Steering Committee meeting that discussed Hurricane Michael HMGP.
- Annual update of LMS Projects due by October 31st.

December 2019
- LMS Quarterly Meeting
- LMS Steering Committee meeting

February 2020
- LMS Steering Committee Meeting

March 2020
- LMS Quarterly Meeting

Recent Development/Redevelopment

Miami-Dade County Regulatory and Environmental Resources Department (RER) maintains the CDMP to guide future development in unincorporated Miami-Dade County. A copy of the elements of the CDMP may be found in LMS-Part 4, Appendix H with a review of how these elements support mitigation measures and areas for consideration. In 2017, RER implemented the Evaluation and Appraisal Report for the CDMP, which occurs every seven (7) years to ensure that the County is in compliance with State law and it provides a comprehensive review and assessment of major issues and reviews the progress towards meeting goals, objectives and policies and identified needed changes. It is estimated that by 2040, Miami-Dade's population will grow from 2.7 million to 3.4 million people.[6]

As identified in Land Use (LU) Element, Miami-Dade is looking to emphasize development around centers of activities, development of well-designed communities containing variety of uses, renewal and rehabilitation of blighted areas and contiguous urban expansion when warranted, rather than sprawl.

- LU-3D identified that the County shall coordinate with Municipalities in Coastal High Hazard Areas and areas with repetitive losses to minimize demand for facilities and services in areas that result in redevelopment and increases in residential densities.
- LU-3E addresses an analysis on climate change and the impacts on the built environment addressing development standards and regulations related to investments of infrastructure, development/redevelopment and public facilities in hazard prone areas.
- LU-3K identifies an initiative to determine the feasibility of designating Adaptation Action Areas, areas that may be vulnerable to storm surge and sea level rise impacts.
- LU-3L identifies that the County will work with the local municipalities to do the same.

Per Resolution R-451-14 and Ordinance No. 14-79 all County infrastructure projects must consider sea level rise in the planning, design, and construction of those projects. All agenda items before the BCC that relate to planning, design, or construction of County infrastructure must include information on how the impact of sea level rise has been considered in the project. As of November 2019, there are 322 projects identified in *Part 2* of the LMS that specifically address sea level rise.

[6] State of Florida Office of Economic and Demographic Research: http://edr.state.fl.us/Content/population-demographics/data/Medium_Projections.pdf

Recent years have also shown increased vulnerabilities as the modeling and mapping capabilities improve and as more information is gathered on the potential impacts of climate change and sea level rise. This version of the Plan integrates updated information on storm surge, sea level rise, and climate change into our hazards, mitigation measures, mapping, and project list. LMSWG members continue to identify LMS Projects to address aging infrastructure to deal with current and emerging threats. There are currently 2,081 projects identified for infrastructure improvements identified in *Part 2*. As an example, Miami Beach has been very proactive in installing new drainage infrastructure and pump systems to mitigate seasonal king tides, which are perhaps a preview of what sea level rise may bring to some of our coastal communities. In October 2014, the elements of the mitigation projects that had been installed were tested by the seasonal high tides and were very successful in limiting sea water from coming up through the storm drains. Our communities continue to include mitigation in their development and redevelopment projects through inclusion in their Master Plans and Capital Improvement Plans. Agencies are proactively including mitigation projects into their internal funding and capital improvement budgets, over 535 projects have been identified with these funding sources identified.

A 2014 analysis of our housing stock shows that 48% of our housing stock was built before the first Flood Insurance Rate (FIRM) maps were developed and 22% of our housing stock was built before there were any special elevation requirements implemented by Miami-Dade County. The continued efforts to identify flood mitigation projects is reflected by the 2,074 identified flood and storm surge projects in *Part 2* of the LMS as of July 2020. The LMS Project Board allows us to track mitigation measures by flood basins with the intent that we can coordinate efforts in areas of Repetitive Loss (RL) and Severe Repetitive Loss (SRL). As the FEMA FIRM maps were updated in September 2009 and new Coastal Flood maps are currently being studied and developed, and with the proposals of changes to flood policy rates, the LMS has embraced additional measures to help integrate CRS initiatives to assist communities with maintaining or improving their rating.

As many of the areas of our County are already developed, new development and redevelopment provide opportunities for structures to be built to or retrofitted to higher building code standards which includes wind and flood mitigation considerations. In 2018, the Beacon Council reported that the business sector invested $402.6 million in new capital investment and added 2,000 direct jobs.[7] According to the U.S. Bureau of Labor Statistics the Education and Health Services industry has grown the most in 2019, adding 17,200 jobs with a 4.2% rate of job growth.[8]

[7] Miami-Dade Beacon Council Highlights Miami's Business Accomplishments at the 2018 Annual Meeting & Key Ceremony https://www.beaconcouncil.com/miami-dade-beacon-council-highlights-miamis-business-accomplishments-at-the-2018-annual-meeting-key-ceremony/
[8] U.S. Bureau of Labor Statistics, Miami Area Employment November 2019: https://www.bls.gov/regions/southeast/news-release/areaemployment_miami.htm

Miami-Dade County launched the Strategic Miami Area Rapid Transit (SMART) plan in 2019[9]. This project's goal is to improve transportation mobility by leveraging and expanding existing transit systems to promote economic growth and job creation

The SMART Plan will expand transit options in Miami-Dade County along six critical corridors that are linked to regional, State, National, and global economic markets. These corridors are:

- Beach Corridor: Highest tourist demand in region with major employment centers
- East-West Corridor: Heaviest commuter travel for international, state and local businesses
- Kendall Corridor: One of the most congested arterial roadways with the highest demand
- North Corridor: Key regional mobility linkage for access to jobs, stadium and educational facilities
- Northeast Corridor: High transit demand and part of a critical regional corridor stretching to Palm Beach County
- South Corridor: Experiencing the fastest population growth in Miami-Dade County

Another critical component of the SMART Plan is a network of Express Buses, known as Bus Express Rapid Transit (BERT), which will connect the SMART rapid transit corridors on limited access facilities, promoting the active expansion of South Florida's Express Lanes network.

An estimated 1.7 million people live within a 2 mile radius of the SMART Plan alignments, representing approximately 63% of the most populous county in Florida.

Development Vulnerability

As the County continues to grow both economically and in population the vulnerability against numerous hazards also increases. However, to mitigate the growth in development the County has taken measures to lessen the impact of hazards on the infrastructure. In developing the SMART plan the Office of Emergency Management (OEM) provided comments on the likely impact on issues involving evacuation clearance times and emergency shelter capacity. OEM and the Office of Resilience provided comments on methods and projects to enhance the County resilience to certain hazards.

While the vulnerability of the County has increased the efforts taken by the County and its LMS partners has sought to balance this growth to lessen the impact of future disasters.

[9] Miami-Dade Transportation Planning Organization, SMART Plan Brochure: http://www.miamidadetpo.org/library/smartplan-brochure-2019.pdf

Measuring the Overall Effectiveness of the LMS Program

The Miami-Dade LMS strives to continue to evolve and address the issues, concerns and challenges identified and encountered by our participants. Changes in personnel, shifting and diminishing funding sources, emerging and increasing threats and risk, aging infrastructure and housing stock and an increasing, diverse and transient population base necessitate the LMS to continuously take stock, re-evaluate and update the strategy.

Table 1 shows an overview of how we have increased our effectiveness.

TABLE 1. LMS PROGRAM EFFECTIVENESS

Hazard Assessment	• Incorporation of the Miami-Dade Threat Hazard Identification and Risk Assessment (THIRA) provides one source for hazard assessment for the Miami-Dade CEMP, LMS and stakeholder agencies to utilize in planning and coordination efforts. [10] • Research and incorporation of climate change and sea level rise identifies potential future risk into THIRA. • Incorporation of new and updated maps. • Added an Economic Analysis (*Part 4 Appendix J)* to better understand the employment sectors and potential impacts. • Analysis of housing stock to look at structures built before flood plain mapping and regulations. • Identification of tools and software to help stakeholders assess and understand risk. Precipitation Frequency estimates from the U.S. National Oceanic and Atmospheric Administration (NOAA) (*Part 7*). • New impact assessment tool, ARM360, provided through OEM to local stakeholders to assist with damage assessment after an event to better track and document at risk hazard areas and impacts (*Part 7*).
Collaboration	• Collaboration with the Miami-Dade Department of Transportation and Public Works (DTPW) to access rain gauges and linkage with local National Weather Service to be able to better tie forecasting with real time monitoring for flooding. • Collaboration with the Office of Sustainability and participation in the Southeast Florida Regional Climate Change Compact has increased the number of planning agencies we are working with. • Collaboration with Miami-Dade Water and Sewer Department (WASD) to utilize the ground and surface water model, developed

[10] EMAP 2016 Standard 4.2.1 (1)

	with the U.S. Geological Survey (USGS). Stakeholders were offered training on the software so, they can run analyses to better identify the potential impacts of sea level rise at a local level. • Engagement of Alliance for Response (cultural community) including workshops and exercise. • Statewide Hurricane Exercise with flood components for CRS communities on May 18, 2016. • FEMA Coastal Flood Study Update on March 28, 2017. • Statewide Hurricane Exercise with flood components for CRS communities on May 3, 2017. • Discussion with RER regarding the update of the Miami-Dade Comprehensive Development Master Plan on May 5, 2017. • Collaboration with County Departments and Miami-Dade Office of Resilience regarding vulnerabilities to flooding, storm surge and sea level rise.
Integration	• Identification of the LMS as a Whole Community initiative. • Review of community planning documents and identifying areas to better integrate mitigation into comprehensive planning and capital improvement (*Part 4 Appendix H* and added Municipal Integration to *Part 1*). • The State of Florida hired a contractor who provided suggested language for the incorporation of climate change and sea level rise into the State Enhanced Mitigation Plan. Miami-Dade used this as a guide in updating the THIRA. • A review of the action items in the Regional Climate Action Plan Implementation Guide was performed and supported. *(Part 4 Appendix H)*. • Hosted L-278 class to assist local communities with the changes in the CRS manual and to identify opportunities to include elements into the LMS, included ISO personnel and newly appointed state CRS Coordinator. • LMS Coordinator active in 2015 update of THIRA including new maps and identification of vulnerable areas in alignment with Comprehensive Preparedness Guide 201. • Activity 510 (Developing a floodplain management plan for your community) and Activity 610 (Flood warning and response planning) were submitted to ISO to obtain CRS credits for communities under the LMS in May 2016. • Community Rating System (CRS) Manual Changes meeting on June 20, 2017. • Hosted Local Mitigation Strategy (LMS) Workshop on November 13, 2019 to assist in helping local communities gain a better understand of how the LMS “works” as hosted by the State of Florida.

Project Identification and Tracking[11]	• Improved project tracking system through creation of internet-based board and encouraged participants to also track any projects that they are doing mitigation on to illustrate all of the mitigation work being done locally (*Part 2*). • Updated the project prioritization process, Benefit Cost Review, and built it into the project submittal process to help identify benefit of projects based on Suitability, Risk Reduction and Cost and Time. (*Part 2).* • Began adding previously completed projects to the archive list to build history of mitigation measures. (*Part 5*). • Added Appendix 2 to *Part 2* to track Deleted/Deferred Projects.
Public Awareness	• 2017 City of North Miami Hurricane Preparedness Fair • 2017 CLEO Institute Preparedness Event • 2018 Miami-Dade Public Schools Youth Fair • 2019 Florida International University (FIU) Weather Day • 2020 FIU, Science, Technology, Engineering & Math Weather Day

[11] EMAP 2016 Standard 4.2.2

POLICIES, ORDINANCES AND PROGRAMS AFFECTING MITIGATION [12]

There are many federal, state and county laws and policies that affect hazard mitigation and all the members of the LMSWG. Some of those are:

Federal

1. The Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288 as amended (The Stafford Act) is interpreted by Title 44 of the Code of Federal Regulation (44 CFR) and governs FEMA and emergency management and sets forth the federal concepts for hazard mitigation. It also defines the Coastal Barriers Resources Act (44 CFR 206 subpart J) and describes floodplain and environmental management (Parts 9 and 10).

2. The Disaster Mitigation Act of 2000 (DMA-2K) has also redefined parts of The Stafford Act and those changes have been incorporated into this document. Much of FEMA has been further redefined by the "Post-Katrina Emergency Management Reform Act of 2006," which was enacted by Congress and signed into law by the President in the fall of 2006.

3. The National Flood Insurance Program (NFIP) and the Community Rating System (CRS) FLA-15, July 1996, sets up a community rating system for flood insurance offering incentives for communities and credits for identified floodplain management activities.

4. National Fire Code, 1993 and NFPA 101 Life Safety Code define uniform fire safety standards adopted by rule by the State Fire Marshal.

5. Title 15 of the Code of Federal Regulations, which defines the Coastal Zone Management Act (15 CFR Parts 923 and 930).

6. Title 40 of the Code of Federal Regulation which defines the National Environmental Policy Act including such mitigation measures as included in the National Emission Standards for Hazardous Air Pollutants (Part 61), Toxic Substances Control Act (Part 763), the Resource Conservation and Recovery Act and CERCLA (the Superfund).

7. Title 29 of the Code of Federal Regulations that defines the Occupational Safety and Health Act containing many hazard mitigation measures.

[12] EMAP 2016 Standard 4.2.4 (1)

8. Presidential Decision Directives 39 and 62 are the authorities directing the development of terrorism response.

9. Presidential Policy Directive (PPD) 8: National Preparedness was released in March 2011. The goal of PPD 8 is to strengthen the security and resilience of the U.S. through five (5) preparedness mission areas – Prevention, Protection, Mitigation, Response and Recovery.

    a. National Protection Framework follows the guiding principles of resilience and scalability, a risk informed culture and shared responsibility.

    b. National Mitigation Framework establishes a common platform for coordinating and addressing how the Nation manages risk through mitigation capabilities.

    c. National Response Framework includes establishing a safe and secure environment moving towards recovery.

    d. National Disaster Recovery Framework focuses on how to best restore, redevelop and revitalize the community and build a more resilient Nation.

10. National Infrastructure Protection Plan (NIPP): provides a framework for programs and initiatives for the protection of Critical Infrastructure and Key Resources (CI/KR) and ensures that resources are applied where they offer the most benefit for mitigating risk.

11. PPD – 21 Critical Infrastructure and Resilience establishes a national policy on critical infrastructure security and resilience

State

1. State of Florida Statutes which are pertinent to hazard mitigation include:

    a. Chapter 161 – Beach and Shore Preservation

    b. Chapter 163 – Conservation, Aquifer Recharge and Drainage Element

    c. Chapter 255 – Public Property and Public Buildings

    d. Chapter 373 – Water Resources

    e. Chapter 403 – Environment Controls

2. The South Florida Water Management District is a regional government agency that oversees the water resources in the southern half of the state through managing and

protecting water resources including balancing and improving water quality, flood control, natural systems and water supply.

3. South Florida Fire Prevention Code 1992-93 (adopted by the County Commission) defines standards for fire prevention and allows controlled burns as mitigation.

Federal, State and Regional Governmental Entities

The Federal, State and Local entities that perform hazard mitigation functions are almost too numerous to name. However, some of the more prominent ones are: FEMA, the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), U.S. Army Corps of Engineers (USACE), Natural Resources Conservation Service (NRCS), FDEM, Florida Department Economic Opportunities, Florida Department of Transportation (FDOT), South Florida Water Management District (SFWMD) and many more.

The government entities that are located within Miami-Dade County and its Municipalities that perform hazard mitigation functions are varied and represent all levels of government: Federal, State, County and Local. FEMA has funded hundreds of hazard mitigation projects following Hurricane Andrew and to a lesser extent following the 1993 March windstorm or "Storm of the Century," the February 1998 "Groundhog Day" storm, and more projects have been implemented following Hurricane Irene in 1999 and the October 3, 2000 floods (pre-Tropical Storm Leslie), the tornadoes of March 27, 2003, the hurricanes of 2004 (Charley, Frances, Ivan and Jeanne), the hurricanes of 2005 (Katrina, Rita and Wilma), Tropical Storm Fay in 2008; Hurricane Irma in 2017 and Hurricane Michael in 2018 . FEMA acts as the administrative agency of the National Flood Insurance Program (NFIP), currently all Miami-Dade municipalities participate in this program.

The USACE is responsible for restoration and re-nourishment of most of the County's beaches, maintenance of the Intracoastal Waterway, maintenance of Government Cut and the Miami Harbor entrance, and some shared responsibility with the South Florida Water Management District (SFWMD) for the canal and levee systems throughout the county. Mitigation functions in these areas by the Corps are multiple and varied.

The SFWMD is responsible for the operations and maintenance of the primary canals system, on behalf of the USACE, performing flood control operations, throughout the County, based on a schedule of operations, which determined when control structures are opened and closed. Flood control mitigation opportunities exist to benefit all of South Florida through the placement of new and maintenance of existing structures. These structures, located throughout the County, mitigate against saltwater intrusion into the Biscayne Aquifer from which Miami-Dade County's drinking water is supplied.

The United States National Park Service (NPS) controls Everglades National Park that covers one third of the land area of Miami-Dade County and Biscayne National Park that covers over half of Biscayne Bay.

The United States Department of Agriculture's Farm Service Agency provides assistance to the farming community similar to that which FEMA provides to counties and municipalities. Additionally, the Natural Resources Conservation Service (formerly Soil Conservation Service) helps with mitigation measures such as, canal bank restoration and stabilization.

The United States Forestry Service and the Florida Division of Forestry both keep fire trails and fire breaks open, conduct controlled or prescribed burns and assist with debris clearance, all of which mitigate and facilitate fire control by keeping fuel levels low.

The Florida Department of Transportation (FDOT) must be a major participant in any mitigation endeavors undertaken throughout the county. They, along with the Miami-Dade Expressway Authority, maintain and control our major thoroughfares including the expressway system. They also control, along with Miami-Dade County DTPW, Florida East Coast and CSX railroads and the Town of Bay Harbor Islands, the twenty-three movable bridges that cross the Miami River and the Intracoastal Waterway.

County

1. Board of County Commission Resolutions

    a. R-572-00, which establishes the Miami-Dade Local Mitigation Strategy as official county policy.

    b. R-710-05, which authorizes the County Manager to apply for, receive, expend and amend applications for projects listed in the Miami-Dade Local Mitigation Strategy.

    c. R-451-14, which requires all County infrastructure projects to consider potential impacts of sea level rise during all project phases.

2. Pertinent Miami-Dade County laws include codes and ordinances that govern the unincorporated and municipal activities, as follows:

    a. Chapter 8(b) of the county code, which deals with emergency management.

    b. Chapter 11(c), covering Development within Flood Hazard Districts.

    c. Chapter 17, i.e. the Housing Code, focused on maintaining the housing stock in decent safe and sanitary conditions.

    d. Chapter 18b covering right-of-way landscaping.

    e. Chapter 24 covering the activities of the Miami-Dade Division Environmental Resources Management (DERM) for permitting hazardous materials.

f. Chapter 28 of the county code which deals with subdivision regulations.

g. Chapter 33, covering zoning activities for approval of a development of regional impact.

h. Floodplain Management Program sets the criteria for elevations and assesses the risks for flooding for different areas of the County.

i. Miami-Dade County Comprehensive Emergency Management Plan (CEMP) mandates that municipalities have emergency management plans, as well as recommends the performance of hazard mitigation activities.

j. Miami-Dade County Comprehensive Land Use Plan dictates current land use and controls future land use and growth throughout the county.

k. The Public Works Manual, especially Section D5, concerning coastal construction.

l. Dade County Environmental Protection Ordinance, Coastal and Freshwater Wetlands Regulations, Sections 24-58 and 24-59.

3. Miami-Dade County Landscape Maintenance Special Taxing Districts provide tree-trimming programs that prevent more severe damage during windstorms.

4. On March 1, 2002, the Florida Building Code (FBC), was adopted by Miami-Dade County and all the Municipalities, consequently replacing the South Florida Building Code. The High Velocity Hurricane Zone (HVHZ) portions of the code are applicable to Miami-Dade and Broward Counties only, the HVHZ sections of the FBC in addition to the most current ASCE- 7 standard contains a stricter design and construction measures, especially to protect windows, walls, and roof from wind-born debris. In 2012, the FBC was amended to include flood protection measures and use of ASCE-24.

5. The Local Law Enforcement Mutual Aid Agreement with Miami-Dade County designed to coordinate and supplement local resources.

6. The Statewide Mutual Aid Agreement for Catastrophic Disaster Response and Recovery establishes a local resource for all Working Group members that are presently signatories.

7. The Southeast Florida Regional Climate Change Compact set forth an agreement between Miami-Dade, Broward, Palm Beach and Monroe Counties to work in collaboration to address the impacts of climate change on Southeast Florida. The Climate Change Action Plan was subsequently developed to identify and pursue reduction and resiliency measures in the region.

County Programs

Stormwater Management Masterplan

This program has the responsibility of the evaluation of flood protection levels of service. The Stormwater Management (Drainage) Level of Service (LOS) Standards for Miami-Dade County contains both a Flood Protection (FPLOS) and Water Quality (WQLOS) component. The minimum acceptable Flood Protection Level of Service (FPLOS) standards for Miami-Dade County shall be protection from the degree of flooding that would result for a duration of one day from a ten-year storm, with exceptions in previously developed canal basins, where additional development to this base standard would pose a risk to existing development. All structures shall be constructed at, or above, the minimum floor elevation following the latest version of the Florida Building Code or as specified in Chapter 11-C of the Miami-Dade County Code, whichever is higher. The incorporated areas of the county (municipalities) may have adopted stricter elevation standards.

Subdivision and Other Regulations.

Miami-Dade County Code imposes certain developmental requirements before land is platted. These relate to the provision of water and sewer facilities, local streets, sidewalks, drainage, and open space. Before use permits or certificates of occupancy can be issued, Section 33-275 of the Miami-Dade County Code requires that adequate water, sewage and waste disposal facilities be provided.

Shoreline Review.

The Shoreline Development Review Ordinance was adopted in 1985 and prescribes minimum standards for setbacks, visual corridors and, with its' accompanying resolutions, sets out a flexible review process through which architectural interest, building orientation, landscaping, shoreline use compatibility, access, and other design related elements can be negotiated with the developers and enforced by the local governing jurisdiction.

Area Plan Report

Since 1998, Area Plan Reports have emerged as a preferred planning technique for community visioning and helping to find answers to fundamental planning questions. An Area Plan Report is a practical planning technique, which blends public participation, detailed planning, and the development of implementation tools. Its principal focus is the creation of planning products (instead of processes. Public participation is indispensable for a successful Area Plan Report. The overriding objective is the creation of a detailed plan, which resolves areas of concern identified in the Area Plan Report study area; often these concerns involve capital improvements such as roads, sewers, sidewalks, parks and other community improvements. The Planning and Zoning Divisions of the Department of Regulatory and Economic Resources implements the Area Plan Report process as a collective planning effort that develops a small area plan which incorporates the priorities of a community.

Coastal Management

The Beach Restoration and Preservation Program is Miami-Dade County's mechanism for initiating and coordinating federal and/or State projects essential to the protection and recreational viability of Miami-Dade's ocean shoreline. Local participation in the determination of activities pertaining to beach restoration and preservation is included in the program. The County has benefited from large federal and State funding contributions and the expertise obtained as a result of the program. Most notably, the Miami-Dade County Beach Restoration Project now provides hurricane and erosion control protection for upland property and a vast recreational resource for public use. This project replaced a seriously eroded shoreline sustained only by bulkheads and seawalls, which offered little protective or recreational value. Implementation of erosion control projects is based on the following criteria:

1. Need for protection of public safety and property in areas threatened by coastal erosion.

2. To provide enhanced beach-related recreational opportunities for both visitors and Miami-Dade County residents.

3. To provide more effective and efficient long-term management of our natural and restored beach systems.

The Biscayne Bay Restoration and Enhancement Program objectives are to maintain or improve ecological, recreational, and aesthetic values of Biscayne Bay, its shoreline, and coastal wetlands. Projects include shoreline stabilization, mangrove and wetland habitat restoration, and bay bottom community enhancement at parks and other public lands. These contribute to erosion control, water quality, and fisheries and wildlife resources.

Future capital expenditures will be directed primarily towards maintaining and enhancing durability of restored beaches and to environmental improvement of the Biscayne Bay ecosystem. All of these projects are developed and carried out based on the best scientific and technical information available to the agencies involved.

Municipalities

Each of the municipal partners has a designated point of contact which is updated annually utilizing LMS Working Group Contact Update Form. These individuals have the responsibility to coordinate mitigation activities with the relevant municipal agencies.

The municipal partners either through their designated point of contact or agencies have the responsibility for integrating mitigation data into their respective plans and procedures. Common examples include of these plans and procedures are:

- Municipal Flood Warning and Response Plans and Procedures
- Municipal Comprehensive Development Master Plans
- Protective Actions Plans and Procedures

Municipal Agencies and Their Mitigation Functions

The municipalities of Miami-Dade County each have within their structure certain departments and agencies which affect and promote mitigation. While these agencies may have slightly different names from city to city, the role they perform in the mitigation function remains the same (e.g. public works or public services or community services, etc.).

Municipal Floodplain Manager: Some of the municipalities have a designated floodplain manager. They are responsible for coordinating and directing compliance with the Community Rating System (CRS) and maintaining their municipality's flood warning and response plan.

Miami-Dade DTPW operates and maintains and operates drainage systems and the secondary canals throughout the County, working with the SFWMD to implement flood control operations, when required.

Police and fire rescue departments: Each of the municipalities except Miami Lakes, Palmetto Bay and Cutler Bay maintains its own Police Department while the cities of Coral Gables, Hialeah, Key Biscayne, Miami and Miami Beach maintain their own fire departments, with the balance of the cities using Miami-Dade Fire Rescue for this service. Emergency responders are essential for alert and notification, lifesaving response, prevention and protection activities that all contribute to lessening the impact of disasters. The police and fire departments also conduct educational seminars to residents to spread awareness on emergency preparedness.

The Miami-Dade County RER, Permitting and Inspections Center: The functions of this department relate extensively to a wide range of mitigation projects and on-going mitigation activities. In most of our cities, the Building Official is responsible for interpreting and enforcing all laws, codes, ordinances, regulations and municipal policies related to the construction, improvement, expansion, repair or rehabilitation of buildings within the city. This department ensures that all new construction complies with the Florida Building Code which in itself is a major contribution to hazard mitigation. The department usually is responsible for the management of development in Special Hazard Areas; preservation

of open space; general control of land use intensities; and coordination between the capacity of public infrastructure in relation to proposals of private development. The Building Department also ensures all proposed development in the City conforms to the City's comprehensive plan as it relates to urban design of public areas and buildings, infrastructure planning and maintenance of flood data and other statistical information.

Planning and Development Department: Often is a part of the building department and even, at times, a part of public works. However, a number of our municipalities maintain planning and development as a separate entity which interacts within the mitigation strategy in many ways and must be part of the overall strategy especially in the area of urban land use.

Public Works Department: In most of our cities this department is responsible for construction and maintenance of roads, bridges and waterways and storm water management including drainage system development, inspection and maintenance, all functions that relate in various ways to hazard mitigation. Public works activities are a major component of any mitigation strategy.

Analysis of Existing Policies, Ordinances and Programs

The LMS Coordinator performed a review of a number of local policies and plans to create an Integration Document (*Part 4 Appendix H*). Additional LMSWG members were invited to participate and assist by reviewing the Integration Document and identifying and reviewing other local policies, ordinance and programs so we may better identify areas where we are in alignment or areas for consideration where mitigation may be better aligned.

As can be imagined, in a county as large and diverse as Miami-Dade, there are numerous planning agencies and documents that are developed. Each many times addresses the needs of their focus (e.g. transportation, emergency management) and each seems to have a different threshold for how often the plan is to be updated and the planning horizon to which it assesses the consideration of hazards and risks.

The Integration Document included in this version should be viewed as a starting point for the LMSWG to discuss, review and identify areas were we as a whole community can be more effective in our approach to mitigation and resiliency.

The Integration Document includes reviews of the following:

- Resilient 305 Strategy
- Southeast Florida Regional Climate Action Plan
- Miami-Dade Comprehensive Development Master Plan (CDMP)
- Miami-Dade Emergency Management Recovery Plan
- Miami-Dade 2035 Long Range Transportation Plan
- Florida Administrative Code 9J-2.0256

As the population grows in Miami-Dade County, hazard mitigation laws must address new structures being built in areas susceptible to unusual occurrences either through prohibition, limitation or tougher code to reduce potential losses. For example, new building construction in low lying flood areas must be limited or built in such a manner to minimize impacts from flooding. Similarly, future construction sites of natural gas, electrical and nuclear power plants must have mechanisms in place that will self-contain, or significantly limit, effects of potential catastrophic incidents. As identified in the Integration Document the Miami-Dade CDMP addresses a number of planning and zoning issues and the prevention or limitation of development in risk areas. Adaptation Action Areas are being incorporated into the CDMP and they should also be considered in relation to recovery and post-disaster redevelopment.

Local government and the private sector must provide ongoing training and information sessions for the public. Clear, unbiased knowledge is a key ingredient for safety enhancement for the public. Ongoing training could include public information notices and continuous training sessions at local libraries, hospitals and schools. Part of the cost for this training should be borne by those private parties who ask or have businesses that may contribute to an unusual occurrence. For example, construction of a new electrical substation, a natural gas company building a new facility, a professional dry cleaner establishment, a new gas station, etc. would have impact fees assessed to offset the mitigation training costs.

Training and equipment to prepare for and subsequently resolve hazard situations are necessary and vital. Alternative financial resources must be assessed and located in addition to including these costs in all respective governmental budgets.

Periodic review and revision of the local government ordinances, policies and programs must occur no less than once every other year.

Each municipality that has not yet done so should adopt a floodplain management ordinance and participate in the community rating system program. At the present time, the Miami-Dade Local Mitigation Strategy will serve as a floodplain management plan if adopted by a municipality.

Municipal Integration of Mitigation Measures

The following section identifies how the participating municipalities have incorporated mitigation into their planning processes, policies and/or ordinances. The municipalities continuously strive to expand and improve upon their mitigation measures as is illustrated below and with the extensive listing of mitigation projects identified in Part 2.

Aventura

The City of Aventura reported the last update on Municipal Integration occurred on July 7, 2015, when Resolution No. 2015-40 was approved as the city's Floodplain Management Plan.

City of Aventura Comprehensive Plan[13]
Transportation Element
Policy 1.9: The City of Aventura, in consultation with the Florida Department of Transportation, shall evaluate the impacts of proposed development and redevelopment on its transportation system, Strategic Intermodal System facilities, and the adopted level of service standards of transportation facilities, and identify strategies to alleviate or mitigate such impacts in coordination with the developer and other agencies as appropriate. The City shall coordinate with FDOT, Miami- Dade County, and 28 other jurisdictions in the county in the development of common methodologies for measuring such impacts.
Infrastructure Element
Objective 4: Aventura shall protect and preserve the biological and hydrological functions of the wetlands identified in the Land Use Element. Future impacts to the biological functions of publicly and privately-owned wetlands shall be mitigated. Publicly acquired wetlands shall be restored and managed for their natural resource, habitat and hydrologic values.
Capital Improvements Element
Objective 3: Future development will be permitted only when the adopted level of service standards for those services listed in the CIE will be upgraded or maintained at adopted levels of service, or when demonstrated negative impacts on hurricane evacuation clearance times will be mitigated, by ensuring that adequate fiscal resources are made available including, the proportionate cost of improvements necessitated by the development.
Conservation & Coastal Management Element
Policy 10.2: Structures which suffer recurring damage to pilings, foundations or load-bearing walls shall be required to rebuild landward of their current location to modify the structure to structurally enhance the structure, institute or mitigation measures or delete the area's most prone to damage.

[13] https://www.cityofaventura.com/DocumentCenter/View/184/Comprehensive-Plan-PDF?bidId=

City of Aventura Comprehensive Plan[13]
Policy 10.14: The City shall implement its local mitigation strategy in accordance with the guidelines provided in the Local Mitigation Strategy: A Guidebook for Florida Cities and Counties in order to fulfill the State requirements relating to post-disaster planning, repair, and reconstruction.

Bal Harbour

Below is the section of this Village's Comprehensive Plan that integrates with the Miami-Dade County LMS.

Comprehensive Plan for Village of Bal Harbour	June 1988
Future Land Use Element	
Objective 9J-5.006(3)(b)4: Protect natural and historical resources. Policy: Developments and construction that adversely impact on the quality of the natural environment shall not be allowed.	
Coastal Management Element	
Objective 2.2 Hazard Mitigation and Coastal High-Hazard Areas: the Village of Bal Harbour shall ensure that building, development and redevelopment activities are carried out in a manner which minimizes the danger to life and property from hurricanes. Development within coastal high-hazard areas shall be restricted and public funding for facilities with coast high-hazard areas shall be curtailed. • Policy 2.2.01: The hazard mitigation section of the Dade County Hurricane Procedure Plan shall be reviewed and updated on a 5-year basis. In the rewrites, the Emergency Management Director shall identify specific actions that could be implemented to reduce exposure to natural hazards. • Policy 2.3.06: The Recovery Task Force shall propose comprehensive plan amendments which reflect the recommendations in any interagency hazard mitigation reports or other reports prepared pursuant to Section 406 of the Disaster Relief Act of 1974 (PL 93-288). • Policy 2.3.07: If rebuilt, structures which suffer damage in excess of fifty (50) percent of their appraised value shall be rebuilt to meet all current requirements, including those enacted since construction of the structure. • Policy 2.3.08: Structures which suffer recurring damage to pilings, foundations, or ·loadbearing walls shall be required to rebuild landward of their current location, to modify the structure to structurally enhance the structure, institute other mitigation measures or delete the areas most prone to damage.	

Bay Harbor Islands
Below is the section of this Village's Comprehensive Plan that integrates with the Miami-Dade County LMS.

The most recent actions taken by the town were:

- On June 10, 2015 the Town of Bay Harbor Islands passed Resolution No. 2054 for adoption of the 2015 Miami-Dade County Local Mitigation Strategy as the city's Floodplain Management Plan.
- On August 8, 2016 the Town of Bay Harbor Islands passed Ordinance No. 991 amending Chapter 23 of the Town's adopted Code of Ordinances entitled Zoning and Planning relating to the allowable height of docks.
- On May 13, 2019 the Town of Bay Harbor Islands passed Ordinance No. 1032 amending the Code of Ordinance that repeals the town's existing Chapter 7 ½ entitled Flood Damage Prevention. This updated ordinance updated the flood plain maps, designated a flood plain administrator, and adopted procedures and criteria for development in flood hazard areas, etc.

Town of Bay Harbor Islands Code of Ordinances	**December 2013**
Article 1 General Provisions	
Sec. 11-5. - Seasonal and periodic flooding; protection of lives. (a)The regulation of areas subject to seasonal and periodic flooding as provided in the comprehensive plan, policies 1.1(4) (page 35), 3.2 (page 36), 5.2 (page 37), and objectives 3 (page 36) and 5 (page 37) shall be implemented by the Code of Ordinances, including sections 5-17, 5-23.1(A)(3), (4) and sections 23-11(A)(5) and 23-12(12). (b)While it is hereby declared that Dade County has retained the primary responsibility for seasonal and periodic flooding throughout the county as provided in county Ordinance Nos. 57-22 and 57-30, as amended, the town's Code of Ordinances shall further implement the goals and objectives of the county ordinances by requiring compliance with all minimum federal flood insurance elevations for all new construction and for which land use densities and intensities have been adopted in further support thereof. (c)The protection of lives as provided in the comprehensive plan, policy 5.2 (page 37), shall be implemented by the Code of Ordinances, including section 5-1, and by virtue of the Miami-Dade County retention of primary responsibility for hurricane evacuation, including responses to lifesaving and other types of emergency evacuation. The town shall continue to coordinate and assist the county by providing minibus mass transportation to designated areas, information dissemination, and such other acts as shall complement the overall mass transit/public notice and evacuation procedures implemented by Miami-Dade County, Florida. While the county has retained the right to regulate land subdividing through the subdivision regulations, nevertheless the town shall continue to coordinate its efforts with the appropriate county agencies. (d)The town has adopted and shall maintain in full force and effect written hurricane procedures, as amended from time to time.	

Town of Bay Harbor Islands Code of Ordinances	December 2013

(e)Drainage facilities for flooding and a nonpoint pollution, as provided in the town's comprehensive plan, policies 1.1.1, 1.1.2 (page 58); 1.3.1 (page 59); 2.1.1 and objective 2 (page 60); capital improvements policies 1.2, 1.3, 1.4 (page 19); and land use policy 1.3 (page 37) shall be implemented by the Code of Ordinances, including sections 5-1 and 5-17, in that the town collects and discharges storm water runoff through inlets for the residential districts and into two drainage wells for the commercial districts. The town shall continue to coordinate its efforts with Dade County, particularly with reference to protecting and preserving Biscayne Bay. The town shall continue to review its land development regulations to ensure the standards as indicated in the town's comprehensive plan.

(Ord. No. 488, § 5, 5-29-90; Ord. No. 733, § 4, 12-8-03)

Article III Provisions for Flood Hazard Reduction

Sec. 7½-26. - General standards.

In all areas of special flood hazard, all development sites including new construction and substantial improvements shall be reasonably safe from flooding, and meet the following provisions:

(1) New construction and substantial improvements shall be designed or modified and adequately anchored to prevent flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

(2) New construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

(3) New construction and substantial improvements shall be constructed by methods and practices that minimize flood damage.

(4) Electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities, including duct work, shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(5) New and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems.

(6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

(7) On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.

(8) Any alteration, repair, reconstruction or improvements to a building that is in compliance with the provisions of this chapter shall meet the requirements of "new construction" as contained in this chapter.

(9) Any alteration, repair, reconstruction or improvements to a building that is not in compliance with the provisions of this chapter, shall be undertaken only if said nonconformity is not furthered, extended, or replaced.

Town of Bay Harbor Islands Code of Ordinances	December 2013

(10) All applicable additional federal, state, and local permits shall be obtained and submitted to the floodplain administrator along with the application for development permit. Copies of such permits shall be maintained on file with the development permit. State permits may include, but not be limited to, the following:

(a) *South Florida Water Management District:* in accordance with F.S. § 373.036(2)(a)—Flood protection and floodplain management.

(b) *Department of Community Affairs:* in accordance with F.S. § 380.05— Areas of critical state concern, and F.S. Chapter 553, part IV—Florida Building Code.

(c) D*epartment of Health:* in accordance with F.S. § 381.0065—On-Site Sewage Treatment and Disposal Systems.

(d) *Department of Environmental Protection, Coastal Construction Control Line:* in accordance with F.S. § 161.053—Coastal Construction and Excavation.

(11) Standards for subdivision proposals and other new proposed development (including manufactured homes):

(a) Such proposals shall be consistent with the need to minimize flood damage.

(b) Such shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize or eliminate flood damage.

(c) Such proposals shall have adequate drainage provided to reduce exposure to flood hazards.

(12) When proposed new construction and substantial improvements are partially located in an area of special flood hazard, the entire structure shall meet the standards for new construction.

(13) When proposed new construction and substantial improvements are located in multiple flood hazard risk zones or in a flood hazard risk zone with multiple base flood elevations, the entire structure shall meet the standards for the most hazardous flood hazard risk zone and the highest base flood elevation.

Biscayne Park
Below is the section of this Village's Comprehensive Plan that integrates with the Miami-Dade County LMS.

2025 Comprehensive Plan Adopted Component	October 2010
Conservation Element	
Policy 4.2 The Village shall encourage the implementation of low impact development techniques and green building standards that reduce the negative environmental impacts of development and redevelopment by: reducing building footprints to the maximum extent feasible, and locating building sites away from environmentally sensitive areas; promoting the preservation of natural resources; providing for on-site mitigation of impacts (i.e. retention and treatment of stormwater runoff, water reuse, Master Stormwater Management Systems); promoting energy conservation through design, landscaping and building techniques (i.e. solar power, increased tree canopies); promoting water conservation through landscaping and building design; ensuring environmentally friendly building practices (i.e. use of environmentally friendly building materials, recycled materials), and; considering the development of a and implementation of a green building certification program, with associated regulations, incentives and standards.	
Public Facilities Element	
GOAL- DRAINAGE: The goal for the drainage is for the Village of Biscayne Park to continue maintenance of the local drainage system to afford reasonable protection from predictable flooding. The drainage objectives to achieve the goals and which address the requirements of paragraphs 163.3177 (6) (c), F.S., and 9J-5.011 (2) F.A.C. are as follows: **OBJECTIVES AND POLICIES** **Objective 1** To review on an annual basis information on the performance of stormwater drainage facilities. **Policy 1.1** The Village will continue to comply with the 1 0 year design storm level of 10 year design storm level of service standard for stormwater drainage. **Policy 1.2** The Village will continue to maintain and monitor local drainage.	

Coral Gables
Below is the section of this City's Comprehensive Plan that integrates with the Miami-Dade County LMS.

City of Coral Gables Comprehensive Emergency Management Plan, Annex I, Mitigation	**October 2009**
Annex I, Mitigation	
Section B: Coral Gables Mitigation Programs and Department Responsibilities Note: Details and further information is contained in the Miami-Dade County Local Mitigation Strategy. (Page 3.) **Section B:** Coral Gables Mitigation Programs and Department Responsibilities **Mitigation Projects Completed.** • The City's Local Mitigation Strategy identifies mitigation projects that have been completed and provides a list of future projects to be implemented as funding becomes available. (Page 6.)	
Public Safety Element	
Objective SAF-2.2: Assure that future development or redevelopment maintains or reduces hurricane evacuation times. The City establishes an out-of-county hurricane evacuation time for a category 5 hurricane of 16 hours. Mitigation is permitted to achieve and maintain these standards. **Policy SAF-2.3.2**: Annually incorporate recommendations of interagency hazard mitigation into the Comprehensive Plan and Post-Disaster Redevelopment Plan. The redevelopment plan shall identify areas which may warrant post-disaster redevelopment, including elimination of unsafe conditions and inappropriate land uses, and limitation of redevelopment in areas of likely repeated damage.	

Cutler Bay

On June 17, 2015 the Town of Cutler Bay passed Resolution No. 15-40 for adoption of the 2015 Miami-Dade County Local Mitigation Strategy; authorizing the Town Manager to identify and prioritize hazard mitigation grant program projects to become a part of the Local and Statewide hazard mitigation strategy. The Town also adopted a Climate Change Element in June 2016.

Town of Cutler Bay Growth Management Plan
Future Land Use Element
Policy FLU-8C: New schools will minimize negative impacts on surrounding areas through site location, configuration, access and development. Conversely, new development and redevelopment shall minimize and/or mitigate negative impacts on existing school facilities. **Policy FLU-9M:** The Town shall require developers to identify and mitigate constraints based on soils, topography, and floodplains. **Policy FLU-11E:** as appropriate and feasible, shall encourage the elimination or reduction of uses that are incompatible with hazard mitigation goals and interagency hazard mitigation report recommendations.
Housing Element
Monitoring Measures H2-1: 1. Land Development Regulations that mitigate regulatory barriers or provide incentives for the provision of a variety of housing types. 2. Number of cost burdened households by income, age, and special needs group and tenure 3. Housing costs
Coastal Management Element
Policy CM-3C: The Town will establish development standards in the Land Development Regulations for siting future water-related uses that address land use compatibility, availability of upland support services, existing protective status of ownership, hurricane contingency planning, protection of water quality, water depth, environmental disruptions, mitigation actions, availability for public use, economic need, and feasibility **Objective CM-4:** Through compliance with Federal Emergency Management Agency (FEMA) regulations and by targeting repetitive flood loss and vulnerable properties for mitigation, the Town will reduce natural hazard impacts. **Objective CM-7:** The Town will coordinate with the Miami-Dade County Office of Emergency Management (OEM) to develop and implement post-disaster redevelopment and hazard mitigation plans that reduce or eliminate exposure of life and property to natural hazards towards the protection of health, safety, and welfare. **Policy CM-7A:** Inconsistencies are found with the policies under this objective and the post disaster redevelopment and hazard mitigation plans of the Miami-Dade County Office of Emergency Management (OEM), the Town will notify and coordinate with OEM.

Town of Cutler Bay Growth Management Plan
Policy CM-7D: Recovery Task Force shall review and decide upon emergency building permits; coordinate with Miami-Dade County, state and federal officials to prepare disaster assistance applications; analyze and recommend to the Town Council hazard mitigation options including reconstruction or relocation of damaged public facilities; develop a redevelopment plan; and recommend amendments to the Growth Management Plan and other appropriate policies and procedures. **Objective CM-8:** The Town will reduce the exposure of life and property to hurricanes through the planning and implementation of pre-disaster hazard mitigation measures. Pre-disaster planning for post-disaster redevelopment shall direct population concentrations away from the undeveloped identified high-risk areas during post-disaster redevelopment. **Policy CM-8C:** During pre-disaster planning, hazard mitigation proposals shall be developed by the Town in conjunction with other agencies and, where appropriate, included in the Town's Emergency Response Plan or the Growth Management Plan. **Policy CM-8D:** Town locates facilities, the Town shall determine the feasibility and necessity of relocating public buildings away from high-risk areas. The Town shall develop a formal process and guidelines for evaluation alternative to the replacement or repair of public facilities damaged by hurricanes such as abandonment, relocation, or repair and reconstruction with structural modifications. The costs; environmental impacts; mitigation activities; community impacts; economic development issues; employment effects; legal issues; consistency with local, regional and state plans; time period for implementation; and availability of funds should be evaluated for each alternative. **Objective CM-9:** During post-disaster recovery and redevelopment, the Town shall implement its Emergency Response Plan (ERP) and applicable Growth Management Plan policies and assist hurricane damaged areas with recovery and hazard mitigation measures that reduce the potential for future loss of life and property. **Policy CM-9D:** The Town will Policy CM-9D: enforce applicable recommendations of post-disaster hazard mitigation plans required under Section 406 of the Disaster Relief Act of 1974.
Conservation Element
Policy C-6A: Wetlands that are to be Policy C-6A: protected will be identified based on the type of wetland, function, size, conditions, location, and overall resource value. The wetlands shall be used for purpose that are compatible with their natural values and functions, and Land Development Regulations shall be adopted to provide these areas with the maximum feasible protection, by using such tools as compensatory wetland mitigation and dedication of conservation easements for preserving open space. All development with the potential to impact wetland areas shall be consistent with South Florida Water Management District (SFWMD) regulations. Activities in wetland areas may be permitted provided all applicable local, regional, state and federal external environmental agency permits have been obtained and one of the following standards is satisfied:

Town of Cutler Bay Growth Management Plan
1. Such an activity is necessary to prevent or eliminate a public hazard. 2. Such an activity would provide direct public benefit, which would exceed those lost as a result of the modification. 3. Such an activity is proposed for habitats in which the functions and values currently provided are significantly less than those typically associated with such habitats and cannot be reasonably restored. 4. Because of the unique geometry of the site, it is the unavoidable consequence of development for uses that are appropriate given site characteristics.

Town of Cutler Bay Climate Change Element	June 2016
The Town of Cutler Bay has already taken a number of steps to reduce greenhouse gas emissions and encourage environmental responsibility at the local level. The Town, along with neighboring communities, participates in the Property Assessed Clean Energy (PACE) Program, which provides loans to property owners for solar panels, wind generators, insulation and shutters. The Town also recently gained the legislative authority to allow residents of certain areas to receive loans, which can be paid off over time, to finance the initial costs of installing an alternate energy producing device (Financing Initiative for Renewable and Solar Energy). In addition, the Town is the only municipality in the County to have achieved the Florida Green Building Council's Silver Certification, and has adopted green building and development standards as part of its Land Development Regulations. "Climate change resilience" means the ability of the built and natural environment (including infrastructure) to adjust to and absorb climate change impacts to the maximum extent feasible. Examples of management and development practices that can increase climate change resilience include: requiring increased minimum floor elevations for new development and redevelopment; retrofitting buildings for increased flood risk; designing infrastructure that can withstand higher water levels such as raising seawalls and installing tidal valves; implementing natural drainage features such as bios wales and stormwater buffers; reducing the heat island effect through increased landscaping, shading, and green building practices, and; adopting building practices that reduce vulnerability to increased storm events.	

Doral

On January 13, 2015, the City of Doral adopted Resolution 15-06 which adopts the current Miami-Dade County Local Mitigation Strategy in accordance with the National Flood Insurance Program Community Rating System Requirements as the city's Floodplain Management Plan.

City of Doral Comprehensive Master Plan[14]
Future Land Use Element
Policy 2.6.1: Coordinate with Miami-Dade County in implementing the approved Local Mitigation Strategy, by assessing the vulnerability of governmental, medical and public safety sites and structures in the City to storm damage, and in developing an action plan, if necessary, to address wind stability and flood protection for key buildings. **Policy 2.6.4:** Following the National Response Framework principles, respond to all types of disasters and emergencies with the primary mission of saving lives, and protecting property and the environment. Activate procedures under mutual aid agreements with Miami-Dade County and other area cities when necessary based on event severity. In the case of hurricanes, the City will also immediately implement the recovery policies contained in its adopted Hurricane Preparedness and Recovery Plan. **Policy 2.6.5:** All proposed large-scale amendments to this Comprehensive Plan and/or zoning applications shall be evaluated for their impact on hurricane evacuation routes and times, and effect on currently available off-site shelter capacities. Roadway improvements and shelter improvements shall be required, if deemed necessary, to mitigate negative impacts and phased with new residential development.
Infrastructure Element
Policy 5E.2.5: Appropriate local planning, development design standards, and special construction practices shall be required to ensure both short and long-term mitigation of impacts on groundwater created by activities occurring in stream-to-sink basins and in areas where the Floridan Aquifer is unconfined or semi confined. The following provisions shall apply: a) All new development or modifications to existing development shall provide stormwater treatment. b) Corrective action to retrofit or upgrade existing hazardous material facilities consistent with standards applicable to new facilities shall be required by the City. The Hazardous Materials Management Code and development regulations establish guidelines and minimum compliance standards for existing facilities. c) New development activities that involve handling or storing of hazardous materials may be prohibited in areas and shall be subject to the general requirements, siting prohibitions, storage facility standards, secondary containment requirements, and monitoring provisions of the Hazardous Materials Management Code. Where such facilities

[14] https://www.cityofdoral.com/all-departments/planning-and-zoning/2016-city-of-doral-comprehensive-plan.pdf

City of Doral Comprehensive Master Plan[14]
exist and are proposed to be modified, development review and permitting activities shall include careful evaluation and implementation of engineering and management controls, setbacks and buffers, and monitoring. Existing facilities shall meet the requirements of the Hazardous Materials Management Code pertaining to such facilities.
Conservation Element
Policy 6.4.12: Provide for regular updates to the City's adopted Stormwater Master Plan. **Policy 6.4.13:** Protect and enhance the stormwater management systems that recharge the Northwest Wellfield Area. **Policy 6.5.2:** Identify future wetlands to be protected based on the type of wetland, function, size, conditions/location, and overall resource value. These wetlands shall be used for purposes that are compatible with their natural values and functions, and land development regulations shall be adopted to provide these areas with the maximum feasible protection, by using such tools as upland buffers, exotic vegetation removal, hydro period restoration, compensatory wetland mitigation and dedication of conservation easements. Activities in wetland areas may be permitted provided all applicable federal, state, regional and local external environmental agency permits have been obtained.
Intergovernmental Coordination Element
Policy 9.1.19: Coordinate all disaster preparedness programs with the Miami-Dade County OEM to ensure consistency with the County's Comprehensive Emergency Management Plan and the Miami-Dade Local Mitigation Strategy (LMS) and in updating hurricane evacuation shelter assignments.
City's Land Development Code
Section 71-112 – "Required to withstand extreme wind conditions": No more than 15 percent of the required tree planting requirement pursuant to Chapter 71 "Landscaping and Buffers" of the City's Land Development Code, can be trees and palm trees which do not fare well in extreme wind conditions such as hurricanes and tropical storms. Examples are, avocado, black olive, carrot-wood, citrus tree, among other trees specified in Section 71-112.
Low Impact Development Master Plan
City of Doral Low Impact Development (LID) Master Plan: Provides the City with guidelines, recommendations and Best Management Practices (BMPs) to promote the implementation of green infrastructure in new development and re-development projects to maintain natural infiltration of Stormwater, reduce the discharge of specific pollutants into local waterways, provide more aesthetically pleasing developments and reduce the flood impacts in the City Stormwater system. The Planning Department is currently working on an update to the LID Master Plan which will add new LID techniques.
Low Impact Development
Section 74-881 - "Low Impact Development (LID) Practices": The City's Planning and Zoning Department is responsible for implementing the LID Master Plan

City of Doral Comprehensive Master Plan[14]
through the incorporation of the LID BMPs in Section 74-881 of the Land Development Code. The LID's BMPs apply to all new development and re-development projects within the City of Doral. Concurrent with the update to the City's LID Master Plan, the Planning Department is revising Section 74-881 of the LDC which will clarify the goals, provide a list of non-structural and structural LID practices (derived from the Master Plan) and provide for maintenance of LID practices.

El Portal
Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

Village of El Portal Comprehensive Plan	May 2002
Coastal Management Element	
Policy 1.1.1. In conjunction with any redevelopment of the mobile home park Little Farm Trailer Park site, preserve (and mitigate where possible) the natural canal banks to further marine and wildlife habitat. **Policy 9.1.20** Work with Miami-Dade County in implementing the approved Local Mitigation Strategy for hazard mitigation, and by January 2007, the City shall develop a City Emergency Plan to increase public safety and reduce damages and public expenditures.	

Florida City
Below is the section of this town's comprehensive plan that integrates with the Miami-Dade County LMS.

Florida City Community Redevelopment Plan	February 2009
Policy 1.1: Acquire and demolish dilapidated and unsafe structures while providing relocation programs for displaced families if necessary. **Policy 7.1:** Work with appropriate government agencies and utility companies to ensure provision of adequate services including potable water, stormwater, sewer, gas, solid waste, television, and electricity.	

Golden Beach
Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

Town of Golden Beach Hurricane and Severe Weather Response Plan	**2007**
Severe Weather Response Element	
Policy: The Town will have an organized response to hurricanes and other severe weather related emergencies in order to mitigate the effects of severe weather and to return Town services and normal living conditions as soon as possible. Wherever practical; the Town's plan will use the same terminology and references as Miami-Dade County's (MDC) plan. The Town Mayor and Manager or their designees are responsible for determining when this plan will be implemented. The determination to mobilize will be based upon information provided by the National Hurricane Center (NHC) and the Miami-Dade Emergency Operations Center (MDEOC). Additionally, it is the policy of the Town of Golden Beach Police Department is to protect life, property, and maintain order within the community during a weather related emergency. Appropriate levels of police services will be maintained before, during and after a hurricane or severe weather incident.	

Hialeah
Below is the section of this city's Comprehensive Plan that integrates with the Miami-Dade County LMS.

City of Hialeah Comprehensive Plan	**2015**
Future Land Use Element	
Policy 1.2.14: Wetland impacts on the Annexation area: The city will develop a wetland mitigation projection based on the on-site wetlands analysis and consistent with environmental requirements and development projections	
Conservation Element	
The 100-year floodplain needs to be protected to help mitigate the damaging effects of flooding. Protection of these areas is assisted through the National Flood Insurance Program and local Code of Ordinances. Flood criteria must be met before the City will issue any building permits.	
Capital Improvements Element	
Policy 1.4.2: The City shall continue to maintain an inventory of any existing hazards within the City by using the hazards analysis and hazards mitigation criteria established within the Miami-Dade County Comprehensive Emergency Management Plan and shall also identify any grant sources available to mitigate the hazards listed on the hazard inventory.	

Hialeah Gardens
The City of Hialeah Gardens incorporates mitigation into its planning process as follows:

City of Hialeah Gardens 2025 Comprehensive Plan	October 2012
Intergovernmental Coordination Element	
• **Policy 1.1.10** The City shall implement the provisions of the Local Mitigation Strategy (LMS) Guidelines in accordance with the Interlocal Agreement with Miami-Dade County. • **Objective 1.3** Coordinate the impact of development with other jurisdictions to define and implement mutually beneficial goals, ensure consistency among adjacent land uses, and mitigate negative development impacts. This objective shall be made measurable by implementation of its policies.	

The City of Hialeah Gardens has a Division of Emergency Management which is responsible for coordinating disaster preparedness, response, recovery, and mitigation concerns for all City departments.

Homestead
Below is the section of this city's comprehensive plan that integrates with the Miami-Dade County LMS.

City of Homestead Comprehensive Plan	June 2011
Future Land Use Element	
Objective 10: Hurricane Evacuation and Mitigation Ensure that development and redevelopment are consistent with hurricane evacuation plans. Measure 2: Maintain hurricane mitigation measures that are consistent with the Miami-Dade County Local Mitigation Strategy (LMS) and facilitate the approved evacuation plans. **Policy 10.1:** Development orders for new development and redevelopment shall be consistent with local and regional hurricane evacuation plans where applicable. **Policy 10.2**: Mitigate any identified deficiencies in storm damage resistance of critical public facilities and construct new facilities, if needed, to assist in the City's evacuation plans.	
Objective 11: Hazard Mitigation and Post-Disaster Redevelopment To the extent financially feasible, incorporate all prudent hazard mitigation needs and post-disaster redevelopment procedures into the City's capital improvement planning and Land Development Code. Measure: Number of capital improvement projects and/or amendments to the land development code successfully implemented to address hazardous mitigation needs and post disaster redevelopment procedures.	
Hazard Mitigation/ Post-Disaster Redevelopment Element	
Policy 4.3: Participate in the preparation/modification of the 409 Hazard Mitigation Plan.	
Objective 6: Implementation of the Local Mitigation Strategy (LMS) The City continues to work with the Miami-Dade EOC and other government agencies to implement the policies, ordinances and programs outlined in the LMS. Measure: Coordinate efforts with state and county agencies to bring the community together as a single mitigating entity. **Policy 6.1:** Participate in the improvements in the City's standing and classification in the Community Rating System (CRS), with the related consequences of making flood insurance under the National Flood Insurance Program (NFIP) more affordable and reachable, while improving the effectiveness in coping with flood hazards, problems and emergencies. P**olicy 6.2:** Disseminate information on a repetitive basis with respect to the existence of flood hazards and the availability of measures to mitigate the problems presented by such hazards. **Policy 6.3:** Increase the level of coordination of mitigation management concerns, plans and activities at all levels of government. **Policy 6.4:** Improve and maintain cutting edge, state-of-the-art, and effectiveness of the City's emergency preparedness and disaster response capacity. Policy 6.5: Continue	

City of Homestead Comprehensive Plan	June 2011
our commitment to the review, update and implementation of the local hazard mitigation strategy.	

Key Biscayne

On August 25, 2015, the Village of Key Biscayne passed Resolution No. 2015-38 for adoption of the 2015 Miami-Dade County Local Mitigation Strategy; authorizing the Village Manager to identify and prioritize hazard mitigation grant program projects to become a part of the Local and Statewide hazard mitigation strategy.

The Village has a full time Certified Flood Plain Manager who is responsible for the implementation of the Community Rating System (CRS) and NFIP compliance with assistance from a CRS Coordinator and a Consultant. The Village of Key Biscayne has incorporated mitigation into their planning processes to include the following plans:

Village of Key Biscayne Code of Ordinances Plan	December 2010
Resolution No. 2010-53: Resolution of the Village Council Adopting the Miami-Dade County Local Mitigation Strategy	
Village of Key Biscayne Code of Ordinances Plan	**February 2014**
Section 30-73-Site Plan Review Procedures Item (f)(6)g: Description of methods to be implemented during construction to mitigate adverse quantity or quality impacts off-site.	
Village of Key Biscayne Comprehensive Emergency Management Plan	**September 2006**
Annex-IV: Recovery H. Hazard Mitigation Plan/Program	
The Village of Key Biscayne has adopted the Miami-Dade County Comprehensive Emergency Management Plan by reference.	
Village of Key Biscayne FMP Annual Progress Report for CRS Annual Recertification	**October 2014**
Progress on FMP implementation, as required in Section X of the FMP, falls within the context of CRS compliance Action Plans followed by the Village. The Action Plan Items are included and tracked through the Miami-Dade County Local Mitigation Strategy (LMS)	
Village of Key Biscayne Stormwater Master Plan Update	**June 2011**
2.3.3: Repetitive Loss Properties One of the activities involved with the Annual NFIP CRS Re-Certification process is the analysis of Repetitive Loss Areas (RLAs). The purpose of the analysis is to determine possible mitigation solutions to minimize the flood claims.	
Village of Key Biscayne Master Plan	**December 2008**
Future Land Use Element	
Objective 2.4 Hurricane Evacuation 9J-5.006 (3) (b) 5	

Village of Key Biscayne Code of Ordinances Plan	December 2010
Eliminate or reduce land uses which are inconsistent with applicable interagency hazard mitigation report recommendations and enhance the efforts of the Metro-Dade Office of Emergency Management by providing it with all relevant information. **Policy 2.4.1:** The Village shall regulate all future development within its jurisdiction in accordance with the Future Land Use Map which is consistent with the Interagency Hazard Mitigation Team Report, FEMA 955-DR-FL, August 1992. The Village shall periodically review and revise the Future Land Use Map in light of future interagency hazard mitigation reports in order to reduce or eliminate uses which are inconsistent therewith.	
Infrastructure Element	
Policy 1.1.2 9J-5.011 (2) (c) 1: During the first phase of drainage master plan implementation (to be initiated in 1994), the Village shall begin to mitigate to the extent technically and economically feasible direct stormwater outfalls into the canals and Biscayne Bay. Anticipated improvements include a series of catch basins, manholes and pipes for the collection of the stormwater and routing to pollution control structures and drainage wells with emergency overflows. The pollution control devises (grease and oil separator) are to be provided before each drainage well to prevent contamination from entering. Emergency overflow structures are to be constructed at the existing outfalls and would discharge only when the storm events generate more than one inch of runoff. These improvements shall be designed to fully meet the specific standards set forth in Objective 1.1 above.	
Conservation and Coastal Management Element	
Policy 1.3.1: By the date required by state statute or sooner, the Village shall enact and enforce estuarine waterfront protection provisions in the land development code. The provisions will be drafted to assure that all applicable development permit applications are reviewed in the context of the mangrove protection policies of the State DEP and the waterfront policies of DERM. In particular, DERM Class 1 Permits pursuant to Section 24-58 of the Dade County Code shall be required for all construction seaward of the mean high water line. Such construction shall be designed to minimize environmental impacts and mitigate unavoidable impacts. This provision shall be interpreted to protect sensitive lands from sea wall and other related construction, but it shall not be interpreted as permitting construction seaward of the State Coastal Construction Control Line in violation of other policies of this Comprehensive Plan. **Policy 1.7.14:** The Village hereby designates DERM mangrove jurisdictional areas in the Village as environmentally sensitive lands which shall be protected from development unless their ecological value is replaced via mitigation. These DERM areas are mapped in Figure V-1 of the Data and Analysis of this Plan. **Policy 3.3.3:** During post-disaster recovery periods, after damaged areas and infrastructure requiring rehabilitation or redevelopment have been identified, appropriate Village departments shall use the post-disaster redevelopment plan to reduce or eliminate the future exposure of life and property to hurricanes; incorporate recommendations of interagency hazard mitigation reports; analyze and recommended to the Village Council hazard mitigation options for damaged public facilities; and recommend amendments, if required, to the Village Master Plan.	

Medley

Below is the section of this town's comprehensive plan that integrates with the Miami-Dade County LMS.

Town of Medley Municipal Code of Ordinances	**May 2014**
Article V. Provisions for Flood Hazard Reduction	
Sec. 30-71. - General standards. In all areas of special flood hazard, all development sites including new construction and substantial improvements shall be reasonably safe from flooding, and meet the following provisions: (1) New construction and substantial improvements shall be designed or modified and adequately anchored to prevent flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. (2) Manufactured homes shall be anchored to prevent flotation, collapse, and lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This standard shall be in addition to and consistent with applicable State of Florida requirements for resisting wind forces. (3) New construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage. (4) New construction and substantial improvements shall be constructed by methods and practices that minimize flood damage. (5) Electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities, including duct work, shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding. (6) New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems. (7) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters. (8) On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.	

Town of Medley Municipal Code of Ordinances	May 2014

(9) Any alteration, repair, reconstruction or improvements to a building that is in compliance with the provisions of this chapter shall meet the requirements of "new construction" as contained in this chapter.

(10) Any alteration, repair, reconstruction or improvements to a building that is not in compliance with the provisions of this chapter, shall be undertaken only if said non-conformity is not furthered, extended, or replaced.

(11) All applicable additional federal, State of Florida, and local permits shall be obtained and submitted to the Floodplain Administrator along with the application for development permit. Copies of such permits shall be maintained on file with the development permit. State of Florida permits may include, but not be limited to, the following:

a. South Florida Water Management District: in accordance with Chapter 373.036 Florida Statutes, Section (2)(a)—Flood Protection and Floodplain Management.
b. Department of Community Affairs: in accordance with Chapter 380.05 F.S. Areas of Critical State Concern, and Chapter 553, Part IV F.S., Florida Building Code.

c. Department of Health: in accordance with Chapter 381.0065 F.S. Onsite Sewage Treatment and Disposal Systems.

(12) Standards for subdivision proposals and other new proposed development (including manufactured homes):

a. Such proposals shall be consistent with the need to minimize flood damage.
b. Such shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize or eliminate flood damage.
c. Such proposals shall have adequate drainage provided to reduce exposure to flood hazards.

(13) When proposed new construction and substantial improvements are partially located in an area of special flood hazard, the entire structure shall meet the standards for new construction.

(14) When proposed new construction and substantial improvements are located in multiple flood hazard risk zones or in a flood hazard risk zone with multiple base flood elevations, the entire structure shall meet the standards for the most hazardous flood hazard risk zone and the highest base flood elevation.

Miami

The City has a full time Flood Plain Manager who is responsible for the implementation of the Community Rating System compliance and NFIP compliance. The City also has an Office of Resilience and Sustainability that is responsible for environmentally-focused projects, including but not limited to the creation of the City's Climate Action Plan, energy efficiency partnerships, and the adoption of green building initiatives.

The City of Miami has incorporated mitigation into their planning processes to include the following plans:

City of Miami Comprehensive Emergency Management Plan	November 2019
Policy III.B.1: City departments will enforce all public safety mandates of the Miami City Code to include land use management and building codes; and recommend to the Mayor and City Commission, legislation required to improve the "disaster resistance" of the community. **Policy III.M.2:** When an emergency/disaster has occurred or is imminent, the Mayor may declare a state of emergency, activating the emergency response, recovery, and mitigation aspects of the Miami CEMP that apply to the affected area. **Policy III.P.2:** Immediately after an incident, local jurisdictions respond using available resources and notify State response elements. As information emerges, they also assess the situation and the need for State assistance...At this point, an initial assessment is also conducted of losses avoided based on previous mitigation efforts. **Policy III.P.9:** As immediate response priorities are met, recovery activities begin. Federal and State agencies assisting with recovery and mitigation activities convene to discuss State needs. **Policy III.P.11:** Throughout response and recovery, mitigation staff at the JFO will examine ways to maximize mitigation measures in accordance with State hazard mitigation administrative plans.	
City of Miami Hurricane Plan	**November 2019**
Policy I.G.7: The responsibilities of the [Recovery Action Team (RAT)] are: • Oversee the recovery and reconstruction process and to serve as an advisory body to the City Manager. • Identify mitigation opportunities and identify recovery resources. • Ensure coordination of the recovery process. **Attachment E.G.1**: Receive and review damage reports and other analyses of post-disaster circumstances and to com-pare these circumstances with mitigation opportunities identified prior to the disaster in order to identify areas for post-disaster change and innovation. Where needed, the RAT may review alternative mechanisms for achieving these changes and recommend the coordination of internal and external resources for achieving these ends. **Attachment E.G.3:** Review damage reports and other analyses of post disaster circumstances and to compare these circumstances with mitigation opportunities and identify areas for post disaster development changes.	

City of Miami Comprehensive Emergency Management Plan	November 2019
Attachment E.I.2: Identify funding sources for mitigation and recovery projects including state and federal assistance programs, private-sector funding and public donations. **Attachment E.J.RF [Recovery Function] #19 Mitigation:** To prepare a post-disaster hazard mitigation plan that will define actions during the recovery period that help prevent repeated future losses and reduce the City's vulnerability to natural hazards.	
Miami-Fort Lauderdale UASI THIRA	**November 2019**
The Miami-Fort Lauderdale UASI THIRA addresses mitigation needs through the recovery and protection core capabilities.	
Miami-Fort Lauderdale Urban Area Security Strategy	**November 2019**
1. **Mission:** Increase preparedness, prevention, protection, mitigation, response, and recovery capabilities within the Urban Areas and the Southeast Florida Region for all hazards, including terrorism. **1. Effort:** Based on the capability assessment and strategy review, implementation steps are included and updated under each core capability and linked to regional initiatives and activities intended to enhance the preparedness, prevention, protection, mitigation, response, and recovery capabilities of the South Florida metropolitan areas either by: • Current, proposed, or future funding to enhance or sustain a capability or capacity needed within the jurisdictions or the region; or, • By reference to existing capabilities where no enhancement is required or currently planned, but access to those capabilities is needed to fulfill the full range of preparedness, prevention, protection, mitigation, response and recovery actions for incidents of all types.	
Goal: Protect Critical Infrastructure & Key Resources, Objective: Physical Protective Measures, Step: Establish a joint CIP workgroup to include the private sector to set security goals, identify assets, systems and networks; assess risks and threats annually; implement protective programs; and measure the effectiveness of risk-mitigation efforts.	
Goal: Protect Critical Infrastructure & Key Resources, Objective: Risk Management for Protection Programs & Activities- State, regional, local, tribal and private sector entities, in coordination with Federal participation, identify and assess risks, prioritize and select appropriate protection, prevention, and mitigation solutions based on reduction of risk, monitor the outcomes of allocation decisions, and undertake corrective actions. Step: Implement and assess the risk management model within the region and develop a plan to implement appropriate risk mitigation strategies using UASI funds.	
Goal: Respond to Disasters- CBRNE, Objective: Infrastructure Systems, Step: Encourage and assist jurisdictions in developing or enhancing recovery and mitigation efforts and plans. Step: Maintain liaison with county Local Mitigation Strategy (LMS) coordinators. Step: Ensure that lifeline facilities are incorporated into mitigation and recovery planning.	
Goal: Recover from Terrorism & Other Disasters, Objective: Natural and Cultural Resources- Protect natural and cultural resources and historic properties through appropriate planning, mitigation, response, and recovery actions to preserve, conserve,	

City of Miami Comprehensive Emergency Management Plan	November 2019
rehabilitate, and restore them consistent with post-disaster community priorities and best practices and in compliance with appropriate environmental and historical preservation laws and executive orders.	

Miami Beach

Below is the section of this city's comprehensive plan that integrates with the Miami-Dade County LMS.

City of Miami Beach Stormwater Management Master Plan – Executive Summary	June 2010
ES.2 Program Goals and Objectives	
Objective No. 8: Provide recommendations for seawalls to mitigate the effects of sea level increases over the next 50 years. As a complement to the engineering evaluation, CDM Smith utilized the FEMA's Hazards United States (HAZUS) tool designed to estimate hazard-induced losses for use by federal, state, regional and local governments, and private enterprises in planning for risk mitigation, emergency preparedness, response and recovery. By using a standard FEMA tool, the City will benefit in the coordination of future activities related to flood proofing, grant assistance, and management of repetitive loss properties. The analysis, which was performed for South Beach, incorporated existing elevations, structure and land use data along with information from the detailed flood model (SWMM). The HAZUS model generates an output that consists of a damage amount in dollars that is based on the percentage of total value loss a structure incurs during a flood event, like the statistically calculated once-in-5-year storm (5.9 inches of rainfall in 24 hours).	
Objective Number 8: Provide recommendations for seawalls to mitigate the effects of sea level increases over the 50 years; SWMMP Solution: Preliminary inspection and elevation standards for seawalls have been made with consideration of SLC, based on USACE guidance documents. A recommendation of a minimum seawall height of 3.2 ft NAVD provides a means to protect against projected spring tidal conditions over the next 50 years, based on intermediate SLC projections.	

Miami Gardens

The City of Miami Gardens incorporates mitigation actively through Drainage Improvement Projects. The City of Miami Gardens budgets $2,000,000+ per year for drainage improvement projects. This is shown in the Comprehensive Development Master Plan. The projects funded through this appropriation are tracked continually during the year. The City also continually seeks grant funds to assist in constructing drainage improvements, and leverages budgeted money as matches to increase the number of projects funded.

Drainage improvement projects are also tracked through the City's Stormwater Management Master Plan. This FY 2020, the City will be updating the Stormwater Master Plan. This plan prioritizes projects based on need in the City, and their degree of flood protection and water quality improvement. In addition, the plan will address the FEMA repetitive loss properties to mitigate flooding issues. The City tracks the projects by coordinating the yearly budget, the Stormwater Management Master Plan, and projects listed in the Local Mitigation Strategy working group.

A future goal of the City is to address the flooding issues through the Stormwater Management Master Plan to update the priority projects, delete those projects completed, add projects as needed, and model the City again with the completed projects to determine future flood protection and stormwater quality needs. Another item in the City budget is drainage maintenance. This includes street sweeping, canal bank maintenance, litter control on land and in the surface waters, and mechanical and biological controls in the canals. These activities are considered mitigation in that they reduce potential obstructions in the event of a storm, and ensure capacity is present if a storm occurs.

City of Miami Gardens' Comprehensive Development Master Plan	**November 2019**
Future Land Use Element	
Objective 2.6: Land Use Compatibility The City shall ensure that the land development regulations contain criteria to mitigate negative impacts that incompatible land uses may have on the neighboring areas.	
Objective 2.12: Hazard Mitigation and Disaster-Preparedness Coordinate the City's Emergency Response Plan with Miami-Dade County and State of Florida to address hazard mitigation and disaster-preparedness for the safety of residents and property in Miami Gardens. **Policy 2.12.1:** The City Public Works Department and City Manager's office shall coordinate with the Miami-Dade County Emergency Management Operations Center for the safety of its citizens. **Policy 2.12.2:** The Public Works Department shall prepare a City Emergency Response Plan to appropriately address emergency/hazard/disaster mitigation program for the safety of Miami Gardens' residents.	

City of Miami Gardens' Comprehensive Development Master Plan	November 2019
Policy 2.12.3: Coordinate with Miami-Dade County in developing and implementing an Action Plan if necessary, to address flood protection, storm damage precautions. **Policy 2.12.4:** The City's Emergency Response Plan shall include but not be limited to an incident command system structure, delegation of responsibilities for incidents, a medical procedure and materials plan, outreach to the community through identified forums and public information systems, and post disaster mitigation plans that includes designated debris sites and personnel needs.	

Miami Lakes

Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

Town of Miami Lakes Comprehensive Plan	November 2019
Land Development Element	
Policy 1.2.4: Develop a code enforcement system in the new Code that is proactive in ensuring that the high standards, which are the hallmark of Miami Lakes, are maintained, and the personnel are very responsive to resident and business owner inquiries. In addition, ensure that the system allows for the mitigation and/or correction of adverse nuisance impacts, such as noise, odor and/or dust, on residential neighborhoods caused by any existing commercial and industrial operations.	
Future Land Use Element	
Objective 1.6: Hazard Mitigation and Disaster Preparedness Coordinate with Miami-Dade County and the State of Florida in addressing the hazard mitigation and disaster-preparedness needs of Miami Lakes, and encouraging the elimination and/or reduction of land uses inconsistent with the recommendations of any public agencies charged with managing hazard mitigation and disaster-preparedness. **Policy 1.6.1:** Coordinate with Miami-Dade County in implementing the approved Local Mitigation Strategy, in assessing the vulnerability of governmental, medical and public safety sites and structures in the Town to storm damage, and develop an action plan, if necessary, to address wind stability and flood protection for key buildings.	
Conservation Element	
Policy 6.7.1: Wetlands that are to be protected will be identified based on the type of wetland, function, size, conditions/location, and overall resource value. These wetlands shall be used for purposes that are compatible with their natural values and functions, and land development regulations shall be adopted to provide these areas with the maximum feasible protection, by using such tools as compensatory wetland mitigation and dedication of conservation easements for preserving open space. All development with the potential to impact wetland areas shall be consistent with South Florida Water Management District regulations.	

Miami Shores

Hazard mitigation and disaster recovery is incorporated throughout the Miami Shores Coastal Management Element. The Miami Shores Village Hurricane Plan, 2014 outlines in detail the city and employee activities, duties and responsibilities to be conducted prior and after a hurricane event. The focus is on preparedness prior to a hurricane event and detailed recovery plan post hurricane event.

Miami Shores Coastal Management Element	November 2013
Objective 4: Direct population concentrations away from the coastal high hazard areas, hurricane vulnerability zone and limit coastal high hazard area, hurricane vulnerability zone infrastructure expenditures. Direct population concentrations away from the coastal high hazard areas, hurricane vulnerability zone and limit the expenditure of Village funds on infrastructure within the Coastal High Hazard Area, hurricane vulnerability zone if such infrastructure would have the effect of directly subsidizing development which is significantly more intensive than authorized by this Plan. [9J-5.012 (3) (b) 5 and 6] The Coastal High Hazard Area is defined as the area below the elevation of the category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. Monitoring and Evaluation: Annual record of Village actions to direct away or reduce the population of the hurricane vulnerability zone.	
Policy 4.1: The Village shall restrict development in accordance with the Future Land Use Map of the plan. It is the legislative judgment of the Village that the Future Land Use Map provides the most appropriate way to limit development in the coastal high hazard areas, hurricane vulnerability zone consistent with reasonable property rights and long-established land use patterns. [9J-5.012 (3) (c) 9]	
Policy 7.2: The Village shall monitor the need for drainage system improvements.	
Policy 7.3: The Village shall design infrastructure with consideration to the potential rise in sea level.	
Policy 7.4: The Village shall deny any Future Land Use Map density increases in the hurricane vulnerability zone.	
Objective 8: Hazard mitigation. In general, the Village shall regulate development so as to minimize and mitigate hazards resulting from hurricanes. In particular, the Village shall ensure that all construction and reconstruction complies with applicable regulations designed to minimize hurricane impact on buildings and their occupants. Monitoring and Evaluation: Record of participation in Miami-Dade County Emergency Preparedness meetings, activities and programs. Annual record of development permits issued in the hurricane vulnerability zone, demonstrating the application of specific standards that result in a reduction in the exposure of human life and property to natural disasters	

Coastal Management Element	November 2013
Policy 11.2: The Land Development Code shall be amended to require Special Approval for the repair or replacement of hurricane damaged buildings in the FEMA VE Velocity Zone. The criteria for granting such approval shall be as follows: 1) repair or replacement shall be authorized for principal buildings and their associated accessory buildings and structures when the principal building suffers minor or major damage; and 2) repair or replacement shall be authorized for principal buildings and their associated accessory buildings and structures when the principal building is destroyed provided that the setback from the FEMA VE Zone is the maximum possible consistent with the authorized floor area, other setback requirements and reasonable design standards, but in no case less than 15 feet from the seawall, and provided further that the applicable requirements of Policy 11.3 are also met.	
Policy 11.3: The Land Development Code shall be amended to require Special Approval for the repair or replacement of hurricane damaged buildings in the Hurricane Vulnerability Zone (east of Biscayne Boulevard). The criteria for granting such approval shall be as follows: 1) repair shall be authorized for principal buildings and their associated accessory buildings and structures when the principal building suffers only minor damage; 2) repair or replacement shall be authorized for principal buildings and their associated accessory buildings and structures when the principal building suffers major damage or is destroyed, provided that the resulting buildings fully meet the Florida Building Code and all requirements of the Miami Shores Village land development code and provided further than ground floor elevations conform with the FEMA map. Historic buildings shall be exempt from this policy.	

Miami Springs

Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

City of Miami Springs Comprehensive Plan	March 2012
Future Land Use Element	
Objective 1.6: Hurricane Evacuation Coordinate future land uses by encouraging the elimination or reduction of land uses which are inconsistent with applicable interagency hazard mitigation report recommendations and enhance the efforts of the Miami-Dade Office of Emergency Management by providing it with all relevant information. This objective shall be measured by implementation of its supporting policies. **Policy 1.6.1:** The City shall regulate all future development within its jurisdiction in accordance with the Future Land Use Map. It shall also consider the most current Interagency Hazard Mitigation Team Report as part of the development regulations. The	

City of Miami Springs Comprehensive Plan	March 2012
City shall periodically review and revise the Future Land Use Map in light of future interagency hazard mitigation reports in order to reduce or eliminate uses which are inconsistent therewith.	

North Bay Village
Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

City of North Bay Village Comprehensive Plan	March 2009
Future Land Use Element	
Policy 2.2.9: Require property owners who lease berths to houseboat owners to provide a storm emergency plan to mitigate damage to public waterways during and after storm events and require such owners to demonstrate the financial capability to remove sunken or damaged houseboats and houseboat debris from the public waterways subsequent to storm events in which such damage may occur.	
Transportation Element	
Policy 3.2.5: Require that new development and redevelopment plans identify, by means of a traffic-way impact study, and mitigate any negative impacts the plans may have upon streets and walkways to ensure the maintenance of levels of service and safety within the City. Mitigation shall be mandatory to the extent that a development or redevelopment contributes to the identified impact. No development or redevelopment plan shall be permitted without an approved traffic-way impact study and mitigation plan. **Policy 3.3.2:** The City shall require all potential development on the Kennedy Causeway to demonstrate that the anticipated traffic impact will not cause the Causeway to fall below the required Level of Service, or to mitigate any impacts to maintain or improve the required Level of Service.	
Coastal Management Element	
GOAL: Protect human life and the environment and limit destruction in areas subject to natural disaster through implementation of hazard mitigation strategies. **Policy 8.5.2:** The City shall inventory and identify all reimbursable improvements in the coastal area eligible for funding under provisions of the Federal Disaster Assistance Plan and include this information in the City's local mitigation strategy plan. **Policy 8.8.3:** The Recovery Task Force shall review and decide upon emergency building permits; coordinate with Miami-Dade County, State and Federal Officials to prepare disaster assistance applications; analyze and recommend to the City Commission hazard mitigation options including reconstruction or relocation of damaged public facilities; develop are development plan; and recommend amendments to the City's Comprehensive Plan, Miami-Dade County Hurricane Procedure Plan, and other appropriate policies and procedures.	

City of North Bay Village Comprehensive Plan	March 2009
Policy 8.8.5: The Recovery Task Force shall propose Comprehensive Plan amendments which reflect the recommendations in any interagency hazard mitigation reports or other reports prepared pursuant to Section 406 of the Disaster Relief Act of 1974 (PL93-288). **Policy 8.8.7:** Structures which suffer recurring damage to pilings, foundations, or load-bearing walls shall be required to rebuild landward of their current location to modify the structure to structurally enhance the structure, institute other mitigation measures, or delete the areas most prone to damage.	

North Miami

Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

City of North Miami 2036 Comprehensive Plan	November 2019
Future Land Use Element	
Objective 1.11: The City shall coordinate with Miami-Dade County, the South Florida Regional Planning Council and the State of Florida in addressing the evacuation, structural integrity and disaster-preparedness needs of North Miami. **Objective Policy 1.11:** The City shall coordinate with the Miami-Dade County and the South Florida Regional Planning Council in implementing the approved Local Mitigation Strategy, by assessing the vulnerability of governmental, medical and public safety sites and structures in the City to storm damage, and in developing an action plan, if necessary, to address wind stability and flood protection for key buildings. **Policy 1.11.1:** The City shall continue to coordinate with the State of Florida, Miami-Dade County and the South Florida Regional Planning Council in implementing the approved Local Mitigation Strategy, by assessing the vulnerability of governmental, medical and public safety sites and structures in the City to storm damage, and in developing an action plan, if necessary, to address wind stability and flood protection for key buildings. **Policy 1.11.2:** The City shall continue to work with the South Florida Regional Planning Council's Local Emergency Planning Committee and Miami-Dade County's Emergency Management Department to ensure that City employees are well-trained in the programs, procedures and policies required during a disaster emergency and the longer-term post-disaster redevelopment process. **Policy 1.11.5:** All proposed large-scale amendments to this Comprehensive Plan and/or zoning applications shall be evaluated for their impact on hurricane evacuation routes and times, and effect on currently available off-site shelter capacities. Roadway improvements and shelter improvements shall be required, if deemed necessary, to mitigate negative impacts and phased with new residential development.	

Housing Element
Policy 3A.4.5: The City shall continue to pursue and maintain funding for the Disaster Mitigation/Recovery Strategy Program to assist with post-disaster repairs and encourage the timely repair of homes damaged as a result of disaster activity. **Policy 3B.3.7:** The City shall continue to coordinate with Miami-Dade County Emergency Management to provide short-term emergency shelter opportunities to meet expected demands.
Transportation Element
Objective 2B.3: Coordinate with Miami-Dade Transit and the Miami-Dade Emergency Management Department to help ensure development of an emergency transit plan that provides timely evacuation of the Coastal High Hazard Area during tropical storms and hurricanes. **Policy 2B.3.1:** The City Manager shall appoint a City employee to meet with the Miami-Dade Emergency Management Department to coordinate evacuation plans and related issues and report back to the City Manager. **Policy 2B.3.2:** Timely evacuation operations shall be established to commence four hours after an evacuation order is issued by the County Administrator.
Coastal Management Element
Objective 5A.2: The City shall implement programs and policies in conjunction with Miami-Dade County to protect residents and business from disasters and mitigate hazards. **Policy 5A.2.2:** As part of on-going monitoring and updating procedures, the City shall ensure that all applicable provisions of the hazard mitigation annex of the Miami-Dade County Emergency Operations Plan, and the Miami-Dade County Local Mitigation Strategy (LMS) are incorporated and/or addressed in local hazard mitigation procedures. **Policy 5A.2.4:** The City shall implement the provisions included in the Local Mitigation Strategy to provide for debris clearance as well as immediate repair and replacement of public infrastructure required to protect public health and safety. **Policy 5A.2.5:** The City shall make every effort to support and implement the initiatives and projects listed in the Local Mitigation Strategy, including both countywide initiatives and the following proposed hazard mitigation projects located in North Miami: 1. Flood Prevention and Mitigation: Basin 13 2. Non-critical Facilities Hazard Mitigation 3. Surge Resistance and Flood Mitigation at Keystone Point and Sans Souci 4. Sanitary Sewer Backup 5. Safeguarding Availability of Potable Water 6. Emergency Portable Stormwater Pumps 7. Gravity Sewer Systems Improvements: Groundwater Infiltration Reduction 8. Emergency Power: Water and Sewer Utility Operations Center 9. Utility Operation Center 10. Replacement Generator for Police Station

11. Correct Water Infiltration at City Hall (EOC) Basement
12. Replacement of U.P.S. for Police Station

Policy 5A.2.10: The City shall promote and educate the public on strengthening their structures against natural disasters by promoting the hardening of structures in accordance with the Florida Comprehensive Hurricane Damage Mitigation Program (My Safe Florida Home).
Policy 5A.3.3: The City shall relieve deficiencies identified in the hurricane evacuation analysis and endeavor to integrate regional and local preparation and evacuation procedures into the City's hazard mitigation measures.
Policy 5A.4.2: Incorporate recommendations found in interagency hazard mitigation reports into the comprehensive plan and post-disaster redevelopment plan.
Policy 5B.2.4: Institute marina siting criteria that address existing protective status of ownership, hurricane contingency planning, protection of water quality, water depth, availability of upland support services, land use compatibility, environmental disruptions and mitigation actions, availability for public use, and economic need and feasibility.

Conservation Element

Objective 6B.1: Through the permitting process continue to preserve and maintain identified wetlands and water quality from the impacts of new development or redevelopment.
Policy 6B.1.1: The City shall deny permit applications for new development or redevelopment projects which may adversely impact existing wetlands and water quality or quantity until satisfactory mitigation and protection measures are performance bonded by the developer.
Policy 6.B.2.4: The City shall continue to provide education programs to educate residents about the polluting effect on the Bay and other natural bodies of water in the City, of run-off containing grass clippings, lawn fertilizers, and other similar type material, and present techniques that can be implemented by residents to mitigate this problem. In addition, the City shall continue to coordinate with the SFRPC's Strategic Regional Policy Plan (Policy 14.14 and 14.17) to educate the public.

Climate Change Element

Objective 12.7: Ensure adequate planning and coordinated response for emergency preparedness and post-disaster management in the context of climate change.
Policy 12.7.1: The City of North Miami shall ensure adequate planning and response for emergency management in the context of climate change by maximizing the resilience and self-sufficiency of, and providing access to, public structures, schools, hospitals and other shelters and critical facilities.
Policy 12.7.2: The City of North Miami shall develop plans and monitoring programs to address the impacts of climate change on households and individuals especially vulnerable to health risks attributable to or exacerbated by rising temperatures, to include low income households and the elderly.
Policy 12.7.3: The City of North Miami shall continue to communicate and collaboratively plan with other local, regional, state and federal agencies on emergency preparedness and disaster management strategies. This includes incorporating climate change impacts into updates of local mitigation plans, water management plans, shelter

placement and capacity, review of major traffic-ways and evacuation routes, and cost analysis of post disaster redevelopment strategies.
Policy 12.7.4: The City of North Miami shall work to encourage dialogue between residents, businesses, insurance companies and other stakeholders, through public education campaigns and workshops, in order to increase understanding regarding the potential impacts of climate change on our coastal communities and evaluate the shared costs of action or inaction in human, ecological and financial terms.
Policy 12.7.5: The City of North Miami shall work with the Florida Division of Emergency Management and other agencies to incorporate sea level rise and increasing storm surge impacts into the remapping of potential hazard areas in coastal zones by 2018. Revised hazard area designations should better reflect the risks to communities associated with climate change and allow reevaluation of suitability for development or redevelopment in these areas, policies and programs.

North Miami Beach
On August 4, 2015, the City of North Miami Beach passed Resolution No. R2015-68 for adoption of the 2015 Miami-Dade County Local Mitigation Strategy; authorizing the Town Manager to identify and prioritize hazard mitigation grant program projects to become a part of the Local and Statewide hazard mitigation strategy.

The City of North Miami Beach is responsible for natural disaster preparedness and emergency management that is addressed in the Comprehensive Plan. This includes response, recovery, and mitigation procedures that are acknowledge throughout all City departments. The City has a Certified Floodplain Manager that administers the Community Rating System (CRS) to reduce flood damage to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management.

The primary duties of the Building Official shall be to intake and process permit applications and associated fees; ensure permits are routed for flood elevation review; conduct the review of building permit applications for compliance with structural and technical code requirements for flood-proofing and resistance of combined dynamic, hydrostatic and wind loads; and provide backup certified personnel as needed to assist in the flood elevation review. These duties may be clarified, and other duties may be assigned in memoranda of understanding or in interdepartmental procedures for the administration of the National Flood Insurance Program and Article X of the City North Miami Beach Ordinance (Subdivision and Floodplain Standards). The Building Official ensures that of record of the actual elevation, in relation to mean sea level, of the lowest floor, including basement, of all new or substantially improved structures, flood proof from a registered professional engineer or architect, helps maintain all records pertaining to the provisions of this section and keep them open for public inspection and keeps a file of as-built drawings.

Interagency Coordination: The City Building Official and Director of Public Works are hereby appointed to assist and cooperate with the Director of Community Development Department or designee in carrying out the requirements of the National Flood Insurance Program, and in the administration of this article. The Director of Community Development Department shall develop interagency memoranda of understanding and procedures which shall describe the duties and responsibilities of each agency involved in the administration of this article. The Director of Public Works, the Building Official, and the Chief Code Enforcement Officer of the City shall cooperate with the Director of Community Development Department in the creation of memoranda of understanding and interdepartmental procedures which shall be approved by the City Manager. Each agency shall properly execute its duties and responsibilities as set forth in this article and in the memoranda of understanding and published procedures. In the absence of any interdepartmental guidance regarding any particular incident or program action, the Director of Community Development Department shall direct immediate or interim action to be taken when time is of the essence, which direction may be reviewed and amended by the City Manager.

The Police Department's Crime Prevention Division has a Community Emergency Response Team (CERT) that receives special training for the purpose of enhancing their ability to recognize, respond to, and recover from a major emergency or disaster situation. The CERT basic training that is offered at the City of North Miami Beach's Police Department, issues a training course that helps residents identify hazards that affects the home, workplace, and neighborhood. The program helps to understand the function of CERTs and their roles in immediate disaster response. For example, the course utilizes prevention techniques such as basic fire suppression strategies and fire safety measures in order to eliminate natural and man-made disasters.

The City of North Miami Beach has incorporated mitigation into their planning processes to include the following plans:

City of North Miami Beach's Comprehensive Plan	**April 26, 2010**
Future Land Use Element	
Objective 1.2: Detail a redevelopment strategy for potential redevelopment areas, including those cited in this plan (see Map 1.16, Volume Four). Redevelopment could include Future Land Use Map designation changes as necessary to facilitate enhancement of these areas. **Policy 1.2.18:** The City should encourage the use of Crime Prevention Through Environmental Design (CPTED) standards in the redevelopment of the City and formalize these standards within the Zoning and Land Development Code, enhancing the safety of the City by limiting design factors which abet crime.	
Objective 1.3: Encourage elimination of uses incompatible with this land use plan. **Policy 1.3.4**: Continue to regulate the use of land in the flood zones in accordance with FEMA requirements and the Land Development Regulations, including not permitting variances from required finished floor elevations. Continue to implement programs and procedures which improve FEMA's Community Rating System score for	

City of North Miami Beach's Comprehensive Plan	April 26, 2010
the City in order to reduce the cost of homeowner's insurance by 5% annually. Continue to annually reduce the number of existing structures which do not comply with these requirements and regulations.	
Objective 1.4: Ensure reasonable protection of natural resources and environmentally sensitive land as new development occurs. **Policy 1.4.1**: Continue to enforce the Oleta River overlay zoning district to achieve maximum reasonable protection of the natural waterfront habitat as development applications are reviewed. **Policy 1.4.2**: The City shall protect and maintain natural resources and environmentally sensitive lands through the implementation of this comprehensive plan and the land development regulations. **Policy 1.4.3:** Coordinate the City's land uses, development, and redevelopment activities with the South Florida Water Management District's Biscayne Bay Surface Water Improvement Plan.	
Objective 1.5: The City shall coordinate with Miami-Dade County, the South Florida Regional Planning Council and the State of Florida in evaluating the impacts of development and redevelopment on hurricane evacuation clearance times, structural integrity, and disaster-preparedness needs. **Policy 1.5.3:** The City shall coordinate with the Miami-Dade County and the South Florida Regional Planning Council in implementing the approved Local Mitigation Strategy by: assessing the vulnerability of governmental, medical and public safety sites and structures in the City to storm damage, and; developing an action plan, if necessary, to address wind stability and flood protection for key buildings. **Policy 1.5.4**: The City shall continue to work with Miami-Dade County to ensure that City employees are well-trained in the programs, procedures and policies required during a disaster emergency and the longer-term post-disaster redevelopment process. **Policy 1.5.5:** The City shall evaluate all proposed large-scale amendments to the Comprehensive Plan and/or zoning applications to determine their impact on hurricane evacuation routes and times, and effect on currently available off-site shelter capacities. Roadway improvements and shelter improvements shall be required to mitigate negative impacts, if deemed necessary, and phased with new residential development.	
Infrastructure Element	
Objective 1.1: Continue to provide new or improved sewer collection, drainage and/or potable water systems in accordance with the Capital Improvements Schedule, as it is annually updated. **Policy 1.1.2:** The City shall continue its drainage improvement program and continue the supporting catch basin cleaning program so that adequate street drainage can be achieved and maintained.	
Objective 1.4: Protect the City's natural drainage and recharge areas by retaining all existing lakes and prohibiting any new development with 100 percent impervious coverage.	

City of North Miami Beach's Comprehensive Plan	April 26, 2010
Policy 1.4.1: Through land development code techniques, protect the existing lakes and assure adequate pervious areas in conjunction with new development.	
Coastal Management Element	
Objective 1.1: Continue to achieve zero (0) net loss of the 2,000 linear feet of natural areas bordering the estuarine areas in the City. **Policy 1.1.2**: As developers apply for permits on the few remaining waterfront sites, the City, in coordination with Miami-Dade County's Shoreline Review Committee when necessary, shall carefully review site plans in order to minimize impacts upon the natural waterfront (and thus the estuary and wildlife), particularly their drainage and tree protection plans; a waterfront zoning overlay district may, in some cases, require mitigation of disturbed natural features through the planting, rip-rap replacement of seawalls, etc. For aesthetic and consistency reasons, seawalls shall continue to be the required shoreline stabilization method for residential areas in Eastern Shores.	
Objective 1.3: Achieve a net increase in the environmental quality of the estuary; see policies for measurability. **Policy 1.3.1:** City officials shall coordinate with appropriate local, regional and state agencies to monitor the commercial marinas and assure avoidance of pollution sources by reporting any violations to those agencies. The City shall also assure review of any proposed marina, coastal drainage project, or waterfront development by the County Shoreline Development Review Committee and Florida DEP to assure conformance with the Biscayne Bay Surface Water Improvement and Management (SWIM) Plan (South Florida Water Management District, 1994). **Policy 1.3.2:** Continue the City's street drainage improvement projects in order to minimize pollution from stormwater run-off; take special care in reviewing drainage plans for private development projects located near waterways to assure that adequate on-site retention is provided **Policy 1.3.3:** Annually review the development code to assure adequate protection is provided against negative impacts that may result from potential new uses in the coastal area and in any flood hazard areas. **Policy 1.3.5:** The City, through its regulatory processes and coordination with appropriate agencies, shall limit specific and cumulative impacts of development or redevelopment upon wetlands water quality, water quantity, surface water runoff, and exposure to natural hazards, wildlife habitat, and living marine resources.	
Objective 1.4: The amount of shoreline devoted to water dependent and water related uses shall be maintained at 3,500 linear feet along the Oleta River system and Snake Creek Canal or increased in conformance with the criteria in the following policies. Note that North Miami Beach has very limited vacant privately owned frontage on the estuary. **Policy 1.4.1:** Existing water dependent uses and new water dependent uses (i.e., uses which cannot exist or occur without estuarine association) should be maintained and should be regulated through zoning policies which insure environmental compatibility. New uses which increase access or preserve and protect shoreline resources should be encouraged.	

City of North Miami Beach's Comprehensive Plan	April 26, 2010
Policy 1.4.7: Acquire natural areas and natural habitat for conservation through County, State, or Federal Grants if possible.	
Objective 1.6: The City shall enforce the minimum floodplain management regulations of the Federal Emergency Management Agency (FEMA) and the City's Floodplain Standards Ordinance for new and substantially improved buildings. **Policy 1.6.4:** The City shall continue to participate in the Community Rating System (CRS) and the National Flood Insurance Programs (NFIP), and distribute information relative to its provisions. **Policy 1.6.5:** In an effort to minimize flood insurance premium rates for North Miami Beach residents, the City shall endeavor to maintain or improve its Class 8 rating to a Class 7 or better by performing floodplain management activities that exceed the minimum NFIP requirements of the Community Rating System. **Policy 1.6.6:** To prevent further additions to the list of Repetitive Loss (RL) properties published by FEMA, the City shall remain committed to working on eliminating RL properties within the City to a point that qualifies as a category A or B Community. **Policy 1.6.7:** The City shall continue to enforce Chapter XXIV Zoning and Land Development Code, in an effort to eliminate an increase in the number of RL properties. **Policy 1.6.8:** The City should attempt to promote the acquisition, or retrofit of RL properties. **Policy 1.6.9:** The Coastal High Hazard Area is defined as the area below the elevation of the Category 1 storm surge line as established by a Sea, Lake and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. The Coastal High Hazard Area is identified on the Future Land Use Map.	
Objective 2.1: The City shall maintain or mitigate the impacts of development on the prescribed hurricane evacuation clearance times identified in the South Florida Regional Planning hurricane evacuation model update. **Policy 2.1.2**: Continue to cooperate with Miami-Dade Police and the County Fire Department's Office of Emergency Management, the Red Cross and FEMA through evacuation planning meetings and policies, and in other ways conform to the Metro-Dade Emergency Operations Plan for a Hurricane. **Policy 2.1.3:** In order to reduce the potential for loss of life and severe property damage, encourage the reduction of densities and intensities in areas likely to be inundated by flooding resulting from hurricane surge as shown by Map 5.3, Volume Four, implement a building code consistent with FEMA requirements, and when possible through grant funding eliminate the potential for increased residential and urban densities in those areas by purchasing such lands for use as public open space and shoreline access. **Policy 2.1.4:** The City shall participate in regional solutions that aim to reduce overall evacuation clearance times. **Policy 2.1.5**: The City shall address deficiencies identified in the hurricane evacuation analysis and endeavor to integrate regional and local preparation and evacuation procedures into the City's hazard mitigation measures.	

Coastal Management Element continued

Objective 2.2: The City of North Miami Beach shall provide immediate response to post-hurricane situations in concert with a post-disaster redevelopment plan, which will reduce or eliminate the exposure of human life and public and private property to natural hazards. Measure: This objective shall be measured by progress in implementing its policies.

Policy 2.2.3: The Recovery Task Force shall include the City Manager, Police Chief, Emergency Management Director, Community Development Director, Building Official, Public Works Director, Parks & Recreation Director and other City staff members as directed by the City Council. Staff shall be provided by the departments whose directors sit on the Task Force. The Task Force shall be terminated after implementing its responsibility under Policy 2.2.6.

Policy 2.2.4: The Recovery Task Force shall review and decide upon emergency building permits; coordinate with Miami-Dade County, State and Federal Officials to prepare disaster assistance applications; analyze and recommend to the City Council hazard mitigation options including reconstruction or relocation of damaged public facilities; develop a redevelopment plan; and recommend amendments to the comprehensive plan, Miami-Dade County Hurricane Procedure Plan and other appropriate policies and procedures.

Policy 2.2.5: Immediate repair and clean-up actions needed to protect the public health and safety include repairs to potable water, wastewater and power facilities; removal of building and/or vegetable debris; stabilization or removal of structures about to collapse; and minimal repairs to make dwellings habitable such as minor roof repairs and other weatherproofing/security measures. These actions shall receive first priority in permitting decisions. Long-term development activities shall be postponed until the Recovery Task Force has completed its tasks.

Policy 2.2.6: The Recovery Task Force shall propose comprehensive plan amendments which reflect the recommendations in any interagency hazard mitigation reports or other reports prepared pursuant to Section 406 of the Disaster Relief Act of 1974 (PL93-288).

Policy 2.2.7: If rebuilt, structures which suffer damages in excess of fifty (50) percent of their appraised value shall be rebuilt to meet all current requirements, including those enacted since construction of the structure.

Policy 2.2.8: Repair or reconstruction of the existing seawalls within the City shall be done using only pre-fabricated concrete or cement, which may be augmented at the base only by decorative material (rip-rap), shall be similar in height and appearance to adjoining lots, pursuant to the Land Development Regulations.

Policy 2.2.9: Following a natural disaster and prior to the implementation of long-term redevelopment, the City shall do the following: Based upon the damage assessment report prepared by the Miami-Dade Public Works Department, the City shall consult with its Public Works officials and consultant engineer to evaluate options for damaged public facilities including abandonment, repair in place, relocation and repair with structural modification, to determine the most strategic approach to long-term development. The evaluation shall include, but not be limited to, issues pertaining to

damage caused by natural disaster, cost to construct repairs, cost to relocate, cost to structurally modify, limitations of right-of-way, and maintenance costs.
Objective 2.4: The City's Emergency Preparedness Committee shall review its hurricane preparation plans and post-disaster redevelopment plans annually to ensure that risks are mitigated to the furthest extent possible and that its plans are in conformance with the most recent Objectives and Procedures developed by the Miami-Dade County Evacuation Planning Task Force. The City shall annually review its Hurricane Procedures in March of each year **Policy 2.4.1:** Continue to enforce building codes, floodplain regulations, design criteria, and zoning regulations established to protect new structures, reduce redevelopment costs, and mitigate hurricane hazards. **Policy 2.4.2**: Zoning district boundaries and land development regulations shall be maintained or revised as necessary to ensure that no new hospitals or mobile homes that do not meet the criteria for manufactured housing are constructed in the coastal area.
Objective 2.6: The City shall take measures towards hurricane preparation, hazard mitigation and plan for post-disaster redevelopment. **Policy 2.6.2:** Encourage public awareness and education regarding appropriate responses to a variety of emergencies as feasible and appropriate utilizing such mechanisms as websites, public access television stations, and newsletters. **Policy 2.6.3**: Coordinate with the County to ensure the availability of emergency shelter for residents required to evacuate areas adversely affected by natural disasters. **Policy 2.6.4**: Work with the South Florida Regional Planning Council in its role as the region's Economic Development District Coordinator to seek hazard mitigation funding from the U.S. Department of Commerce, Economic Development Administration to fund the organizational and training activities of the Business Disaster Mitigation and Recovery Assistance Program. **Policy 2.6.5**: Consider reducing building permit application fees for disaster resistant shutters, doors, windows, and roof clips for businesses participating in the Business Disaster Mitigation and Recovery Assistance Program **Policy 2.6.6**: The City shall ensure that all applicable provisions of the hazard mitigation annex of the Miami-Dade County Emergency Operations Plan, and the Miami-Dade County Local Mitigation Strategy (LMS), are incorporated and/or addressed in local hazard mitigation procedures. **Policy 2.6.7**: The City shall monitor problems and life-threatening situations resulting from natural disaster events and take the necessary steps to ensure that the potential for such problems and situations are minimized in the future. **Policy 2.6.8:** The City shall implement the Local Mitigation Strategy and Post-Disaster Redevelopment Plan to provide for debris clearance as well as immediate repair and replacement of public infrastructure required to protect public health and safety. **Policy 2.6.9:** The City shall make every effort to support and implement the initiatives and projects listed in the Local Mitigation Strategy, including both countywide initiatives and the proposed hazard mitigation projects located in the City.

Policy 2.6.10: The City will promote the hardening of structures to increase resistance against natural disasters pursuant to the Florida Comprehensive Hurricane Damage Mitigation Program (My Safe Florida Home).
Conservation Element
Objective 1.2: Continue to pursue drainage practices and programs that minimize ground and surface water pollution, including pollution to the Biscayne Aquifer; experience no increase in the amount of properties, developments, or facilities polluting ground water or surface water as the result of non-implementation of such practices and programs. Measure: Number of properties developed or redeveloped without technical review insuring that proposed drainage at the site minimizes ground and surface water pollution. **Policy 1.2.1:** Continue to make street drainage improvements City-wide.
Objective 1.3: Protect existing rare or threatened vegetative communities, natural ecosystems, listed animal species and their habitat, sensitive soils, and estuarine communities against any further degradation. Achieve 0 net loss of the 2,000 lineal feet of natural shoreline bordering the estuary. **Policy 1.3.4:** Further landscape and extend the linear park along the Snake Creek Canal in an effort to assist wildlife and riverine habitat conservation, including the removal of invasive, nuisance vegetation. **Policy 1.5.6:** Continue to restrict activities known to adversely affect endangered and threatened wild life, and require mitigation measures for activities impacting native vegetative communities.
Objective 1.6: The City shall seek to reduce greenhouse gas emissions to the maximum extent feasible and conserve energy resources. In developing the 2012 Evaluation and Appraisal Report and associated amendments, the City shall establish and adopt a percentage goal for greenhouse gas reduction consistent with Miami-Dade County's greenhouse gas reduction goal. Measure: The number of specific programs initiated to reduce greenhouse gas emissions, percentage reduction of greenhouse gas emissions, acres of mixed use development as a percentage of total development, and the estimated reduction of vehicle miles travelled as a result of these efforts. **Policy 1.6.2**: The City shall require low impact development techniques and green building standards that reduce the negative environmental impacts of development and redevelopment by: reducing building footprints to the maximum extent feasible, and locating building sites away from environmentally sensitive areas; promoting the preservation of natural resources; providing for on-site mitigation of impacts (i.e. retention and treatment of stormwater runoff, water reuse, Master Stormwater Management Systems); promoting energy conservation through design, landscaping and building techniques (i.e. solar power, increased tree canopies); promoting water conservation through landscaping and building design; ensuring environmentally friendly building practices (i.e. use of environmentally friendly building materials, recycled materials), and; considering the development and implementation of a green building certification program, with associated regulations, incentives and standards**.**

Opa-locka
Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

Opa-locka Code of Ordinances	October 2014
Article VI Flood Damage Protection	

Sec. 7-75. - Purpose.

This article is to insure the continued availability of flood insurance through the National Flood Insurance Program; to comply with federally imposed requirements; and to protect the public health, safety and general welfare, by minimizing flood losses in the flood hazard areas of the City of Opa-locka, and to require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction and substantial improvement; control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of flood waters; control filling, grading, dredging and other development which may increase erosion or flood damage, and; to insure that potential home buyers are notified that property is in a flood area.

Sec. 7-78. - Standards for development within special flood hazard (SFH) areas.
(a) No new construction and substantial improvement of any residential structure or manufactured home shall be permitted in SFH Areas, and no development permit referred to in section 7-77 of this chapter shall be issued therefore, unless said new construction and substantial improvement has the lowest floor (including basement) elevated to or above the regulatory flood (100-year flood) elevation.

Electrical, plumbing, air conditioning and other attendant utilities must be constructed, designed, and/or located so as to prevent water from entering or accumulating within their components during conditions of flooding.

(b) No new construction and substantial improvement of any nonresidential structure shall be permitted in SFH Areas, and no development permit referred to in section 7-77 of this chapter shall be issued therefore, unless said development has the lowest floor (including basement) elevated to or above the level of the base flood (100-year flood). If the lowest permitted floor level of such nonresidential structure (including basement) is below the regulatory flood level then such nonresidential structure together with attendant utility and sanitary facilities shall be flood-proofed to one (1) foot above the level of the base flood; provided that the lowest floor level of such nonresidential structure (including basement) shall be not more than ten (10) feet below the base flood level. Where flood proofing is utilized for a particular structure, a registered professional engineer or architect shall certify that the flood proofing methods are adequate to withstand the flood depth, pressures, velocities, impact and uplift forces associated with the base flood, and a record of such certificates indicating the specific elevation (in relation to mean sea

Opa-locka Code of Ordinances	October 2014

level) to which such structure is flood proofed shall be maintained with the designated official.

(c) All manufactured homes placed, or substantially improved, on individual lots or parcels, in expansions to existing manufactured home parks or subdivisions, in new manufactured home parks, in substantially improved manufactured home parks, shall meet all of the requirements for "new construction", including elevation in accordance with section 7-78(a) and anchoring requirement of section 7-77(c)(2).

(d) All manufactured homes placed, or substantially improved in an existing manufactured home park or sub division shall be elevated so that:

(1) The lowest floor of the manufactured home is elevated no lower than the base flood elevation; or

(2) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least an equivalent strength, of no less than thirty-six (36) inches in height above grade.

(3) The manufactured home shall be securely anchored to the adequately anchored foundation system to resist flotation, collapse and lateral movement.

(4) In an existing manufactured home park or subdivision in which a manufactured home has incurred "substantial damage as the result of a flood, any manufactured home placed or substantially improved shall meet the standards of section 7-78(a) and 7-77(3).

(e) All recreational vehicles placed within this area shall either:

(1) Be on site for fewer than one hundred eighty (180) consecutive days;

(2) Be fully licensed and ready for highway use; or

(3) The recreational vehicle shall meet all the requirements for new construction, including anchoring and elevation requirements of section 7-78(c).

(4) Be on the site for fewer than one hundred eighty (180) consecutive days. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices and has no permanently attached structures.

(f) Elevated buildings. New construction and substantial improvements of elevated buildings that include fully enclosed areas formed by foundations and other exterior walls below the lowest floor shall be designed to preclude finished living space except allowable uses (i.e. parking, limited storage and building access) and shall be designed to allow for the entry and exit of floodwaters to automatically equalize hydrostatic flood forces on exterior walls. Designs for complying with this requirement must either meet or exceed the following minimum criteria or be certified by a professional engineer or architect:

(1) Provide a minimum of two (2) openings having a total net area of not less than one (1) square inch for every square foot of enclosed area subject to flooding;

Opa-locka Code of Ordinances	October 2014

(2) The bottom of all openings shall be no higher than one (1) foot above grade; and

(3) Openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic flow of floodwaters in both directions;

Electrical, plumbing, air conditioning and other utility connections must be constructed, designed, and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

Access to the enclosed area shall be the minimum necessary to allow for parking of vehicles (garage door), (standard exterior door), or entry to the living area (stairway or elevator); the interior portion of such enclosed area shall not be finished or partitioned into separate rooms or air conditioned.

(g) Notify, in river line situations, adjacent communities and the Florida NFIP Coordinating Office to any alteration or relocation of a watercourse, and submit copies of such notifications to FEMA;

(h) The flood carrying capacity within the altered or relocated portion of any watercourse shall be maintained.

(Ord. No. 12-09, § 2, 4-11-12)

Palmetto Bay

On September 19, 2016, the Village of Palmetto Bay passed Resolution No. 2016-73 adopting Miami-Dade County's Local Mitigation Strategy. This allowed the Village to apply for inclusion into the National Flood Insurance's Community Rating System (CRS) Program.

In addition, the Village of Palmetto Bay has integrated mitigation locally through the following plans:

Village of Palmetto Bay Comprehensive Plan	**2019**
Future Land Use Element	
Objective 1.6 <u>Coastal High Hazard and Disaster Preparedness</u> Coordinate with Miami-Dade County and the State of Florida in addressing the land use planning, evacuation, structural integrity, and disaster-preparedness needs of Palmetto Bay. **Policy 1.6.2** Coordinate with Miami-Dade County in implementing the approved Local Mitigation Strategy, by assessing the vulnerability of governmental, medical, and public safety sites and structures in the Village to storm damage, and in developing an action plan, if necessary, to address wind stability and flood protection for key buildings.	
Transportation Element	
Objective 2B.3 <u>Emergency Transit Plan</u> Coordinate with Miami-Dade Transit and Miami-Dade Office of Emergency Management (OEM) to help ensure development of an emergency transit plan that will provide a timely evacuation of the Coastal High Hazard Area during tropical storms and hurricanes. **Policy 2B.3.1** The Village Manager shall direct the transportation liaison, established under Policy 2A.2.6 of this Element, to meet with the Miami-Dade Office of Emergency Management at least every twelve months to coordinate evacuation plans and related issues and report back to the Manager. **Policy 2B.3.2** Timely evacuation operations shall be established to commence four (4) hours after an evacuation order is issued by the County Administrator.	

Coastal Management Element
Objective 5.3 Flood Protection The Village will reduce natural hazard impacts through compliance with federal Emergency Management Agency (FEMA) regulations and by targeting repetitive flood loss and vulnerable properties for mitigation. **Objective 5.8 Post Disaster Redevelopment and Hazard Mitigation** Coordinate with the Miami-Dade County Office of Emergency Management (OEM) to develop and implement post-disaster redevelopment and hazard mitigation plans that reduce or eliminate exposure of life and property to natural hazards towards the protection of health, safety, and welfare within the Village. **Policy 5.8.2** The Village shall enforce applicable recommendations of post disaster hazard mitigation plans required under Section 405 of the Disaster Relief Act of 1974.

Pinecrest

The Village of Pinecrest is currently working on a Stormwater Basin Master Plan to evaluate the existing stormwater infrastructure and look at the current Level of Service and identify and prioritize any problem areas. The Plan will model and look at current and future conditions for 24-hour, 2-year, 10-year, 25-year, 50-year and 100-year storm events including consideration for sea level rise. Pinecrest is also going through the process to become a Community Rating System Community.

Resolution 2011-63	2011
Resolution of the Village of Pinecrest, Florida Authorizing the Village Manager to execute an Interlocal Agreement with Other Municipalities Relating to the Green Corridor Property Assessment Clean Energy (PACE) District.	
WHEREAS, pursuant to section 163.08, Florida Statutes, the improved property that has been retrofitted with energy-related qualifying improvements receive special benefit of alleviating the property's burden from energy consumption and assists in the fulfillment of the state's energy and hurricane mitigation policies; and … WHEREAS, the Village Council wishes to enter into an interlocal agreement with the Town of Cutler Bay and other municipalities to participate in the District in order to provide financing for qualifying improvements as provided for in F.S. 163.08;	

South Miami
Below is the section of this city's comprehensive plan that integrates with the Miami-Dade County LMS.

City of South Miami Comprehensive Plan	2010
Intergovernmental Coordination Element	
Policy 1.3.7 The City will coordinate with the emergency management program of Miami-Dade County y notifying the County of any current or future land use policies or population changes which would affect hurricane shelters or emergency evacuation routes. **Policy 1.3.11** The City will participate with Miami-Dade County in the planning and implementation of the County's Hazard Mitigation Plan, as it impacts the City of South Miami.	
Future Land Use Element	
OBJECTIVE 4.4 **P***reserve floodplain areas via floodplain management and limiting development within the Special Flood Hazard Area.* **Policy 4.4.1** in coordination with the Transit-Oriented Development District, permit more intense development only in those areas which are located outside of the Special Flood Hazard Area. **Policy 4.4.2** Building density and intensity may be transferred from areas within the Special Flood Hazard Area, in order to permit development within the Transit-Oriented Development District, while reducing the permitted intensities within the Special Flood Hazard Areas.	

Sunny Isles Beach
Below is the section of this city's comprehensive plan that integrates with the Miami-Dade County LMS.

City of Sunny Isles Beach Comprehensive Plan	October 2000
Future Land Use Element	
Policy 3P: Applications for rezoning, zoning variances or subdivision approvals for all new development in areas subject to coastal flooding shall be reviewed for emergency evacuation, sheltering, hazard mitigation, and post-disaster recovery and redevelopment.	
Transportation Element	
Objective 3: Transportation Network Safety & Efficiency The City shall improve the safety, and efficiency of the City's roadway system through transportation system management (TSM) techniques, including: access management (Policies 3A-D), improved intersection operations (Policy 3E), traffic calming along residential streets (Policy 3F), mitigation by developers (Policy 3G), accident analysis (Policy 3H, 31), and maintaining visibility for pedestrians, vehicles, and cyclists (Policy 3J).	

Surfside

Below is the section of this town's comprehensive plan that integrates with the Miami-Dade County LMS.

Town of Surfside Comprehensive Plan	**January 2010**
Future Land Use Element	
Objective 7: Coordination of population with hurricane evacuation plans: Coordinate population densities with the applicable local or regional coastal evacuation plan [9J-5.006 (3) (b) 5] and coordinate future land uses by encouraging the elimination or reduction of land uses which are inconsistent with applicable interagency hazard mitigation report recommendations [9J-5.006 (3) (b) 6]. This objective shall be measured by implementation of its supporting policies. [9J5.006 (3) (b) 5 and 6]. **Policy 7.2:** The Town shall regulate all future development within its jurisdiction in accordance with the goals and objectives of the "The Local Mitigation Strategy for Miami-Dade County and its Municipalities, Departments and Private Sector Partners" (June 2008). The Town shall periodically review and revise the Future Land Use Map in light of future interagency hazard mitigation reports in order to reduce or eliminate uses which are inconsistent therewith. **Policy 5.5**: Consideration for the relocation, mitigation or replacement of any of the existing infrastructure in the Coastal High Hazard Area, as may be deemed appropriate by the Town, shall be coordinate with the state when state funding is anticipated to be needed for implementation of the project. al Management Element **Policy 6.5:** The Town shall adopt a Comprehensive Emergency Management Plan in order to prepare for, respond to, recover from and mitigate potential hazard by December 2011.	
Objective 11: Hazard mitigation In general, the Town shall regulate development so as to minimize and mitigate hazard resulting from hurricanes. In particular, the Town shall ensure that all construction and reconstruction complies with applicable regulations designed to minimize hurricane impact on buildings and their occupants. **Policy 11.5:** The Town shall continue to enforce regulations and codes which provide for hazard mitigation, including but not limited to, land use, building construction, placement of fill, flood elevation, sewer, water and power infrastructure, and stormwater facilities. These regulations shall be applied to eliminate unsafe conditions, inappropriate uses and reduce hazard potentials. **Policy 11.6:** The Town shall increase public awareness of hazards and their impacts by providing hazard mitigation information to the public. Information shall address evacuation, sheltering, building techniques to reduce hazards as well as other hazard mitigation issues that could help prevent loss of life and property. **Policy 11.9:** The Town shall, as deemed appropriate, incorporate the recommendation of the hazard mitigation annex of the local emergency management plan and shall analyze and consider the recommendations from interagency hazard mitigation reports.	

Town of Surfside Comprehensive Plan	January 2010
Policy 11.10: The Town shall include criteria in the five (5) year schedule of Capital Improvement projects to include consideration for and prioritization for projects that are hazard mitigation initiatives.	

Sweetwater

On October 2016, the City adopted a Floodplain Management Ordinance (Ordinance 4230) to meet the requirements of the NFIP and coordination with the Florida Building Code. The model ordinance specifically repealed and replaced the City Chapter 35 named "Floodplain Management Regulations" (Ordinance 3427 September 28, 2009) to satisfy the NFIP, to coordinate with the FBC, and to meet the requirements of section 553.73 (5), F.S. This ordinance applies to all flood hazard areas within the City of Sweetwater.

City of Sweetwater Code of Ordinances	2016
Sec. 35-102.3. - Basis For Establishing The Areas of Special Flood Hazard	
The Flood Insurance Study for Miami-Dade County, Florida and Incorporated Areas dated September 11, 2009, and all subsequent amendments and revisions, and the accompanying FIRM map, and all subsequent amendments and revisions to such maps, are adopted by reference as a part of this ordinance and shall serve as the minimum basis for establishing flood hazard areas. Studies and maps that establish flood hazard areas are on file at the City of Sweetwater Building Department.	
Sec. 35-102.4 Submission of additional data to establish flood hazard areas	
To establish flood hazard areas and base flood elevations, pursuant to Section 35.105 of this ordinance the Floodplain Administrator may require submission of additional data. Where field surveyed topography prepared by a Florida licensed professional surveyor or digital topography accepted by the community indicates that ground elevations: (1) Are below the closest applicable base flood elevation, even in areas not delineated as a special flood hazard area on a FIRM, the area shall be considered as flood hazard area and subject to the requirements of this ordinance and, as applicable, the requirements of the Florida Building Code. (2) Are above the closest applicable base flood elevation, the area shall be regulated as special flood hazard area unless the applicant obtains a Letter of Map Change that removes the area from the special flood hazard area. Require lowest floor above base flood elevation	

Sec. 35-301.2 Specific methods of construction and requirements.
Pursuant to Chapter 8 Article Ill of the Miami Dade County Code, the following specific methods of construction and requirements apply: (1) Additional Elevation (Freeboard) for Buildings. For buildings in special flood hazard areas, the minimum elevation requirements in the Florida Building Code shall be to or above the base flood elevation plus one (1) foot. (2) Limitations on Enclosures Under Elevated Buildings. For buildings located in the special flood hazard area, enclosures shall: a. Have the minimum necessary access to allow for parking of vehicles (garage door), limited storage of maintenance equipment used in connection with the premises (standard exterior door), or entry to the elevated building (stairway or elevator). b. Not have the interior portion partitioned or finished into separate rooms other than separation of parking from storage and building access. (3) Flood Damage and Substantial Damage. In the Florida Building Code, Building, and Florida Building Code, Existing Building, definitions for the term "Substantial Damage" shall be as follows: Substantial damage. Damage of any origin sustained by a building or structure whereby the cost of restoring the building or structure to its before-damaged condition would equal or exceed 50 percent of the market value of the building or structure before the damage occurred. The term also includes flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on average, equals or exceeds 25 percent of structure before the damage occurred.
35.102.7 Interpretation
In the interpretation and application of this ordinance, all provisions shall be: (1) Considered as minimum requirements; (2) Liberally construed in favor of the governing body; and (3) Deemed neither to limit nor repeal any other powers granted under state statutes

Virginia Gardens
Below is the section of this village's comprehensive plan that integrates with the Miami-Dade County LMS.

Village of Virginia Gardens Provisions for Flood Hazard Reduction Code of Ordinances	**August 2013**
Article X. Floodplain Management	
10.1 Administration: Duties of the Administrator shall include, but are not be limited to: Verify and record the actual elevation (in relation to mean sea level) of the lowest floor (A-Zones) or bottom of the lowest horizontal structural member of the lowest floor (V-Zones) of all new and substantially improved buildings, in accordance with Article 5, Section B (1) and (2) and Section E (2), respectively; Verify and record the actual elevation (in relation to mean sea level) to which the new and substantially improved buildings have been flood-proofed, in accordance with Article 5, Section B (2);	
6.11 Stormwater Management Code of Ordinances	
6.11.3 Design Standards To comply with the foregoing performance standards, the proposed storm water management system shall conform to the following standards: A. To the maximum extent practicable, natural systems shall be used to accommodate stormwater. B. The proposed stormwater management system shall be designed to accommodate the stormwater that originates within the development and stormwater that flows onto or across the development from adjacent lands. The proposed stormwater management system shall be designed to function properly for a minimum twenty (20) year life. C. The design and construction of the proposed stormwater management system shall be certified as meeting the requirements of this Code by a professional engineer registered, in the State of Florida. D. No surface water may be channeled or directed into a sanitary sewer.	

West Miami
Below is the section of this city's comprehensive plan that integrates with the Miami-Dade County LMS.

City of West Miami Comprehensive Plan	**2000**
Costs and Funding For Proposed Program	
Objective 7: As per 9J-5 .016 (2) (c), this section of the Capital Improvements Element provides a cost analysis of the capital improvements identified for mitigation of existing deficiencies, replacement and new growth needs pursuant to the Future Land Use Element.	

MITIGATION GOALS AND OBJECTIVES[15]

Mitigation goals and objectives must be consistent with the goals and objectives of the county and the individual municipalities' master plans, their codes and ordinances, as well as other endeavors that reflect the aspirations for the welfare, safety and quality of life of their citizens.

Goals

1. Reduce Miami-Dade County's vulnerability to natural and man-made hazards

Objectives:

1.1. Incorporate new and more accurate data, studies and maps that demonstrate the evolution of risk in the county
1.2. Identify new and emerging mitigation methods and products for new and retro-fitting construction
1.3. Identify projects that mitigate expected impacts from hazards identified in the THIRA
1.4. Promote mitigation measures to the Whole Community through outreach and education
1.5. Harden building envelope protection – including all openings – and inclusion of a continuous load path from roof to foundation on all structures within the county
1.6. Reduce flooding from rainfall events
1.7. Reduce storm surge hazards and effects by encouraging greater setbacks from shorelines for new developments of waterfront properties, encouraging retrofit-ting and elevation of structures with high priority consideration for those built on waterfront properties, seeking opportunities to acquire, exchange or otherwise secure limited control of waterfront real estate

2. Minimize future losses from all hazard impacts by reducing the risk to people and property

Objectives:

2.1. Adopt land use policies that limit, prohibit or mandate development and con-struction standards to promote resiliency and reduce risk
2.2. Adopt building codes leading to building design criteria based on site-specific evolving and future risk
2.3. Identify mitigation projects that reduce risk to vulnerable populations that are at greater risk from hazards

[15] EMAP 2016 Standard 4.2.1.(3)

2.4. Integrate mitigation into existing structures during regular maintenance and replacement cycles

3. Implement mitigation projects that meet or exceed current codes

Objectives:

3.1 Design and develop projects that address both current and future risk
3.2 Identify projects to address potential threats from climate change such as sea level rise and the impacts of storm surge and breaking waves exacerbated by sea level rise

4. Prevent flood related repetitive losses from natural disaster through education and regulation

Objectives:

4.1. Map repetitive and severe repetitive loss (RL) areas
4.2. Identify projects that will mitigate flood risk in these the RL areas
4.3. Track mitigation projects by flood basin to see past, current and future projects and compare to flooding data

5. Promote and support the Community Rating System (CRS) for all communities in Miami-Dade.

Objectives:

5.1. Incorporate measures into the LMS to help obtain uniform credit for all CRS communities
5.2. Identify and track projects in the LMS to demonstrate the role of mitigation measures in reducing flood risk
5.3. Provide outreach and educational opportunities
5.4. Develop and implement a Program for Public Information (PPI)

6. Promote mitigation measures for critical facilities

Objectives:

6.1. Continue to invite and work with critical facility stakeholders
6.2. Identify and track mitigation measures for existing critical facilities
6.3. Assess alternate facilities as identified in continuity of operations plans to determine if the sites are appropriately mitigated
6.4. Identify additional sites for emergency sheltering
6.5. Integrate sea level rise modeling to project and characterize expected impacts during the expected service-life of critical facilities Protect expressways, major

highways and other thoroughfares and, bridges and causeways to provide for continuous, free flowing traffic and circulation as needed for the effective and unencumbered provision of emergency services and evacuation operations

7. Provide whole community planning

Objectives:

7.1. Continue to engage additional local community stakeholders to participate in the LMSWG meetings
7.2. Host mitigation workshops to educate stakeholders and community members
7.3. Initiate organizational, managerial and administrative goals to make mitigation a mainstream function of government affairs; spread the responsibilities throughout many departments and agencies to ensure continuity and a full integration of mitigation management functions in the operations of government
7.4. Enhance public information and engagement to increase awareness of hazards and problems and to educate through a widespread program of general information, media coverage and participatory involvement

Mitigation Opportunities

Though some may link mitigation with post-disaster initiatives, opportunities to integrate and promote mitigation are available before, during, and after development and construction occurs. The following tables list some opportunities both for pre and post disaster.

FIGURE 1. PRE-DISASTER MITIGATION OPPORTUNITIES/PROMOTING MITIGATION

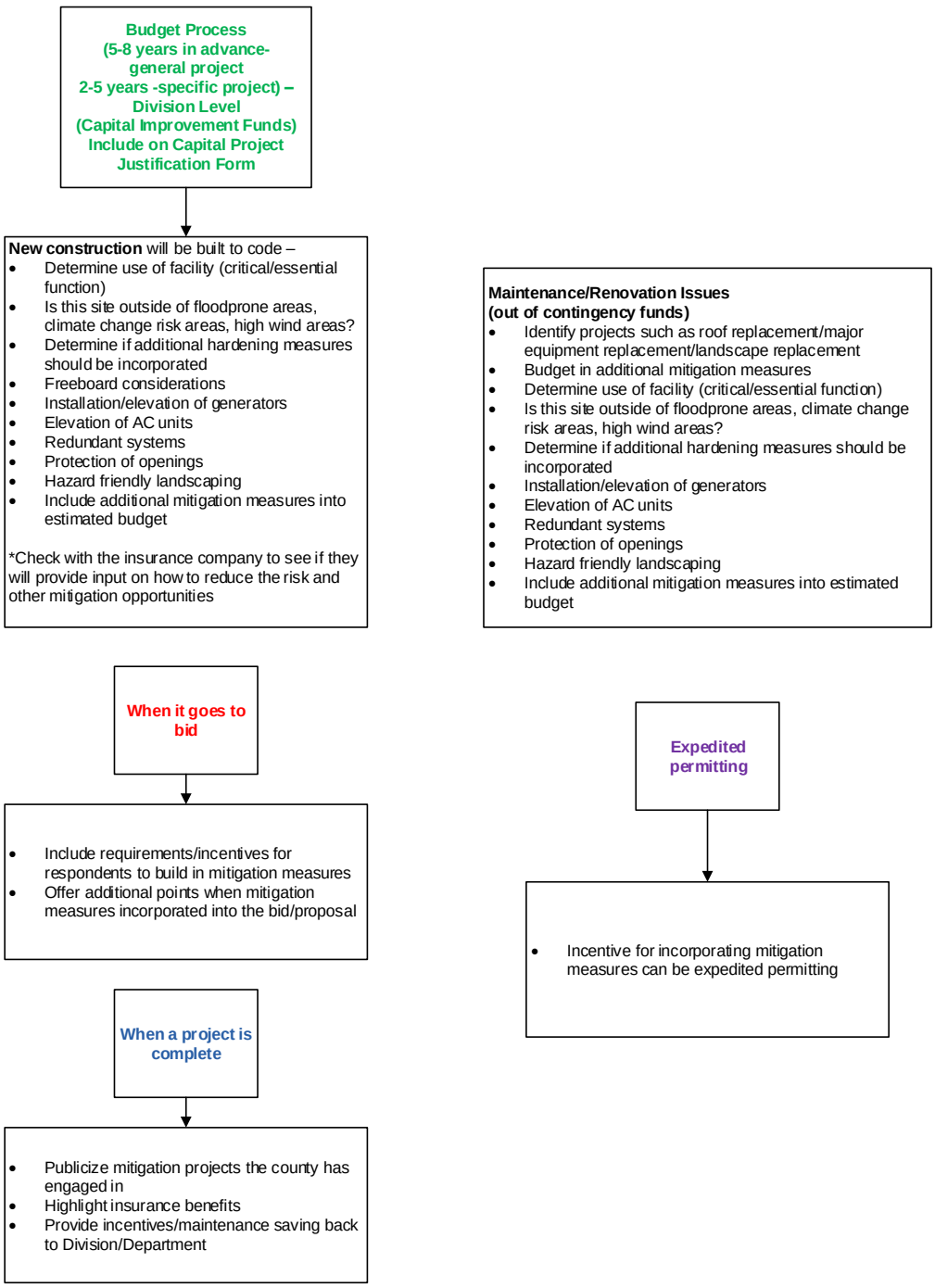
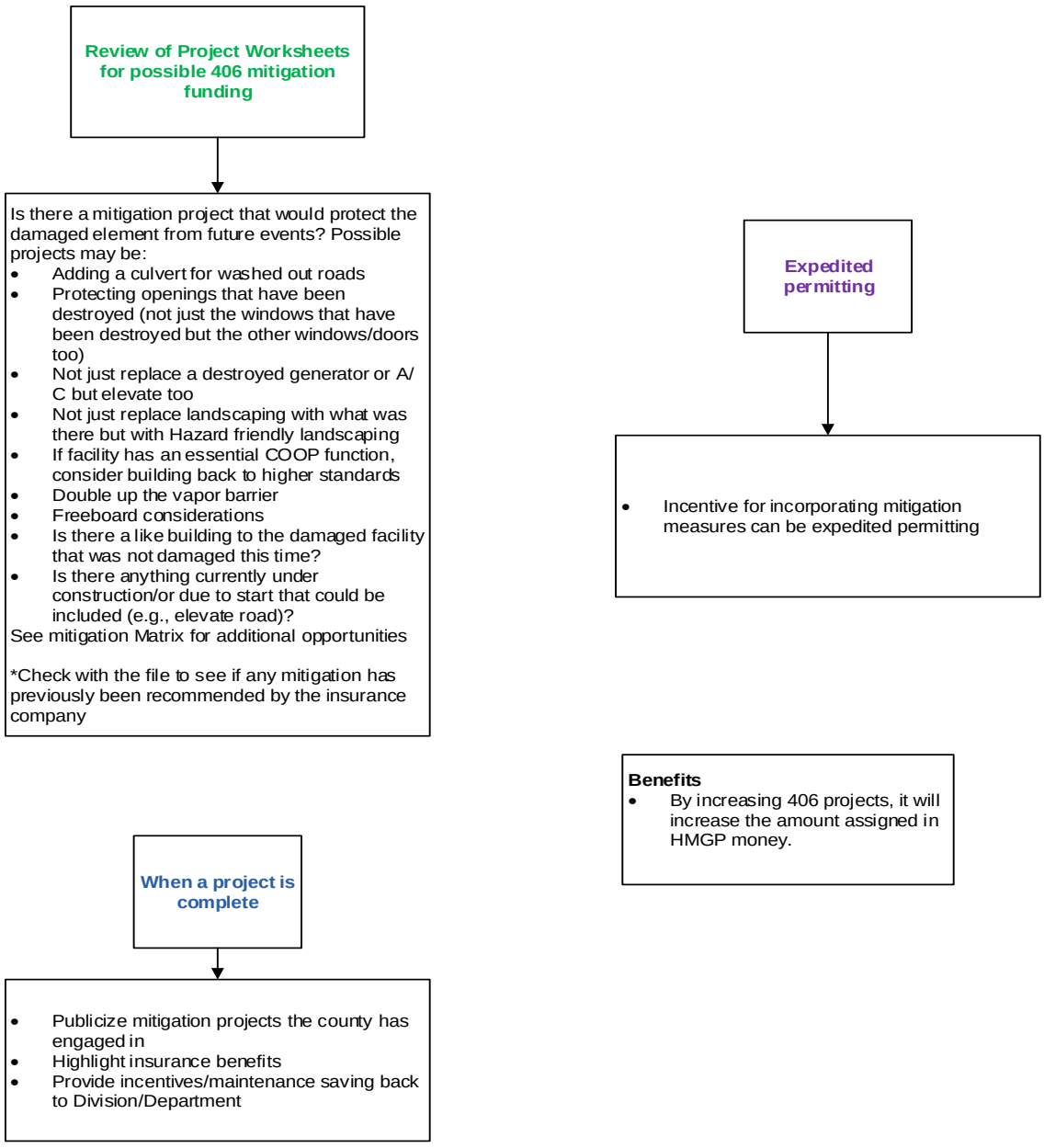


FIGURE 2. POST-DISASTER MITIGATION OPPORTUNITIES



HAZARD IDENTIFICATION & VULNERABILITY ASSESSMENT[16]

As was mentioned in the introduction to the LMS, metropolitan Miami-Dade County is a large and diverse place and therefore vulnerable to many hazards. Each of these types of hazard is unique and produces distinct impacts to a community. Miami-Dade County developed a Threat and Hazard Identification and Risk Assessment (THIRA) that includes numerous natural, technological, crime/terrorism and public health hazards that Miami-Dade County could experience. The THIRA was under development during the time of the writing of the 5-year LMS update and the information contained in here is based on the current draft of the THIRA. Each hazard was looked at in terms of a general description, location, extent, previous occurrence and vulnerability in the THIRA. Table 2 provides a listing of all of the hazards profiled in the THIRA, including ones that are not further analyzed for purposes of the LMS. Persons interested in seeing a complete review of all of the hazards listed in Table 2 may request to see the complete THIRA.

To determine which natural hazards would be included in the LMS, a review of the analyses from the THIRA was conducted. For purposes of this analysis, risk is defined as a relative measure of the probability that a hazard event will occur in comparison to the consequences or impacts of that event. That is, if a hazard event occurs frequently, and has very high consequences, then that hazard is considered to pose a very high risk to the affected communities. In comparison, if a hazard event is not expected to occur frequently, and even if it did, the consequences would be minimal, then that hazard is considered to pose a very low risk. The determination to further consider hazards is also based on current available information including modeling that may indicate future risk. Some hazards such as windstorms, in and of themselves have not occurred very often nor had a high impact on the physical environment and mitigation measures that would cover these events include mitigation that is being done for hurricanes and tropical storms. Though we may not currently be considering a hazard for future consideration at this time, with new information, technology or modeling we may include it at a later time.

We have identified potential mitigation measures, as able for all of the hazards. The Miami-Dade LMS welcomes our participating agencies to identify mitigation measures for all hazards and not just those that the LMS focuses on. The Community Profile (demographics) as developed for the 2015 THIRA is located in Part 4 Appendix I.

Though we are vulnerable to many different natural hazards, one of the reasons we spend a lot of time talking about hurricanes and tropical storms and mitigation measures in relation to them, is that though they account for only 8% of the actual number of hazard events, they account for 81% of the losses, as illustrated in Figure 1.

[16] EMAP 2016 Standard 4.2.1 (1)

FEMA also maintains a website entitled Mitigation Best Practices that can be utilized to search for mitigation projects that other communities have embarked upon by hazard type, state and FEMA Regions. These projects also identify the funding source that may assist local communities in finding funding for like projects. FEMA's Mitigation Best Practices webpage is: https://www.fema.gov/mitigation-best-practices

TABLE 2. ANALYSIS OF ALL HAZARDS FROM THIRA[17]

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Animal and Plant Disease		X	Historically, there have not been any occurrences of major animal disease in Miami-Dade County. There have been three new plant disease outbreaks in the last 20 years (15% probability in any one year) that have impacted the agricultural communities but have not had any impact on the physical environment. In 2015, an outbreak of the Oriental Fruit Fly, one of the world's most serious exotic fruit flies that threatens agricultural commodities, was detected in Miami-Dade County farmlands. As a result, 97-square miles of farmland was quarantined in the Redland area and an eradication program was triggered. A state of agricultural emergency was declared in the county by the Florida Commissioner of Agriculture, Adam H. Putman on September 15th, 2015. Due to the low occurrence and limited impact, this hazard will not be further evaluated for the LMS at this time.	• For plant diseases pesticides, separation/distancing, eradication of infected plants • For animal diseases, vaccinations, vector control, mosquito control, eradication of breeding grounds (e.g. standing water), public health education • Drain and Cover campaign materials to address mosquito abatement http://www.miamidade.gov/mosquito/index.html
Dam / Dike / Levee Failure		X	Miami-Dade County does not have any dams or levees on the NFIP maps. There are several water conservation areas that have a berm of about 4 feet around them that are dry most of the year. Historically, there have been no occurrences of dam, dike or levee failures in Miami-Dade County. Modeling performed by Miami-Dade Department of	• Maintenance of structures • Reduce/minimize construction close to structures, where possible • Fortify structures where risks are identified

[17] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
			Transportation and Public Works shows that there are no populated areas near these locations that could be negatively impacted if the levees were breached. Due to the low occurrence and limited impact, this hazard will not be further evaluated for the LMS at this time.	
Drought	X		Historically, there has been 54 drought events recorded between 1950 and 2019 (78% probability of having a drought in any one year). There have been no reported dollar losses to either physical structures or crops. Although, on July 15, 2015, USDA designated Miami-Dade County as a primary natural disaster area due to the persistent drought conditions between January and July. No definitive dollar amounts of damages has been reported for this incident. This hazard is considered further for the LMS due to the high probability.	• Water conservation • Public education and outreach • Regulatory fines • National Drought Mitigation Center http://drought.unl.edu/ • Drought Resources for Miami-Dade http://miami-dade.ifas.ufl.edu/weather_issues/DroughtPrepardness.shtml
Earthquake		X	There have been no earthquakes in Miami-Dade County. South Florida does not have any documented fault lines. The USGS shows there is a 0.279% chance of a major earthquake within 50 kilometers of Miami-Dade in the next 50 years. Therefore, this plan will not include a further evaluation of this hazard at this time.	• No Current Recommendations
Epidemic / Pandemic		X	There have been no instances of an epidemic only affecting Miami-Dade County. In 2017, Miami-Dade had 113 confirmed cases of the Zika Virus. Out of the total cases, 1 was locally acquired and	• Public education and outreach • Vaccinations • Fortify pharmaceutical supplies • Surveillance, monitoring and reporting mechanisms

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
			112 were travel related. The Zika virus is a disease spread primarily through the bite of an infected *Aedes* species mosquito, the same type of mosquito that spreads other viruses like dengue and chikungunya. A coordinated effort between Miami-Dade County Department of Solid Waste Management and the Florida Department of Health in Miami-Dade County is established to set out a strategic plan in response to the Zika Virus. This would help create a unified message for public education and outreach throughout all County agencies and municipalities. There were no recorded deaths and no impact to the physical environment. In February 2020 OEM began providing regular reports on the Coronavirus Disease (COVID-19) Pandemic. As of July 13th this pandemic has resulted in 67,713 positive cases and 1,037 deaths in the County.	• Quarantine/Isolation as needed

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Erosion	X		Coastal Erosion is a continuous problem for the Miami-Dade County coastline. They are the county's natural barrier that can help protect us from the impacts of storm surge and sea level rise. The most severe erosion occurs in relation to hurricanes and tropical storm, from June to November. There are 20.8 miles of beaches in Miami-Dade County at risk for erosion and 500 parcels that sit adjacent to the shoreline that could be at risk, if erosion became severe. In 2017, Hurricane Irma caused some beach erosion throughout Miami-Dade County with the preliminary assessment estimating a loss of about 170,000 cubic yards of sand. This hazard is considered further for the LMS.	• Fortify beaches through re-nourishment • Fortify dunes with vegetation or structural components • Natural barriers such as mangroves and coral reefs • Limit construction close to coastal areas prone to erosion • Limit re-development after disasters in coastal areas prone to erosion • Implement/enforce building code to fortify structures in coastal areas
Extreme Heat		X	There have been one extreme heat event reported, between 1950 and 2019 (2% chance of occurrence per year). On July 25, 2017, NWS issued a heat advisory for Miami-Dade County due to very warm and humid weather conditions potentially resulting in heat index values between 105 and 110 degrees Fahrenheit. The heat advisory was extended until July 26th. During this event, there were 15 injuries on July 25th in Miami Beach, but no reported damages to property or crops. Due to the efficient air conditioning systems of homes in South Florida, Florida Power and Light said that even with high usage of A/C there is not a surge of demand for power that would cause a concern for power outages. The threshold for the National Weather Service to issue an Excessive Heat	• Public Education and Outreach • Identification, designation and opening of cooling centers for vulnerable populations, as needed.

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
			Warning is when heat index values are expected to reach 113 degrees Fahrenheit or higher for at least 2 hours, with an 80% chance, or greater, of occurrence. Due to the low impact this hazard will not be further considered for the LMS at this time.	
Flooding	X		Much of Miami-Dade County is susceptible to localized flooding, particularly during the rainy season that runs from mid-May through mid-October. The mean elevation of Miami-Dade County is relatively flat at 11 feet. The County's flat terrain causes extensive "ponding" due to the lack of elevation gradients to facilitate "run-off". Of Miami-Dade's 1,250,287 acres, 44.62% of that is within the flood plain (557,871 acres). There have been 13 flood events and 31 flash flood events recorded since 1950 (50% chance of flooding occurrence every year). Localized flooding and "ponding" occurs frequently during the rainy season. Property damages of over $542M and crop damages of over $714M have been recorded from flooding for incidents between 1950 and 2019. This hazard is considered further for the LMS.	• Public education and outreach on FEMA Flood Zones, storm surge planning zones and general flood risks. • Education on Flood Insurance • Participation in NFIP and CRS • Drainage projects to address RL and SRL areas • Freeboard requirements for elevation of structures above BFE • Monitoring and coordination for maintenance and mitigation projects along canal areas • Monitoring and maintenance of storm drains • Design for larger storm drains • Swale and open space protection • Participation in the development of FEMA FIRM maps to help identify at risk areas and areas that have been mitigated
Hail		X	218 hail events have been reported, between 1950 and 2019 in Miami-Dade County. The only reported damage associated with hail was for about $3K in 2012, but this was more likely due to a tree limb that had fallen on a car during the same event. Due to the low impacts of this hazard it will not be considered further for the LMS at this time.	• Alert and notification of public to seek safety inside • No other current recommendations

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Hurricane / Tropical Storm	X		In 2017, Miami-Dade County was impacted by major Hurricane Irma and Tropical Storm Philippe. Due to the high impacts, this hazard is further considered for the LMS.	• Public education and outreach • Designation of storm surge risk areas • Supportive services (evacuation and sheltering) for at risk populations • Hardened facilities for use as evacuation centers • See also recommendations under winds and floods.
Landslides		X	Due to Miami-Dade's low average elevation, landslides are not likely to occur. There have been no reported landslides in Miami-Dade. Due to the low probability and low risk this hazard is not further considered for the LMS.	• No current recommendations
Lightning		X	There were 69 reported lightning events in Miami-Dade County between 1950 and 2019 (100% chance of a lighting event occurring every year). Though the probability is high the recorded impacts of these events is low with the highest single impact being about $80K for an incident in Hialeah Gardens when a lightning struck an apartment building. The lightning strike caused a fire and four apartments suffered significant damage leaving a total of 20 residents displaced. Due to the low impact of this hazard it will not be considered further for the LMS at this time.	• Surge protection for electrical, computer and phone systems • Lightning detection and warning devices • Public education and outreach
Saltwater Intrusion	X		Saltwater intrusion is a continuous problem that has been occurring ever since the Everglades	• Continue practices of monitoring levels, gauging pumping levels and determining future impacts and need for deeper wells

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
			were drained to provide dry land for urban development and agriculture. Long periods of drought and storm surge inundation are hazards that have been attributed to increases in saltwater intrusion. It poses a threat to the drinking water supply and requires close coordination of local agencies to continuously monitor intrusion, determine appropriate pumping rates and the coordination with South Florida Water Management District for maintenance of ground water levels. This hazard is included in the LMS for further consideration.	

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Sea Level Rise	X		Sea level rise is likely to increase coastal flooding during astronomical high tides and storm surge events. Sea level rise will likely impact the ability of the canals and low-lying areas to drain standing water after rainfall events and impact the ground water elevation. Gravity based outfalls that lie below sea level have already seen impacts when salt water flows up through the outfall system into the streets of several communities. This Unified Sea Level Rise Projection for Southeast Florida highlights three planning horizons. The first is the short term projection, that by 2040, sea level is projected to rise 10 to 17 inches above 2000 mean sea level. The second is by 2070, sea level is projected to rise 21 to 54 inches above 2000 mean sea level. The third is that by 2120, sea level is projected to rise 40 to 136 inches above 2000 mean sea level.[18]	• Designation of Adaptation Action Areas • Additional modeling/mapping to determine areas at risk • Build with sea level rise considerations to increase future resiliency as determined by the useful lifespan of a project • Minimize development in future risk areas

[18] 2019 Unified Sea Level Rise Projection for Southeast Florida: https://southeastfloridaclimatecompact.org/wp-content/uploads/2020/04/Sea-Level-Rise-Projection-Guidance-Report_FINAL_02212020.pdf

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Severe Storm	X		A storm is considered severe if it produces a tornado, winds of 50 knots (58 mph) or greater, and/or hail of an inch in diameter or greater. From 1950 through 2019, there have been 511 severe storm related events reported in Miami-Dade (averaging about five occurrences per year). Over $209M in damages have been recorded during that time. Due to the high probability and impact, this hazard is further considered in the LMS.	• Practices to mitigate against hurricanes are also applicable to severe storms. • Also see recommendations under floods • Review Model Storm analyses and identify mitigation initiatives for the hardest impacted areas • Track heavy rain and subsequent flooding to identify areas for potential mitigation measures

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Sinkholes		X	There is no official record of all sinkholes in Miami-Dade. The Florida Geological Survey maintains a database of all "subsidence incidents," however this only includes events that have been officially reported and includes many events that are not sinkholes. Between 1948 and 2019, only one subsidence incident was reported in Miami-Dade to the Florida Geological Survey. In 1972, a sinkhole measuring three feet by three feet, was recorded in Miami-Dade County by the Florida Geological Survey.[19] Most of the instances reported are small in extent and have not significantly impacted the built environment. Within the State of Florida for insurance claims, Miami-Dade County represented 2% of the total claims in 2010. Additional instances of sinkholes claims have been reported through insurance claim reporting data but the magnitude of each respective claim was not made available. Due to the low impact of this hazard it is not considered further for the LMS at this time.	• Assessment, hardening and replacement of aging infrastructure.
Space		X	There have been no space weather events specific to Miami-Dade County that have caused interference with technological components of communication or electrical systems. Due to the low probability of this hazard it is not considered further for the LMS at this time.	• Identifying redundant or alternate systems in case of outages. • Hardening of CI/KR

[19] Florida Department of Environmental Protection, Florida Geological Survey Division Subsidence Incident Reports Map: https://ca.dep.state.fl.us/mapdirect/?focus=fgssinkholes

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
Tornado	X		There have been 140 occurrences of tornadoes in Miami-Dade County between 1950 and 2019 (averaging about 2 times a year). Recorded damages from tornadoes for property exceeds $203M. Due to the high probability and high impact, this hazard is included in the LMS for further consideration.	• Hardening of structures. • Identification of safe rooms and structures. Follow FEMA Safe Room Guidance • Increased public awareness • Signing up for existing alert and notification systems.
Tsunami		X	There have been no tsunamis occurring in Miami-Dade County. The risk of a tsunami striking Florida is considered to be relatively low by the National Oceanographic and Atmospheric Administration. Due to the low probability of this hazard it will not be considered further at this time.	• Education for risk can be also tied to coastal communities currently at risk for Storm Surge.
Volcano (Ash/Dust)		X	There are no volcanoes in Miami-Dade County and no recorded impacts to the physical environment from volcanoes. Due to our distance to any volcanoes there is no projected impact. The biggest concern in relation to an active volcano outside of our area would be volcanic ash that may be carried by trade winds that could limit aviation operations or possible compromise the air quality. There are no expected impacts to physical infrastructure. Due to the low probability and low impacts, this hazard will not be considered further for the LMS at this time.	• Implementation of Sheltering in Place as identified in the Miami-Dade All Hazards Protective Measures Plan.
Wildfires	X		There have been 14 wildfires recorded between 1950 and 2019 in Miami-Dade County (20% chance of a wildfire occurring every year). Recorded property damages for wildfires is about $255K. Though historically there has not been a high impact on property, it is estimated that about	• Prescribed burning programs. • Cutting brush or other fuel away from structures. • Follow National Fire Protection Association (NFPA) Firewise Communities Program

Hazard	Further Consideration for LMS		Inclusion/Exclusion Criteria	Mitigation Measures
Natural	**Yes**	**No**		
			613,453 people, or 25% of our area population, live within the Wildland Urban Interface and could be at risk. This hazard is included for further consideration in the LMS.	• Roles in Fire-Adapted Communities http://www.usfa.fema.gov/downloads/pdf/publications/fire_adapted_communities.pdf
Windstorms		X	There were 10 high wind and 2 strong wind events on record from 1950 to 2019 (17% chance of an event occurring every year). Recorded property damages total about $18K. Mitigation strategies that address tropical storms and hurricanes would also help protect the built environment from high wind events. Due to the low impact of these events, this hazard will not be considered further for the LMS at this time.	• Building opening and glazing protection. • Hardening of roof structures. • Securing roof top equipment.
Winter Storm	X		There have been 27 occurrences of winter storm related events (cold/wind chill, extreme cold, frost/freeze) between 1950 and 2019 (39% chance of an event occurring every year in Miami-Dade County). Though there has not been any recorded property damages, there has been over $300M in crop damages during these events. During these events, a demand for electricity will increase and many homes in South Florida do not have efficient heating systems, unlike their air conditioning systems, and therefore the demand on electricity can be much higher. This hazard is included in the LMS for further consideration.	• Identification, designation, construction of cold weather shelters for homeless and other vulnerable populations, and opening of the same during cold weather events. • Public education and outreach • Agriculture Extension works with local growers for educational material for mitigation of crop losses. http://miami-dade.ifas.ufl.edu/weather_issues/cold%20preparedness.shtml

The following non-natural hazards are included in the THIRA and we have included suggested mitigation measures, but they are not currently further considered in the LMS.

Technological	
Coastal Oil Spill	• Vessel inspections • Compliance with safety regulations
Electric Utility Failure	• Emergency Generators • Alternate energy sources • Hardened utility lines and structures • Emergency Evacuation and Assistance Program run by the OEM to assist vulnerable populations • Public Outreach and Education
Hazardous Materials Release	• Regular onsite inspections of hazardous materials facilities • Hardening of facilities with hazardous materials • Emergency shut off valves • Public Outreach and Education • Implementation of All Hazards Protective Measures Plan
Nuclear Power Plant Release	• Hardened facilities • Public Education, Outreach and Alert and Notification process • Protective Actions to shut down facility • Turkey Point Response Plan and annual exercises
Structural Fire	• Fire suppression safety systems • Alert and notification systems • Regular Fire Drills and Inspections
Transportation Incident (i.e. Highway and/or Rail Incident)	• Inspection and maintenance of transportation corridors • Building infrastructure to future risk and capacity needs • Inspection and maintenance of trains, planes, automobiles and vessels
Water/Wastewater Incident	• Inspection and maintenance of infrastructure • Building infrastructure to future risk and capacity needs
Human Caused Hazards	
Active Shooter	• See Something, Say Something campaign • Security screening procedures
Civil Disturbance/ Civil Unrest	• Intel gathering and sharing • Community gathering points to allow for peaceful demonstrations

	• Public Outreach and Education • Increased law enforcement presence as a deterrence
Electromagnetic Pulse	• Shielding • Backup systems for communications and power • Surge protection
Food Borne Illness Incident	• Follow Public Health guidelines • Reporting systems
Mass Migration	• Intel gathering and sharing
Terrorism – Biological (Category A, B and C Agents)	• Surveillance and reporting • Follow Public Health guidance • Personal Protective Equipment • All Hazards Protective Measures Plan – implementation of Isolation/Quarantine • Public Education and Outreach
Terrorism – Chemical	• Intel gathering and sharing • See Something, Say Something campaign • Surveillance/monitoring of CI/KR sites
Terrorism – Cyber	• Intel gathering and sharing • Security procedures and passwords • Firewalls • Tamper proof infrastructure • Surveillance/monitoring of CI/KR sites • Miami-Dade created a Cyber Security Plan (April 2017)
Terrorism – Explosive	• Protective barriers (bollards, cement barriers, bullet proof glass, metal/chemical detection)
Terrorism – Radiological	• Surveillance/monitoring of CI/KR sites • Intel gathering and sharing • See Something, Say Something campaign
Terrorism – Small Arms	• Intel gathering and sharing • See Something, Say Something campaign • Surveillance/monitoring of CI/KR sites • Security screening procedures

Drought

Description

A drought is characterized as an extended period of time with persistent dry weather conditions in a geographic area that typically has none to minimal precipitation. A drought can however be defined in several different ways depending on the geographical region and situation:

- Meteorological drought: When the normal level of precipitation has a significant measurable drop.
- Agricultural drought: When the level of soil moisture drops below the suitable range for agricultural growth.
- Hydrological drought: When the surface water and underground water supply falls below normal.
- Socioeconomic drought: When water shortages seriously interferes with human activity.

The Palmer Index, developed by Wayne Palmer in the 1960s, uses temperature and rainfall information to formulate dryness. It has become the semi-official drought index. The index is effective in determining long term drought conditions of several months. The index sets normal conditions at 0 with drought conditions in negative values. The index can also be reversed showing the excess of precipitation where the normal conditions at 0 and positive values for amount of rainfall. The advantage of the Palmer Index is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions.

TABLE 3. NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM ALERTS FOR DROUGHTS

Alert	Criteria	Palmer Drought Index
D0 Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1 Moderate Drought	Some damage to crops, pastures, streams, reservoirs, or wells low, some water shortages developing or imminent, and voluntary water-use restrictions requested.	-2.0 to -2.9
D2 Severe Drought	Crop or pasture losses are likely, water shortages common and water restrictions imposed.	-3.0 to -3.9
D3 Extreme Drought	Major crop and pasture losses with widespread water shortages or restrictions.	-4.0 to -4.9
D4 Exceptional Drought	Exceptional and widespread crop and pasture loss, shortages of water in reservoirs, streams, and wells creating water emergencies.	-5.0 or less

Source: U.S. Drought Monitor Classification Scheme, from the United States Drought Monitor

Location
The entire County is vulnerable to drought conditions.

Extent
D4 on the Palmer Drought Scale.

Impact
The Drought Center reports that the direct impacts of a drought can include reduced crop productivity; increased fire hazards; reduced water levels; increased wildlife mortality rates; damage to wildlife and fish habitat; increased problems with insects and diseases to plants and trees; and reduced growth. Indirect results can lead to financial hardships for farmers and "increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs." During times of drought, crop irrigation can lower the water table, exposing it to salt water (please see the Salt Water Intrusion section for more information). Water restrictions were put in place for Miami-Dade County that impacted both residential and agricultural communities. No definitive dollar amounts of damages were found during a review of the literature.

Previous Occurrences

April – early May, 2018 – A prolonged dry spell from February through the middle of May caused very dry conditions over all of Miami-Dade County. There were no reported damages. Ground water levels led to the continuation of severe drought conditions.[20]

January – September 2015 – A combination of decreased rainfall and higher than normal temperatures through Miami-Dade County resulted in drought conditions throughout the county between January and September. A persistent high-pressure system in the upper levels of the troposphere restricted cold fronts to move southward through South Florida and delivered warm subtropical air to the region during the spring months (March-May). During the summer months (June-August), this high-pressure system brought warm and dry easterly winds steering most of the typical South Florida afternoon thunderstorms to the west of the peninsula. A three-month deficit of 10-15 inches of rainfall across the County and temperatures between 0.5 and 1.5 degrees Fahrenheit above normal resulted in drought conditions throughout this period. Miami-Dade County had its peak drought condition in late July 2015 when the Palmer Drought Index peaked to extreme drought (D3) in the eastern part of the County. As a result of this event, USDA designated Miami-Dade County as a primary natural disaster area due to the damages and losses caused to the agriculture community.[21]

[20] NOAA National Centers for Environmental Information: https://www.ncdc.noaa.gov/data-access/severe-weather
[21] USDA Designates 2 Counties in Florida as Primary Natural Disaster Areas, 2015: https://www.fsa.usda.gov/news-room/emergency-designations/2015/ed_20150715_rel_0089

March – early April, 2012 – Very dry conditions continued into early April over all of Florida. There were no reported damages. Ground water levels led to the continuation of severe drought conditions.

January – August 2011 – Rainfall totals in January were near to below normal over most of southeast Florida. This resulted in the expansion of severe drought (D2) conditions over inland sections of Miami-Dade County. Rainfall deficits since October over these areas ranged anywhere from 8 to 11 inches. Most wells across the area were running at around 10 percent of normal water levels. The level of Lake Okeechobee remained steady at about 12.5 feet, which is 2.2 feet below normal. The Keetch-Byram Drought Index (KBDI) was in the 500 to 600 range, which reflects a high fire danger and low soil moisture values.

February was a very dry month over South Florida as a high pressure dominated the region's weather pattern. Over most of Miami-Dade, February rainfall totals were less than a tenth of an inch. As a result, February 2011 was among the top 10 driest Februaries on record at Miami and Miami Beach. This led to severe drought conditions over most of South Florida, with extreme drought conditions over portions of the southeast coast. The level of Lake Okeechobee fell about a half-foot during February, from around 12.5 feet to near 12 feet. Forestry officials reported double the number of wildfires during the winter months of 2010-2011 compared to the previous year. The period of October 2010 to February 2011 was the driest on record in the 80-year history of the South Florida Water Management District's records.

Conditions remained dry and by the end of May, most of southern Florida was in an extreme (D3) drought status, except for an area of exceptional (D4) drought over eastern Palm Beach and Broward counties. This is the first time in well over a decade that any part of south Florida has been designated as being under exceptional drought conditions.

June continued the streak of below normal rainfall over most of South Florida. Little rain fell during the first 10 days of the month, with the rainy season not starting until around June 8th. Almost all the rain across the area fell in the last 2 weeks of the months. Total rainfall were only in the 2 to 4 inch range over the east coast metro areas as well as the Gulf coast areas. Miami Beach recorded its driest June on record with only 1.15 inches of rain. Inland areas of South Florida received about 6 to 8 inches, with isolated 9 to 11 inch amounts south and west of Lake Okeechobee.

The level of Lake Okeechobee dropped from around 10 feet at the beginning of June to a minimum of around 9.6 feet in late June before recovering by the end of the month. Wells and underground reservoirs remained at the lowest 10 percent of normal levels. Exceptional (D4) drought conditions extended over most of Palm Beach and Broward counties as well as far northern Miami-Dade County. Extreme (D3) drought conditions extended all the way to the southwest Florida Coast of Collier County, with severe (D2) drought conditions elsewhere over South Florida. Several wildfires broke out over South Florida in June, including a large wildfire in the Everglades of Miami-Dade County near

the Miccosukee Resort and several wildfires in north-central Palm Beach County and eastern Collier County. July and August brought much needed rains. Overall, rainfall averaged near to above average over most areas, leading to gradually improving drought conditions. Lake Okeechobee remained over 3 feet below the normal level for this time of year. Underground water levels remained below normal over much of South Florida, especially over the metro east coast sections.[22] No data was available to determine the economic impacts of this event.

November 2008 – May 2009 – The driest winter on record over many locations in South-east Florida led to the onset of severe drought (D2) conditions. At Miami International Airport, winter season rainfall was only 0.74 inches, making it the driest winter on record. The drought continued into the spring as most of South Florida was still under severe drought (D2) conditions. April rainfall was less than an inch at most locations. Then a very dry start to the month of May prompted the issuance of extreme drought (D3) conditions over virtually all of South Florida. The drought ended in Mid-May.[23]

Vulnerability

Physical Vulnerabilities

Drought is not anticipated to have any impact on the built environment (Critical Infrastructure, Key Resources, and Building Stock). It may cause economic losses to agriculture and aquaculture due to loss of crops or water restrictions that inhibit normal operations. Crops most vulnerable to drought are the ones that are grown during the winter months, our dry season, and harvested in the spring months including cantaloupe, carambola, celery, cucumbers, dragon fruit, eggplant, fennel, guava, green beans, herbs, jackfruit, longyan, lychee, mushrooms, onions, papaya, passion fruit, plantains, radishes, sapodilla, spinach, squash, strawberries, sweetcorn, thyme, tomatoes and zucchini. Drought conditions can also impact the Miami-Dade County Water and Wastewater Treatment system.

Social Vulnerabilities

This hazard may impact persons employed by the agricultural community including migrant farm workers. In terms of the general population, it does not tend to affect one population over another, however the social vulnerability section should be reviewed for more information on how these types of circumstances may affect populations in Miami-Dade County differently.

[22]National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[23] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

Erosion

Description

Erosion is the wearing-away of land or the removal of beach or dune sediments by wave action, tidal currents, wave currents, or drainage; the wearing-away of land by the action of natural forces; on a beach, the carrying away of beach material by wave action, tidal currents, littoral currents or by deflation. Waves generated by storms cause coastal erosion, which may take the form of long-term losses of sediment and rocks, or merely in the temporary redistribution of coastal sediments. Riverine and canal erosion are minimal within Miami-Dade County and will not be further analyzed. Coastal erosion is of greater concern and is expanded upon below. Long-shore currents move water in a direction parallel to the shoreline. Sand is moved parallel to most beaches in Florida by long-shore drift and currents. Ideally the movement of sand functions like a balanced budget. Sand is continually removed by long-shore currents in some areas but it is also continually replaced by sand carried in by the same type of currents. Structures such as piers or sea walls, jetties, and navigational inlets may interrupt the movement of sand. Sand can become "trapped" in one place by these types of structures. The currents will, of course, continue to flow, though depleted of sand trapped elsewhere. With significant amounts of sand trapped in the system, the continuing motion of currents (now deficient in sand) results in erosion. In this way, human construction activities that result in the unnatural trapping of sand have the potential to result in significant coastal erosion.

Beach Erosion – Beach erosion occurs when waves and currents remove sand from the beach system. The narrowing of the beach threatens coastal properties and tourism revenue in coastal counties throughout the United States.
Dune Erosion – Dune erosion occurs when waves attack the front face of the sand dune, reducing the volume and elevation of the dune. Erosion of the sand dune leaves coastal properties more vulnerable to future storms.

Overwash – When waves exceed the elevation of the dune, sand is transported across the island in a process known as overwash. When overwash occurs, it often results in significant damage to coastal property.

Inundation and Island Breaching – Inundation occurs when the beach system, or the sandy profile located between the most seaward (primary) dune and the shoreline, is completely submerged under the rising storm surge. Strong currents may carve a channel in the island in a process known as island breaching.

Location
The coastal areas indicated in the map are at highest risk for coastal erosion. This includes the municipalities of Key Biscayne, Miami, Miami Beach, Biscayne Park, Bay Harbor Islands, Bal Harbour, Sunny Isles Beach and Golden Beach.

Extent
25,000 cubic yards of sand.

Impact
Miami-Dade beaches provide storm surge protection and coastal erosion can diminish this natural buffer. Sea turtles can also be impacted as their nesting grounds may be impacted and the beaches are a big draw for tourism. Miami-Dade's shoreline is highly developed with an estimated beachfront value in excess of $13.5 billion, not including infrastructure.

Previous Occurrences
Coastal erosion has been occurring for years, the first study was done in 1930 and a restudy was done in 1961. As a result, from 1975-1982 the USACE implemented the

Miami-Dade County Beach Erosion control and Hurricane Surge Protection project that cost about $48 million. It is estimated for every $1 that is invested in beach nourishment that there is a return of about $700 foreign, primarily tourism impacts. USACE completed a $11.5 million project to widen 3,000 feet stretch of Miami Beach's shore, that was washing away. The shore between 46th and 54th street was expanded by 230 feet to protect the island from storm surge. In August 2017, USACE awarded $8.6 million for Sunny Isles Beach re-nourishment project that began in October 2017 and is set to be completed by May 2018.[24]

September 2017 – Hurricane Irma caused some beach erosion throughout Miami-Dade County. The preliminary damage assessments estimated a loss of 170,000 cubic yards of sand. The money amount in damages has not been determined.

October 2016 – Hurricane Matthew caused minor beach erosion, as it travelled northward parallel to Florida's east coast. Miami-Dade County agencies and municipalities estimated close to $1M in damages due to coastal erosion.

October 2012 – Hurricane Sandy, never made landfall, but paralleled the coast causing coastal erosion with reports of waves up to 10 feet in Miami-Dade. There was no Presidential Declaration for damages within Miami-Dade.[25] Hurricane Sandy, was estimated to cause over $2M in damages to beaches including the following:

- Miami Beach 26th – 29th Street – approximately 10,000 cubic yards
- Miami Beach 44th – 46th Street – approximately 2,500 cubic yards
- Miami Beach 53rd – 56th Street – approximately 3,000 cubic yards
- Miami Beach 63rd – 66th Street – approximately 5,000 cubic yards
- Bal Harbour 99th – 103rd Street – approximately 2,600cubic yards
- Key Biscayne – unknown cubic yards estimated at $1.2M [26]

[24] U.S. Army Corps of Engineers (Jacksonville District) Miami-Dade County Projects: http://www.saj.usace.army.mil/Missions/Civil-Works/Shore-Protection/Dade-County/
[25] Miami-Dade County EOC Activation Archive
[26] Miami-Dade Emergency Operations Center Damages Report

October 2005 – Hurricane Wilma, caused in general only minor beach (Condition I) erosion to the majority of beaches in Miami-Dade but dune erosion (Condition II) occurred at the Bill Baggs Cape Florida State Park.[27] Picture at right shows damage to Bill Baggs. No major structural damage was observed seaward of the Coastal Construction Control Line (CCCL) or within the Coastal Building Zone (CBZ). The majority of the damage near the coast occurred north of Bakers Haulover Inlet. At Cape Florida, a concrete sea-wall and rock revetment sustained level three damage.

September 2005 – Hurricane Rita, caused only minor beach erosion (Condition I) north of Government Cut from Miami Beach to Broward County. Virginia Key also had minor beach erosion (Condition I) but also experienced overtopping, resulting in a wash over deposit of sand. Portions of Key Biscayne experience moderate beach and dune erosion (Condition III) and south of Sonesta Beach Resort had minor dune erosion (Condition II). No structural damages were sustained along the Miami-Dade County coast seaward of the CCCL or within the CBZ during the passage of Hurricane Rita.

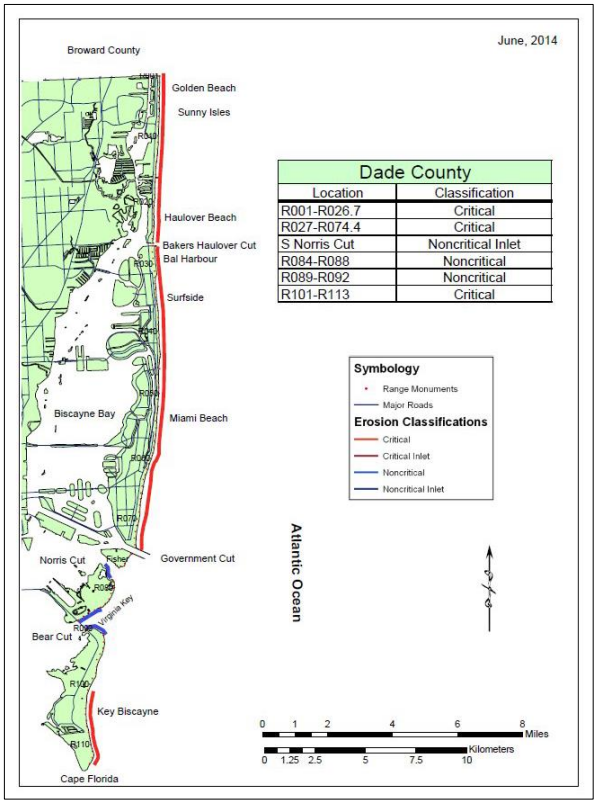
August 2005 – Hurricane Katrina caused minor beach erosion (Condition I) to the north-ern beaches in Miami-Dade. No structural damages were sustained along the Dade County coast seaward of the CCCL or within the CBZ; however, a number of single-family dwellings were flooded on Key Biscayne forcing their evacuation.

Vulnerability

Physical Vulnerabilities

[27] Florida Department of Environmental Protection Post-Storm Reports

The entire built environment (Critical Infrastructure, Key Resources, Building Stock) and natural environment (beaches) are vulnerable to erosion primarily along coastal areas. According to a GIS analysis there are approximately 500 parcels in the property appraiser database that intersect with the CCCL. Though the beaches have been fortified over the years and are much wider than they used to be (see pictures), constant erosion could put structures in these areas at risk. The map to the right shows the status of erosion classifications for Miami-Dade County's coastal areas. Severe erosion can exacerbate storm surge inundation by minimizing the protection offered by beaches and seawalls as they are compromised. Structures such as boardwalks or piers that are have pilings in coastal areas may suffer collapse or complete destruction. Beaches in Miami-Dade, such as South Beach and Biscayne National Park, are cited as the number one reason tourists come to Miami-Dade.



Dade County

Location	Classification
R001-R026.7	Critical
R027-R074.4	Critical
S Norris Cut	Noncritical Inlet
R084-R088	Noncritical
R089-R092	Noncritical
R101-R113	Critical

There are two piers in Miami-Dade County that extends into the Atlantic Ocean and Government Cut, the Newport Beach Fishing Pier in Sunny Isles Beach and the South Pointe Pier in Miami Beach. The Newport Beach Pier was rebuilt and reopened in 2013 after being destroyed by Hurricane Wilma in 2005 and the South Point Pier was rebuilt and reopened in 2014 after being closed in 2004 due to deterioration.

Social Vulnerabilities

This hazard does not tend to affect one population over another.

Flooding

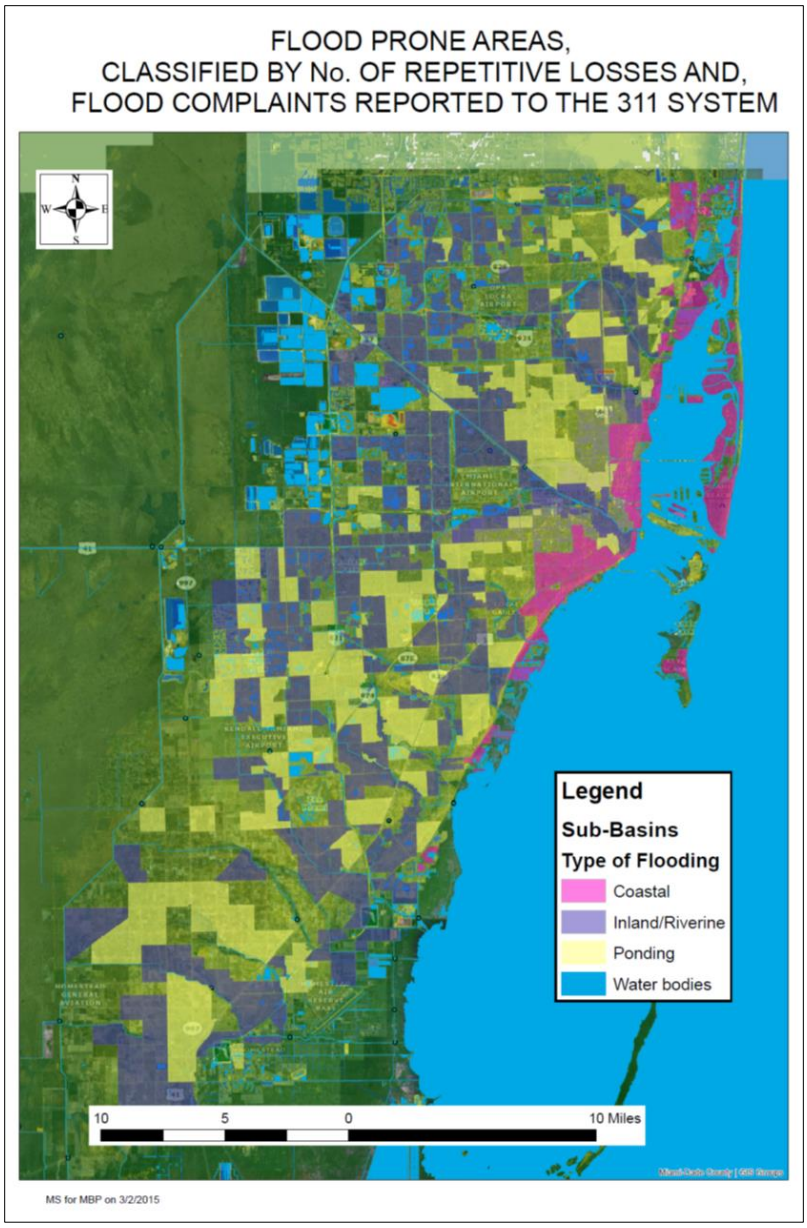
Description

Flooding is an overflowing of water onto land that is normally dry. It can happen during heavy rains, when ocean waves come onshore, and when regular drainage capabilities are compromised. Flooding may happen with only a few inches of water, or it may happen with several feet of water. Flooding can affect many different communities covering several states during a single flooding event. Sunny day flooding and tidal flooding are discussed in the Sea Level Rise section.

TABLE 4. COMMON FLOOD TYPES

Category	Criteria
River or Canal Overbank Flooding	When water levels rise in a river due to excessive rain from tropical systems making landfall, persistent thunderstorms over the same area for extended periods of time
Ponding	When water levels rise in a land locked area, lake or detention basin due to excessive rain from tropical systems making landfall, persistent thunderstorms over the same area for extended periods of time. In South Florida, some of the severe localized thunderstorms frequently exceed 3 inches/hour, exhausting the storage and infiltration capacity of the drainage system.
Coastal Flooding	When a hurricane, tropical storm, or tropical depression produces a deadly storm surge that overwhelms coastal areas as it makes landfall. Storm surge is water pushed on shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the average water level 15 feet or more. The greatest natural disaster in the United States, in terms of loss of life, was caused by a storm surge and associated coastal flooding from the great Galveston, Texas, hurricane of 1900. At least 8,000 people lost their lives.
Inland or Riverine Flooding	When tropical cyclones move inland, they are typically accompanied by torrential rain. If the decaying storm moves slowly over land, it can produce rainfall amounts of 20 to 40 inches over several days. Widespread flash flooding and river flooding can result. In the 1970s, '80s, and '90s, inland flooding was responsible for more than half of the deaths associated with tropical cyclones in the United States. The state of Florida has nearly 121,000 census blocks potentially threatened by riverine flooding, translating to nearly $880 billion in property.
Flash Flooding	A rapid rise of water along a stream or low-lying urban area. Flash flooding occurs within six hours of a significant rain event and is usually caused by intense storms that produce heavy rainfall in a short amount of time. Excessive rainfall that causes rivers and streams to swell rapidly and overflow their banks is frequently associated with hurricanes and tropical storms, large clusters of thunderstorms, supercells, or squall lines. Other types of flash floods can occur from dam or levee failures.

Much of Miami-Dade County is susceptible to localized flooding, particularly during the rainy season of June through October, see the map on next page. One area in particular experiences flooding on a regular basis. Known as the 8½ square mile area, it is located west of the L-31N Levee, between SW 104th Street on the north and SW 168th Street on the south. The mean elevation of Miami-Dade County is relatively flat at 11 feet. The county's flat terrain causes extensive "ponding" due to the lack of elevation gradients to facilitate "run-off". Of Miami-Dade's 1,250,287 acres, 44.62% of that is within the flood plain (557,871 acres). Our community is interlaced with an intricate system of canals that play an integral role in our groundwater saturation levels. When the levels are too high or the canal structures cannot be opened, this can lead to localized flooding during rain events. Agricultural interests can be impacted by levels that are too high or too low. If the control structures release the fresh water at a rapid rate this can also lead to environmental concerns where the fresh water is released. When the control structures fail or are damaged and cannot be operated, alleviation of any localized flooding may require pumping until the canal structures can be re-opened or fixed. Inability to be able to close the salinity structures within the canals could also increase the risk of salt water intrusion during high tide and storm surge. Part 7 of the LMS provide greater detail as to the canal system within the county and the relation to drainage basins.



Extent

Two feet of flooding.

Impact

In 1999 and 2000 Miami-Dade experienced two major flooding incidents, Hurricane Irene and the "No Name Storm", later known as Tropical Storm Leslie once it entered the Atlantic. The damages from the 1999 storm were reported as $100 million in property and $200 million in

crop damages and the 2000 storm caused $440 million in property damage and $500 million in crop damages.[28] Though the flooding in this area was not directly attributed to a failure of the canal system, it was acknowledged that the original drainage system for the Tamiami Canal Basin was not designed to accommodate the population that resided in that area and the water managers recognized a need for major system improvements. A $42 million multi-phase project that included a 900-acre emergency detention basin, and the S-25B Forward Pump Station and S-26 Pump Station and dredging project. This project improved flood protection for 500,000 residents and to 5,000 homes and businesses.[29]

After Hurricane Irene in 1999, areas of Miami-Dade had standing water for long periods of time as is reflected in the following chart.[30]

Area	Estimation of the deepest water	Problems	Estimated time it took for the water to dissipate
East Everglades	2 feet	Impassable roads and minimal home intrusion	1 month
Sweetwater	2 feet	Impassable roads and extensive home intrusion	1 week
West Miami	18 inches	Impassable roads and extensive home intrusion	2 weeks
Homestead (near Harris Field)	2 feet	Impassable roads and some home intrusion	1 week
NW 127 Avenue between Tamiami canal and NW 8th Street	1 foot	Impassable roads	2 weeks
NW 97 Avenue between 25th Street and 30th Street (Vanderbilt Park)	1-2 feet	Severe home intrusion	1 week
NW 41 Street west of the Turnpike	2 feet	Impassable roads	2 weeks

[28] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[29] South Florida Water Management District Tamiami Canal (C-4) Flood Protection Project, July 2008. June 15, 2012
[30] Miami-Dade Emergency Operations Center Activation Archives, After Action Report Hurricane Irene

Previous Occurrences

August 15, 2019 – Thunderstorms produced very heavy rainfall that measured over 7 inches in about 3 hours across portions of Kendall. This heavy rainfall resulted in flash flooding which resulted in water intrusions in numerous structures and impassable roadways.[31]

October 3-7, 2017 – A combination of high tide and heavy rainfall led to flooding across portions of Miami-Dade County. There were reports of coastal and street flooding in the vicinity of Biscayne Blvd from I-395 to NE 30th Street.

August 24-27, 2017 – A tropical wave (Invest 97L) was located near the central Bahamas on August 21st, 2017 and forecast to move northwestward over Florida. Wind shear and dry air hindered further development of this system, but the National Weather Service forecast an excessive rainfall threat for the remainder of the week. Rainfall amounts of 2 to 4 inches, with locally higher amounts possible, were forecast for the region. As a result, a Flood Watch was in effect for Miami-Dade County from August 24th through the 27th.

Between August 24th and 26th, rainfall amounts ranged between 1 and 4 inches through the county. Rainfall amounts of up to 4.5 inches were recorded in the northeast portion of the county between August 26th and 28th. The only significant report received by the National Weather Service was of Okeechobee Road flooded in Hialeah and a spotter in the area recorded 6.62 inches of rain in a single afternoon on August 27th.

[31] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

August 1, 2017 – Tropical Storm Emily formed west of Tampa Bay on July 31st, and moved across central Florida, just north of Lake Okeechobee. On August 1st, Tropical Storm Emily was located over the Atlantic and moving away from Florida. Although no direct impacts were reported for Miami-Dade County, a trough extending from the tropical system was over southeastern Florida. A combination of the frontal boundary and daytime heating, a band of thunderstorms developed off the coast and moved west. At around 2 pm, the band became nearly stationary over Miami Beach, Key Biscayne and Downtown Miami. A Flash Flood Warning was issued at 3:47pm until 9:45pm. Later in the afternoon, the same band of thunderstorms redeveloped over The Redland, Kendall, Palmetto Bay and Pinecrest area. Rainfall amounts in these areas ranged between 4 and 6 inches with isolated amounts between 7 and 8 inches. The rainfall rates of 2 to 4 inches an hour lasted 2 to 3 hours, and around the same time as high tide.

Significant flooding was reported in Miami Beach and the Brickell area in the City of Miami. Vehicles were stalled in streets with up to 2 feet of water and some streets had to be closed due to deep standing water. In Miami Beach, 1 to 2 feet of water was reported on streets in South Beach including Purdy Avenue, West Avenue, Alton Road, Pennsylvania Avenue, Meridian Avenue, Collins Avenue, Washington Avenue and Indian Creek Drive. Water entered business, homes, apartment lobbies and parking garages. In Mary Brickell Village, more than 10 businesses and buildings had 1 to 4 inches of water inside the structures. The picture to the right, shows the 24-hour rainfall estimates between August 1st and 2nd.

June 7, 2017 – An area of low pressure over the Gulf of Mexico, brought tropical moisture across South Florida during the week of June 5th. Widespread showers and thunderstorms, with the potential of heavy rainfall was forecast for the rest of the week. On June 7th, a Flood Watch was issued for Miami-Dade County until 8 pm. Aside from minor flooding on roadways, no significant issued were reported.

December 2015 – A cold front moved into South Florida during on December 3rd, and stalled across the far southern end of the peninsula and upper Florida Keys on December 4th and 5th. Several rounds of heavy rainfall fell across Southern Miami-Dade County. Rainfall amounts near 15 inches fell across Homestead, the Redlands, and western Kendall, with four (4) to eight (8) inches reported across the remainder of Miami-Dade County, most of which occurred on December 5th. This rainfall led to significant flooding in Miami-Dade County with numerous road closures and cars stalling in flood waters. An estimated $1 Million in damage impacted the County's fall and winter crops and also resulted in multiple day closures at Zoo Miami.[32]

[32] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

October 20, 2014 – localized flooding and rainfall amounts of 4 to 7 inches were measured in the south Miami-Dade County communities of Cutler Bay and Palmetto Bay. No additional data was available on this event.

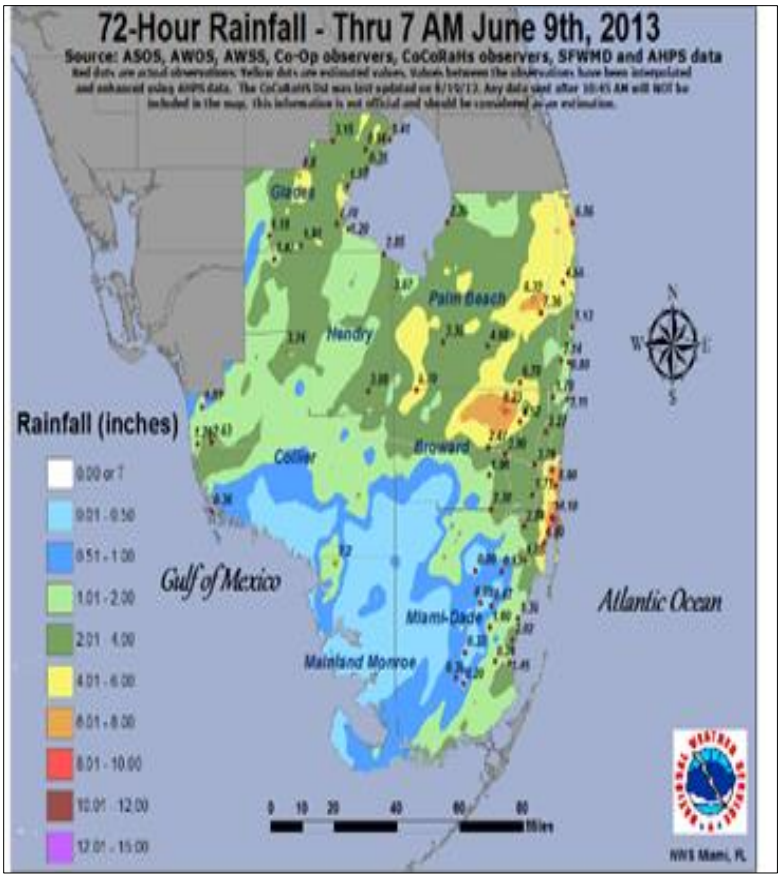
October 2, 2013 – Persistent heavy rains from slow moving showers and thunderstorms produced an isolated area of flash flooding near the Falls Shopping Mall in Miami-Dade County. Measured rainfall amounts were in the range of 7 to 10 inches in the matter of just a few hours, resulting in streets being nearly impassible and the Falls parking lot almost completely under water. Several cars were also reported to have been flooded. The heaviest rainfall total was in Kendall with 10 inches.[33]

July 18, 2013 – An intense thunderstorm moved across the southern portion of Miami Beach with up to four inches of rain falling in a very short time. A second storm moved across the same area later in the afternoon brining the rainfall total for the day at Miami Beach to 6.78 inches. This was not only the daily record but was a daily record for the month of July and this total made it the wettest July on record.[34]

June 18, 2013 – Persistent heavy rains from slow moving showers and thunderstorms produced an isolated area of flash flooding near the Falls Shopping Mall in Miami-Dade County during the late afternoon and early evening. Measured rainfall amounts were in the range of 7 to 10 inches in the matter of just a few hours. The first report of flooding was received at 5:10 PM EDT with streets nearly impassable and the Falls Shopping Mall parking lot almost completely under water. Several cars were also reported to have been flooded. Water entered structures in the Village at the Falls Condo development with the Oak Ridge Residential Community also reporting water intrusion into a vehicle which caused a total loss of the car. Estimated damages for this event totaled $5K.

[33] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[34] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

June 7-8, 2013 – On June 6th, Tropical Storm Andrea made landfall in northern Florida, but southern Florida received torrential rain from the tail of the storm. A South Florida Water Management District rain gauge recorded 13.15 inches of rain in North Miami Beach at 5:53 PM EDT with storm total at the same gauge by 9 PM EDT recording 13.94 inches. Other rainfall reports received were 11.71 inches at the FIU Biscayne Campus in North Miami Beach and 9.89 inches at North Miami/Keystone Point. Over 50 vehicles were reported as being stranded in impassable roads in Aventura and additional roads had similar problems in North Miami and Golden Beach. The picture to the right, shows 72-hour rainfall amounts ending on the morning of June 9th, 2013.

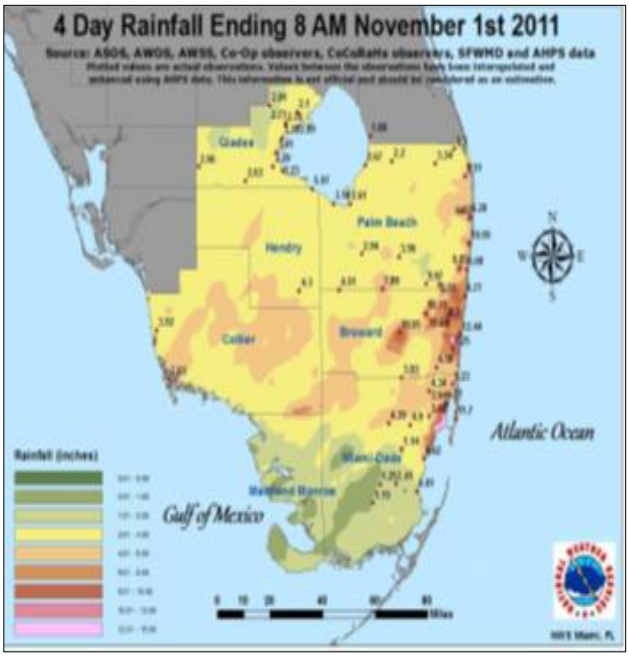


April 30, 2013 – A nearly stationary thunderstorm over Coral Gables produced torrential rainfall over a period of about two hours with rainfall estimates in excess of six inches and an unofficial, measured report just west of Coral Gables of 7.56 inches. Law enforcement reported water was entering garages along Anderson Rd. between Palermo Ave. and Camilo Ave. Water was also reported to be entering businesses along Miracle Mile near Galiano St. A parking lot was flooded along Biltmore Way with water reported to be up to the bottom of car doors.

May 22, 2012 - A band of showers and a few thunderstorms produced torrential rainfall over the far western portions of the Miami-Dade County metropolitan area and moved east through the area from Kendall to Doral and Miami Springs. Miami International Airport recorded 4.40 inches of rainfall between 12:45 and 2 PM EDT. Standing water was reported on numerous streets and several vehicles stalled out in the waters. Other rainfall reports received for this event were 3.64 inches at the National Weather Service Forecast Office on the FIU South Campus and 4.03 inches at Ruben Dario Middle School in Sweetwater. Damage totals for this event are including the event which occurred later in the evening over the same area, estimated at $75K.

A second band of numerous showers and a few thunderstorms accompanied with intense rainfall moved through the same area of Miami-Dade County that received very heavy rainfall earlier in the day. The first significant report of flooding with this event was received at 8:10 PM EDT in Doral by the media stating that the canal running along NW 25th Street near NW 107th Avenue had overflowed its banks and flooded a nearby police department parking lot. Many roads in Doral were under several feet of water, resulting in stalled cars and water entering businesses in warehouse districts. Miami International Airport received an additional three plus inches of rainfall making the total for the calendar day to 9.7 inches which was a record daily amount. This also made it the second wettest day recorded in Miami for the month of May with continuous records back to 1895. Storm total rainfall amounts in the Sweetwater and Doral areas ranged from 8 to 10 inches, with an area of 4 to 7 inches extending from the FIU area to near the Dolphin Mall.

October 28-31, 2011 – The greatest impacts of this rain event were felt in Miami Beach. The areas of heaviest showers and thunderstorms were over Pinecrest, Coral Gables and Coconut Grove and remained over that area for another few hours. This area of rainfall produced anywhere from 6 to 10 inches of rain in only a few hours from Cutler Bay to Coconut Grove, leading to severe street flooding and intrusion of water into dozens of homes across this area. Estimates from the South Florida Water Management District indicate that isolated areas in Coconut Grove may have received in excess of 12 inches during this time span. Portions of Miami-Dade County experienced 3-7 inches of rain in a few hours causing significant street flooding.



October 9, 2011 – Over 10 inches of rainfall was recorded at the West Kendall/Tamiami Airport. The graphic illustrates the rainfall amounts for a 48- hour period.

June 5, 2009 – Severe flooding affected the Mid and South Beach sections of Miami Beach as well as downtown Miami from a nearly stationary thunderstorm. A total of nine (9) inches fell at Miami Beach, most of this occurred in less than three (3) hours. This caused as much as three feet of standing water on streets and garages on South Beach, resulting in many vehicles becoming stalled on streets and road closures across the area. Cars were also seen floating down Michigan Avenue at 11th Street. A number of condominium buildings along West Avenue had up to five (5) feet of water in the parking garages, resulting in dozens of cars being towed. Significant flooded was also reported in downtown Miami in the Omni area. Also at the Fountainbleau Hotel in Miami Beach, heavy rains caused an eight-foot hole to open up in the lobby's ceiling, causing ankle deep water to spread from the lobby into a nightclub.[35]

October 5, 2008 – Heavy rainfall of two to three inches per hour occurred at Miami Beach and Key Biscayne. Several roads were closed in these areas with two to three feet of standing water for several hours.[36]

September 28, 2004 – Extensive street flooding occurred in Kendall with depths of up to 18 inches. There was minor flooding of homes with an estimated property damage of $50,000.[37]

December 10, 2000 – A stalled front contributed to producing up to nearly 14 inches of rain in five hours over portions of southern Miami-Dade County. Rainfall amounts in Southern Miami-Dade ranged from three inches at Homestead General Airport to 13.9 inches at Homestead Air Reserve Base. Other locations in the county received up to 10 inches of rain. Potato and corn crops were 80% destroyed, resulting in about $13 million in crop damages.[38]

[35] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[36] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[37] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[38] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

October 3, 2000 – A low-pressure system known as the "No Name Storm", later to become Tropical Storm Leslie, developed off the west coast of Cuba, and headed toward South Florida (DR-1345). Water managers and weather officials closely tracked the storm, and preemptive measures were taken to start moving water out of the canals. Weather forecasts called for 4-8 inches of rainfall from this storm. During that afternoon and evening, as the system moved northeastward over central Florida, a stationary band of thunderstorms extended through southwest Miami-Dade. This resulted in the accumulation of 14 to18 inches of rainfall over a linear area in the center of the county.[39] Equally as unfortunate were residents and businesses that experienced a similar result as in Irene.

October 1999 – Hurricane Irene (DR-1306) developed and started a path towards South Florida. Initial projections were correct in stating the hurricane would impact the west coast of Florida, and Irene traveled through the state and, on October 15, passed just to the west of Miami-Dade County. Although the hurricane did not pass directly through the county and no exceptionally high winds were experienced, the heavy rainfall associated with this storm did hit Miami-Dade County, and the impacts were severe. Some roads were impassible for weeks, electricity was out in certain areas, and residents and businesses suffered heavy losses.

Vulnerability

Physical Vulnerabilities

The entire built environment (Critical Infrastructure, Key Resources, Building Stock) may be vulnerable to flooding especially in low lying, storm surge planning zones, areas close to canals and structures that were built prior to flood plain regulations. Structures in areas where there has been repetitive losses and no mitigation may also be at a higher risk but past flooding events do not necessarily indicate future flooding problems. Part 7 provides additional analysis of residential structures by date of flood regulations within Miami-Dade County.

[39] National Hurricane Center, Tropical Storm Leslie (Subtropical Depression One) (AL162000)

Below is a chart showing how many structures within each jurisdiction are within FEMA Flood Zones.

TABLE 5. NUMBER OF BUILDINGS BY JURISDICTION IN FEMA FLOOD ZONES

Jurisdiction	A	AE	AH	D	VE	X	XE
Aventura		24,149				52	31
Bal Harbour		738				955	2250
Bay Harbor		2576					
Biscayne Park		991				42	42
Coral Gables		2770	1209		58	13209	1466
Cutler Bay		8840	1871			3886	
Doral		93	3768			16746	
El Portal		6	97			566	92
Florida City	3	2	1097			396	817
Golden Beach		262				98	
Hialeah Gardens		133	271			5802	
Hialeah		1304	18513			36496	
Homestead		222	8824			9098	746
Indian Creek Village		33				4	1
Key Biscayne		7056					
Medley		19	251			578	
Miami Beach		51049				4381	123
Miami Gardens		12103				9083	8638
Miami Lakes	0	8317				1263	
Miami Shores		843	3		19	2470	552
Miami Springs		11	2029			2125	21
Miami		43094	6441		3897	68535	2215
North Bay Village		3872					
North Miami Beach		5650				7212	653
North Miami		8190			261	5637	1995
Opa-locka		714	543			1319	1275
Palmetto Bay		4701			41	3590	80
Pinecrest		2168	268			3563	260
South Miami		2	784			3660	
Sunny Isles Beach		11351			1	7647	0
Surfside		1560				1878	
Sweetwater		1	582			367	
Virginia Gardens			122			445	86
West Miami						960	768
Unincorporated	582	44750	105,976	2	28	169059	20053
Total:	585	247,570	152,649	2	4305	381122	42164

Heavy rainfall events tend to be measured by the amount of rain during a certain duration to give you what would equate to the chances of this type of storm which is typically categorized by terminology such as a 100 year or 500-year storm.

To help local communities determine if a rain event is considered significant the following site and chart from the National Oceanic and Atmospheric Administration (NOAA) Hydro meteorological Design Studies Center maintains the Precipitation Frequency Data Server (PFDS) which is a point-and-click interface developed to deliver NOAA Atlas 14 precipitation frequency estimates and associated information. To determine the amounts and rates of rain that could create a various internal rain event (e.g. 100 year or 500 year) this website provides local information.
http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=fl

Using a location in Miami-Dade County with a 7-foot elevation, the following chart depicts the rainfall amounts per an interval of time that could determine if a significant rain event has occurred.

Social Vulnerabilities

People who live in areas prone to flooding and whom may be uninsured or underinsured are at greatest risk. The cost of insurance may be prohibitive and people who live outside of a flood zone may believe they are not at risk. People who rent properties may not be aware of their flood risk as it may not be disclosed by the owner or they may not know the history of the area.

NOAA Atlas 14, Volume 9, Version 2
Location name: Miami, Florida, US*
Latitude: 25.8204°, Longitude: -80.2930°
Elevation: 7 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.578 (0.471–0.713)	0.661 (0.538–0.816)	0.797 (0.647–0.988)	0.911 (0.735–1.13)	1.07 (0.833–1.38)	1.19 (0.907–1.56)	1.32 (0.967–1.77)	1.44 (1.02–1.99)	1.61 (1.09–2.29)	1.74 (1.15–2.52)
10-min	0.846 (0.690–1.04)	0.967 (0.788–1.20)	1.17 (0.948–1.45)	1.33 (1.08–1.66)	1.57 (1.22–2.01)	1.75 (1.33–2.28)	1.93 (1.42–2.58)	2.11 (1.49–2.92)	2.36 (1.60–3.36)	2.54 (1.68–3.69)
15-min	1.03 (0.841–1.27)	1.18 (0.961–1.46)	1.42 (1.16–1.76)	1.63 (1.31–2.03)	1.91 (1.49–2.46)	2.13 (1.62–2.78)	2.35 (1.73–3.15)	2.57 (1.81–3.56)	2.87 (1.95–4.09)	3.10 (2.05–4.50)
30-min	1.58 (1.29–1.95)	1.81 (1.48–2.24)	2.20 (1.79–2.73)	2.52 (2.04–3.14)	2.97 (2.32–3.82)	3.32 (2.53–4.33)	3.67 (2.70–4.92)	4.02 (2.83–5.56)	4.49 (3.04–6.40)	4.85 (3.20–7.04)
60-min	2.09 (1.71–2.58)	2.39 (1.95–2.96)	2.92 (2.37–3.62)	3.39 (2.73–4.22)	4.07 (3.20–5.30)	4.64 (3.55–6.11)	5.24 (3.87–7.08)	5.87 (4.15–8.18)	6.76 (4.60–9.69)	7.47 (4.93–10.8)
2-hr	2.60 (2.13–3.19)	2.97 (2.43–3.65)	3.64 (2.97–4.48)	4.25 (3.45–5.26)	5.18 (4.10–6.73)	5.96 (4.60–7.84)	6.81 (5.06–9.18)	7.72 (5.51–10.7)	9.03 (6.19–12.9)	10.1 (6.70–14.5)
3-hr	2.89 (2.37–3.53)	3.29 (2.70–4.03)	4.05 (3.32–4.97)	4.78 (3.89–5.89)	5.92 (4.73–7.72)	6.91 (5.36–9.10)	8.00 (5.98–10.8)	9.20 (6.60–12.8)	10.9 (7.53–15.6)	12.4 (8.24–17.8)
6-hr	3.39 (2.80–4.12)	3.90 (3.22–4.74)	4.88 (4.01–5.95)	5.84 (4.77–7.15)	7.36 (5.93–9.59)	8.71 (6.80–11.4)	10.2 (7.69–13.7)	11.9 (8.57–16.4)	14.3 (9.91–20.3)	16.3 (10.9–23.2)
12-hr	3.96 (3.29–4.77)	4.63 (3.84–5.59)	5.91 (4.88–7.15)	7.13 (5.86–8.67)	9.04 (7.30–11.7)	10.7 (8.40–13.9)	12.5 (9.49–16.7)	14.6 (10.6–20.0)	17.5 (12.2–24.6)	19.9 (13.4–28.2)
24-hr	4.62 (3.85–5.53)	5.47 (4.56–6.56)	7.04 (5.85–8.47)	8.51 (7.03–10.3)	10.8 (8.73–13.8)	12.7 (10.0–16.4)	14.8 (11.3–19.6)	17.1 (12.5–23.3)	20.4 (14.4–28.6)	23.2 (15.8–32.6)
2-day	5.42 (4.54–6.45)	6.40 (5.36–7.63)	8.19 (6.84–9.79)	9.85 (8.17–11.8)	12.4 (10.1–15.7)	14.5 (11.5–18.6)	16.8 (12.9–22.1)	19.4 (14.2–26.2)	23.0 (16.2–31.9)	25.9 (17.8–36.3)
3-day	6.03 (5.07–7.15)	7.06 (5.93–8.37)	8.91 (7.46–10.6)	10.6 (8.83–12.7)	13.2 (10.8–16.6)	15.4 (12.2–19.6)	17.8 (13.6–23.2)	20.3 (15.0–27.3)	24.0 (17.0–33.2)	27.0 (18.5–37.6)
4-day	6.59 (5.55–7.79)	7.60 (6.40–8.99)	9.43 (7.91–11.2)	11.1 (9.28–13.3)	13.7 (11.2–17.2)	15.9 (12.6–20.2)	18.2 (14.0–23.8)	20.8 (15.4–27.9)	24.5 (17.4–33.7)	27.5 (18.9–38.2)
7-day	8.08 (6.83–9.50)	8.97 (7.58–10.6)	10.6 (8.96–12.6)	12.2 (10.2–14.5)	14.7 (12.1–18.3)	16.8 (13.4–21.2)	19.1 (14.8–24.8)	21.7 (16.1–28.9)	25.4 (18.2–34.8)	28.4 (19.7–39.3)
10-day	9.34 (7.92–10.9)	10.2 (8.67–12.0)	11.9 (10.1–14.0)	13.5 (11.3–15.9)	16.0 (13.1–19.8)	18.1 (14.5–22.7)	20.4 (15.8–26.3)	23.0 (17.1–30.5)	26.7 (19.1–36.4)	29.7 (20.7–40.9)
20-day	12.7 (10.8–14.7)	14.1 (12.0–16.4)	16.4 (13.9–19.2)	18.5 (15.6–21.7)	21.4 (17.6–26.0)	23.7 (19.1–29.3)	26.2 (20.3–33.2)	28.7 (21.4–37.5)	32.2 (23.2–43.4)	35.0 (24.5–47.8)
30-day	15.4 (13.2–17.9)	17.3 (14.8–20.1)	20.4 (17.3–23.7)	22.9 (19.4–26.7)	26.2 (21.5–31.6)	28.8 (23.1–35.3)	31.4 (24.4–39.4)	33.9 (25.3–43.9)	37.2 (26.8–49.7)	39.7 (27.9–54.1)
45-day	19.1 (16.4–22.0)	21.5 (18.4–24.8)	25.3 (21.6–29.3)	28.3 (24.0–32.9)	32.2 (26.3–38.3)	35.0 (28.1–42.4)	37.6 (29.3–46.9)	40.2 (30.1–51.6)	43.3 (31.3–57.4)	45.5 (32.2–61.8)
60-day	22.3 (19.2–25.7)	25.1 (21.5–28.9)	29.3 (25.1–33.9)	32.7 (27.8–37.9)	36.9 (30.2–43.8)	39.9 (32.1–48.2)	42.6 (33.2–52.9)	45.2 (33.9–57.8)	48.2 (34.8–63.6)	50.2 (35.6–68.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

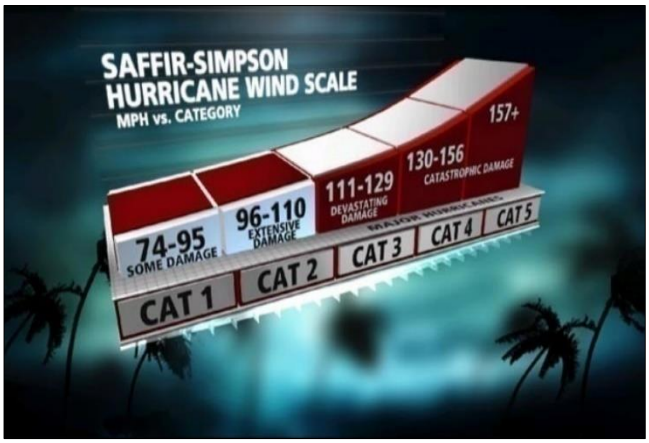
Hurricanes and Tropical Storms

Description

A tropical cyclone is a rotating, organized system of clouds and thunderstorms that develop over subtropical or tropical waters with lowered pressure and a closed low-level circulation. These cyclones have a counterclockwise rotation and depending on their maximum sustained winds they are classified as a tropical depression, tropical storm or hurricane. Tropical cyclones that contain all the characteristic previously mentioned and maximum sustained surface winds between 23-38 mph are classified as a tropical depression, when it reaches winds between 39-73mph, it is called a tropical storm. Once the maximum sustained winds reach 74 mph, it is then a hurricane. Tropical cyclones that pose a threat to Miami-Dade County usually form during the Atlantic hurricane season that starts on June 1st and goes through November 30th.

The term hurricane is used for tropical cyclones in the Northern Hemisphere and east of the International Dateline. Hurricanes are considered one of the most damaging and deadly weather events that occur in the United States, with violent winds, waves reaching heights of 40 feet, torrential rains, flooding and tornadoes. According to the National Oceanic and Atmospheric Administration (NOAA), there are an average of 11 tropical storms that form over the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico regions each year, and on average 6 of the tropical storms develop into hurricanes. The United States experiences a hurricane strike on land about once every year and a half. The strike zone can potentially extend anywhere from Maine and south to Texas. Hurricanes are further classified according to their wind speeds.

Winds



The Saffir-Simpson Hurricane Wind Scale was first developed in the early 1970s to categorize hurricanes by intensity. The scale used to include storm surge projections and central pressure by category of storm, but it was determined that there was not a direct correlation between wind speed, storm surge heights and central pressure. For example, hurricanes with wind fields which are very large in size can produce storm surge heights that are much higher than is average for a given category. Conversely, very compact hurricanes, with strong maximum sustained winds and a significant low central pressure can produce surges substantially lower than what was included in the original Saffir-Simpson Scale.

Today, the Saffir-Simpson Hurricane Wind Scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale provides examples of the type of damage and impacts in the United States associated with winds of the indicated intensity. In general, damage rises by about a factor of four for every category increase. Miami-Dade has experience sustained winds of up 150 mph and storm surge of 16.9 feet at the Burger King International Headquarters during Hurricane Andrew in 1992.

Storm Surge

From a hurricane, storm surge is often the greatest threat to life and property along the coast. Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tide. Storm surge is produced when the force of the winds moving around the storm push water towards the shore and this surge can travel several miles inland.[40] Predictions for storm surge are made through a variety of means, including the Sea, Lake and Overland Surges from Hurricanes (SLOSH) models.

Storm surge inundation is modeled in two zones: the high-velocity zone where wave action and debris can severely damage structures, and farther inland, where the primary concern is flooding as opposed to structural damage. Storm surge can create flooding that can destroy buildings and carry debris miles inland, into canals and rivers, the intercostal waterways and out to sea. The water can also pool in low-lying areas impeding response and recovery activities.

Damages associated with storm surge include but are not limited to:

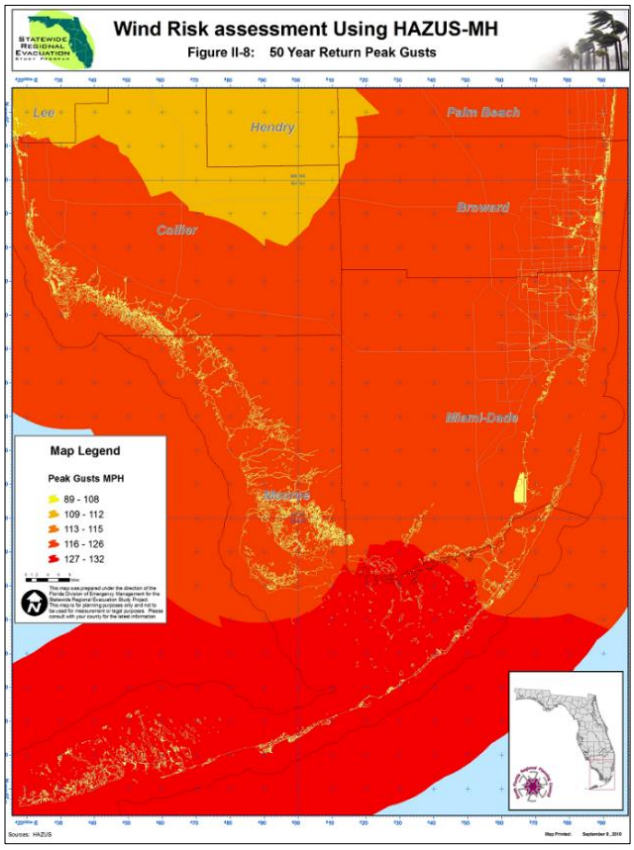
- Extreme flooding in coastal areas
- Inundation along rivers and canals
- Beach erosion
- Undermining of foundations of structures or roadways along the coastline (erosion or scour)
- In confined harbors and rivers, severely damaged marinas and boats
- Sunken vessels or underwater hazards in navigable waterways

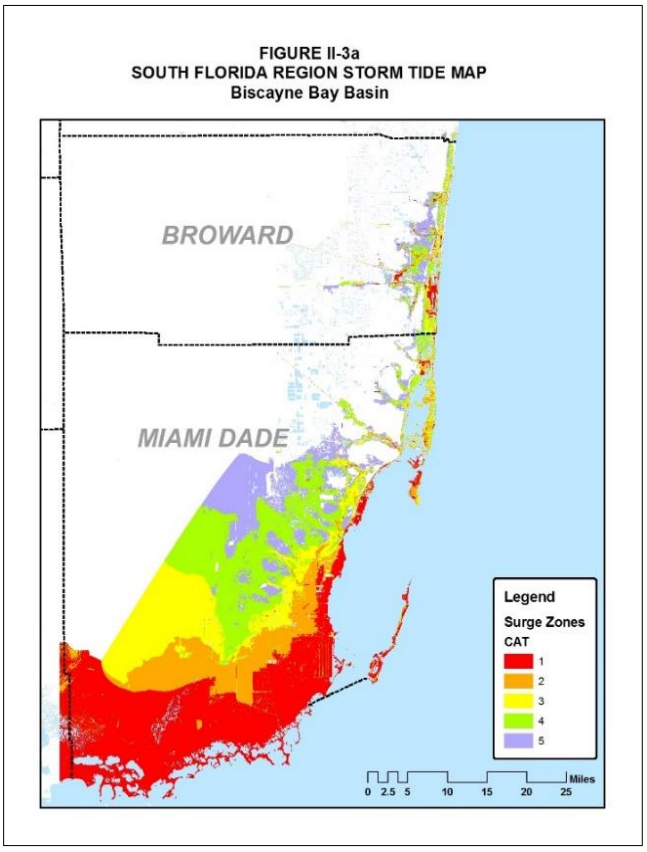
Location

Hurricanes and tropical storms can impact the entire county. The following two maps show the location for winds and storm surge based model runs by HAZUS and SLOSH.

[40] Source: National Hurricane Center, Storm Surge Overview

FIGURE 5. 50 YEAR RETURN FOR MAXIMUM SUSTAINED WINDS (LEFT) & POTENTIAL STORM SURGE FOR STORMS MODELED WITHIN THE BISCAYNE BAY BASIN (RIGHT)





Extent

Category 5 Hurricane with storm surge of 16.9 feet.

Impact

Historical observations from types of impacts and damages associated with the winds of hurricanes are included in Table 6. All of these have been experienced in Miami-Dade.

TABLE 6. POTENTIAL IMPACTS OF HURRICANES BY CATEGORY OF STORM

Potential Impacts by Category of Storm	
Category 1 Very Dangerous Winds	• People, livestock, and pets struck by flying or falling debris could be injured or killed. • Extensive damage to power lines and poles will likely result in power outages that could last a few to several days. • Pre-1994 mobile homes may be damaged or destroyed, especially if they are not anchored properly • Damage to newer mobile homes anchored properly involving the removal of shingle or metal roof coverings, loss of vinyl siding and damage to carports, sunrooms or lanais • Poorly constructed frame homes may have major damage – loss of roof covering, damage to gable ends and removal of porch coverings and awnings • Unprotected windows may be broken by flying debris • Masonry chimneys can be toppled • Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels and gutters. • Failure of aluminum, screened-in, swimming pool enclosures can occur. • Some apartment building and shopping center roof coverings could be partially removed. • Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. • Failures to overhead doors and unprotected windows will be common. • Windows in high-rise buildings can be broken by flying debris. • Occasional damage to commercial signage, fences, and canopies. • Large branches of trees will snap and shallow rooted trees can be toppled.

Potential Impacts by Category of Storm	
Category 2 Extremely Dangerous Winds	• There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. • Near-total power loss is expected with outages that could last from several days to weeks. • Potable water could become scarce as filtration systems begin to fail. • Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. • Newer mobile homes can also be destroyed. • Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. • Unprotected windows will have a high probability of being broken by flying debris. • Well-constructed frame homes could sustain major roof and siding damage. • Failure of aluminum, screened-in, swimming pool enclosures will be common. • There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. • Unreinforced masonry walls can collapse. • Windows in high-rise buildings can be broken by flying debris. • Commercial signage, fences, and canopies will be damaged and often destroyed. • Many shallowly rooted trees will be snapped or uprooted and block numerous roads.
Category 3 Devastating Damage	• There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris • Electricity and water will be unavailable for several days to a few weeks after the storm passes. • Nearly all older (pre-1994) mobile homes will be destroyed. • Most mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. • Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. • Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. • There will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings. • Isolated structural damage to wood or steel framing can occur. • Complete failure of older metal buildings is possible, and older unreinforced masonry buildings can collapse. • Most commercial signage, fences, and canopies will be destroyed. • Many trees will be snapped or uprooted.

Potential Impacts by Category of Storm	
Category 4 Catastrophic Damage	• There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. • Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. • Most of the area will be uninhabitable for weeks or months. • Nearly all older (pre-1994) mobile homes will be destroyed. • A high percentage of newer mobile homes also will be destroyed. • Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. • Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. • Extensive damage to roof coverings, windows, and doors will occur. • Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. • There will be a high percentage of structural damage to the top floors of apartment buildings. • Steel frames in older industrial buildings can collapse. • There will be a high percentage of collapse to older unreinforced masonry buildings. • Most windows will be blown out of high-rise buildings. • Nearly all commercial signage, fences, and canopies will be destroyed. • Most trees will be snapped or uprooted and power poles downed.

Potential Impacts by Category of Storm	
Category 5 Catastrophic Damage	• People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes • Power outages will last for weeks to possibly months. • Long-term water shortages will increase human suffering. • Most of the area will be uninhabitable for weeks or months. • Almost complete destruction of all mobile homes will occur, regardless of age or construction. • A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. • Extensive damage to roof covers, windows, and doors will occur. • Large amounts of windborne debris will be lofted into the air. • Windborne debris damage will occur to nearly all unprotected windows and many protected windows. • Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. • Complete collapse of many older metal buildings can occur. • Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. • A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. • Nearly all windows will be blown out of high-rise buildings resulting in falling glass. • Nearly all commercial signage, fences, and canopies will be destroyed. • Nearly all trees will be snapped or uprooted and power poles downed.

Source: National Hurricane Center

Previous Occurrences

October 2017 – Tropical Storm Philippe was a disorganized storm as it moved across the Florida Straits on October 28th, making landfall in extreme South Florida along the Florida Bay on October 29th as a minimal tropical storm.

The storm brought widespread rainfall across all of South Florida, with average amounts of 2 to 4 inches across the region. The wind impacts of Philippe were limited to the east coast of South Florida. This storm produced maximum sustained winds generally between 25 and 35 mph across Miami-Dade County on October 28th. A peak gust of 41 mph was measured at Miami International Airport. Minor tree damage was reported across the area, with no significant property damage reported.[41]

[41] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

September 2017 – On August 30th, Tropical Storm Irma formed over the eastern Atlantic Ocean with maximum sustained winds of 50 mph. As the day progressed, Tropical Storm Irma continued strengthening and was expected to become a hurricane the following day. Irma's rapid intensification began in the early morning of August 31st, when the maximum sustained winds increased from 70 mph to 115 mph in less than 12 hours. Hurricane Irma, now a category 3 storm, continued its track across the Atlantic Ocean, as it headed towards the Leeward Islands. In the afternoon of September 4th, Miami-Dade County was within the 5-day forecast cone of a major hurricane. Due to the potentially catastrophic hurricane heading to Miami-Dade County, Miami-Dade OEM initiated preparations and activated the Emergency Operations Center (EOC) on September 5th. By the evening, Miami-Dade County was within the 3-day forecast cone.

In the morning of September 5th, less than 300 miles east of the Leeward Islands, Irma became a category 5 hurricane with maximum sustained winds of 175 mph. Catastrophic Hurricane Irma reached its peak strength later that day, with maximum sustained winds of 185 mph. For the next couple of days, Hurricane Irma wreaked havoc in Barbuda, Saint Barthélemy, Saint Martin, Anguilla and the Virgin Islands at its peak intensity causing catastrophic damage. Hurricane Irma continued its course through the Caribbean causing widespread damage in Puerto Rico, Hispaniola, Turks and Caicos, the Bahamas and Cuba. At 11pm on September 7th, Miami-Dade County was under a Hurricane Warning and Storm Surge Warning.

On Sunday, September 10th, category 4 Hurricane Irma made its first Florida landfall at Cudjoe Key in the lower Florida Keys at 9:10am. Hurricane Irma continued its northward track and made its second Florida landfall at Marco Island at 3:35pm as a category 3 hurricane. Widespread wind damage, heavy rainfall and storm surge was reported throughout Miami-Dade County. Hurricane and tropical storm force sustained winds were measured throughout the county and resulted in mostly tree damage. Rainfall amounts from September 9th through September 11th were between 5 and 10 inches. Recorded storm surge on Biscayne Bay (from south of Miami to Homestead) was between 4 and 6 feet, and on the east coast was between 2 and 4 feet. Also, an estimated $255 M in agricultural damage was reported in the county. Hurricane Irma was the first hurricane to make landfall in South Florida since Hurricane Wilma in 2005.

October 2016 – In the morning of September 28th, 2016, Tropical Storm Matthew formed over the Windward Islands with a high potential of strengthening. Matthew continued a westward track through the Caribbean and strengthening into a hurricane the next day on September 29th. On the forecast track, Hurricane Matthew would move west followed by a northwest turn and a then continue a northward track through western Haiti and eastern Cuba. On the evening of September 30th, Miami-Dade County was within the 5-day forecast cone of Category 5 Hurricane Matthew. Two days later, Miami-Dade County was not within the cone, but Miami-Dade OEM continued to be vigilant due to the storm's track potential to shift west. On Monday, October 3rd, the forecast track took a drastic westward shift putting Miami-Dade County within the 3-day forecast cone of a major hurricane. The following day, Miami-Dade County was under a Tropical Storm Warning.

Ultimately, the county was affected by the outside bands of Hurricane Matthew, as it continued its paralleled track along the Florida east coast. Rainfall amounts of up to 1.5 inches were recorded throughout the County. Although, no significant damage was reported, Miami-Dade agencies and municipalities estimated $10M for public assistance eligible categories.

August 2016 – On August 18th, 2016 a tropical disturbance off the coast of Africa was designated as Invest 99L. Invest 99L continued its track across the Atlantic Ocean and on August 23rd, the system was located east of the Lesser Antilles. At this time, the system was posing a threat for South Florida with a high percent chance of development within the following 5 days. The disturbance was forecasted to mature into a stronger tropical cyclone, but as the system continued its west northwest track through a hostile atmospheric environment which hindered its development. Ultimately, the disturbance continued its trajectory south of the lower Florida Keys, evading Miami-Dade County.
No significant impacts were recorded for Miami-Dade County. Invest 99L eventually developed into Hurricane Hermine and made landfall in the Florida Panhandle on September 2nd, 2016.

August 2015 – On the evening of August 24th, 2015, an area of low pressure located over the Atlantic Ocean developed into Tropical Storm Erika. The evening of August 25th, the tropical system was forecasted to make landfall in the county as a Category 1 hurricane on the Saffir-Simpson Hurricane Wind Scale. Miami-Dade County was inside the storm's track until the morning of August 29th, when the storm was downgraded to a trough of low pressure after its interaction with Hispaniola. Due to the trailing moisture, local heavy rains and gusty winds were forecasted to spread across portions of South Florida for the following days.[42] A Flood Watch was in effect and tidal flooding along the Atlantic coast was possible until Monday, August 31st.[43] FPL reported about 3,300 customers without power. Ultimately, no public protective actions were taken and no significant impacts were reported throughout the county.

August 2012 – Tropical Storm Isaac moved across the Florida Keys and Miami-Dade experienced a storm surge measured at 1.3 feet and sustained winds measuring 29 mph at the Miami International Airport. In a 72-hour period portions of the county received between 2-10 inches of rain. Wind damage in southern Florida was minor and mostly limited to downed trees and power lines.[44] Approximately 26,000 customers lost power in Miami-Dade. There was no Presidential Declaration for damages within Miami-Dade. Miami-Dade agencies and municipalities estimated $5.5 M for public assistance eligible categories.[45]

[42] National Hurricane Center, Tropical Storm Erika Advisory Archive (AL052015)
[43] Miami-Dade County EOC Activation Archive, Situation Report #1
[44] National Hurricane Center, Tropical Cyclone Report Hurricane Isaac (AL092012)
[45] Miami-Dade County EOC Activation Archive

October 2012 – Hurricane Sandy, never made landfall locally, but paralleled the coast causing coastal erosion with reports of waves up to 10 feet in Miami-Dade. There was no Presidential Declaration for damages within Miami-Dade. It was estimated by the Miami-Dade Regulatory and Economic Resources Department that there was approximately $2M in damages from coastal erosion.[46]

October 2005 – Hurricane Wilma, made landfall in southwestern Florida on October 24th as a Category 3, crossing Florida in less than 5 hours.[47] Wilma caused structural damage from hurricane force winds out to the west and southwest. Widespread light to moderate wind damage was sustained throughout the county. In downtown Miami, numerous high-rise office buildings were severely impacted by hurricane force winds. The Miami Metromover was closed due to falling debris from a neighboring high rise building. Power outages occurred county-wide for three weeks due to damaged power lines and utility poles. Power losses to service station fuel pumps caused a major but temporary impact on recovery operations. Wind damage to trees and shrubs (native and ornamental) was extensive throughout the county. Ficus trees and Australian Pines sustained the majority of the tree damage, while palms appeared to fare well. Throughout the Biscayne Bay area there was significant marine damage. Many boats were blown up into bulkheads, docks, and overpasses. Some vessels were freed from their moorings and deposited hundreds of feet from where they were originally docked. The Port of Miami sustained damage to roughly 2,000 feet of bulkheads and a cruise terminal lost a section of its roof. The Sunny Isles Marina dry storage facility collapsed, damaging close to 300 vessels. Numerous docks and pilings throughout the county were severely damaged by the battering of vessels that were moored to them. On the barrier islands, there was sporadic minor to moderate wind damage to ocean front high-rise condominiums, low-rise motels, commercial buildings, and single-family dwellings. The typical wind damages were broken windows, damaged hurricane shutters, and minor roofing losses.

August 2005 – Hurricane Katrina, made landfall in Miami-Dade County on August 25th. Katrina caused flooding to about 50 single-family dwellings from a measured 12.25 inches of rain, but no major structural damage was reported in south Miami-Dade. Adjacent Homestead to the south, storm water flooding was also sustained in Florida City. In addition, an overpass under construction in Miami collapsed onto the Dolphin Expressway between 87th and 97th Avenues. Katrina did cause significant tree damage at Cape Florida State Park.

October 1999 – Hurricane Irene, made landfall in Miami-Dade County on October 15th. The category one intensity hurricane moved northeast across central Miami-Dade County before exiting to the Atlantic in Palm Beach County. Heavy rains and sustained winds of

[46] Miami-Dade County EOC Activation Archive
[47] National Hurricane Center, Tropical Cyclone Report Hurricane Wilma

tropical storm force caused widespread flooding and power outages in the Miami metropolitan area. Rainfall totals in southeast Florida ranged from 6 to 17 inches. The highest recorded wind gust was 85mph at the Homestead Air Reserve Base.[48]

August 1992 – Hurricane Andrew, which was reclassified as a Category 5 in 2002, made landfall in Miami-Dade County on August 24th, 1992. Damage was estimated at $25 billion, with 25,524 homes destroyed and 101,241 damaged. 90% of all mobile homes in the southern portion of the county were totally destroyed. The Miami Herald reported $.5 billion losses for boats. The powerful seas extensively damaged offshore structures, including the artificial reef system.[49]

The last Presidential Disaster Declarations for Hurricanes in Miami-Dade occurred after Hurricane Wilma in 2005. Wilma impacted Miami-Dade in October 2005 and caused

TABLE 7. SOUTH FLORIDA HURRICANES & STORMS 1906-2018

Date	Name	Category	Wind	Surge	Deaths	Damage $
6/17/1906	Hurricane #2	1	80	Unk	0	Unk
10/18/1906	Hurricane #8	3	120	Unk	164	160,000
10/11/1909	Hurricane #9	2	100	Unk	0	Unk
10/21/1924	Hurricane #7	TS	70	Unk	0	Unk
9/18/1926	Hurricane #6	4	138	13.2’	243	1.4 Billion
10/21/1926	Hurricane #10	2	110	Unk	0	Unk
9/17/1928	Hurricane #4	4	132	10-15’	2,500*	26,000,000
9/28/1929	Hurricane #2	2	100	Unk	0	Unk
9/3/1935	Hurricane #2	5	160	20+	408	6,000,000
11/4/1935	Hurricane #6	1	75	6’	19	5,500,000
10/6/1941	Hurricane #5	3	120	8’	5	700,000
9//16/1945	Hurricane #9	4	138	13.7’	4	540,000,000
9/22/1948	Hurricane #7	2	98	8’	0	Unk
10/6/1948	Hurricane #8	2	105	6.2’	0	5,500,000
8/27/1949	Hurricane #2	4	130	Unk	2	52,000,000
10/18/1950	King	2	105	14’	3	28,000,000
9/10/1960	Donna	4	136	13’	50	1.8 Billion
8/27/1964	Cleo	2	105	6’	3	28,000,000
9/8/1965	Betsy	3	125	9’	75	6.4 Billion
10/4/1966	Inez	1	85	15.5’	48	5,000,000
9/3/1979	David	2	98	3-5’	5	10,000,000
8/24/1992	Andrew	5†	155	16.9’	48	30 Billion
11/16/1994	Gordon	TS	52	3-5’	0	90,000,000
9/25/1998	Georges	2	98	5-6’	0	12,500,000
11/5/1998	Mitch	TS	65	3-4’	0	100,000
10/15/1999	Irene	1	75	3-5’	4	800,000,000

[48] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[49] National Hurricane Center, Preliminary Report Hurricane Andrew

Date	Name	Category	Wind	Surge	Deaths	Damage $
10/3/2000	To become Leslie	TD	35	2-4’	0	500,000,000
9/3/2004	Frances	1	75	2-4’	0	33,000,000
9/25/2004	Jeanne	TS	50	2-4’	0	10,400,000
8/25/2005	Katrina	1	80	2-4’	0	800,000,000
9/18/2005	Rita	TS	50	2-3’	0	12,000,000
10/24/2005	Wilma	2	110	5-6’	0	1.5 billion
08/27/2012	Isaac	TS	29	1-2’	0	Unk
10/26/2012	Sandy	1	60	1-2’	0	Unk
6/6/2013	Andrea	TS	65	2-4’	0	Unk
10/6/2016	Matthew	TS	50	1-2’	2	1,200,000
9/9/2017	Irma	1	99	4-6’	5	800,000,000
10/28/17	Philippe	TS	35	N/A	0	N/A

Note: The date listed is the date of landfall in South Florida and the category of storm shown is the highest category that existed when the storm passed over or near Miami-Dade County.

† Hurricane Andrew was reclassified from a Cat 4 storm to Cat 5 in 2002 by the National Hurricane Center.
Sources: *National Weather Service, Miami Forecast Office*
NOAA National Hurricane Center/Tropical Prediction Center
Florida State University Meteorology Department
Florida Hurricanes and Tropical Storms (Williams & Duedall)

Vulnerability

Physical Vulnerabilities

The entire built environment (Critical Infrastructure, Key Resources, and Building Stock) may be vulnerable to hurricanes and tropical storms due to wind, rain and/or storm surge damages. Structures that do not have impact resistant features or protection that can be installed may be more vulnerable to winds. Homes that were built under older building codes and standards may be more vulnerable to wind damages. Per the HAZUS conducted by the State of Florida in 2018, Miami-Dade has the following physical vulnerabilities.

HAZUS estimates that in 2019 there are 575,844 buildings in the region which have an aggregate total replacement value of $213,289,402. Table 1 presents the relative distribution of the value with respect to the general occupancies.

Coastal areas and areas along canals and rivers, as depicted in the storm surge map, may be more vulnerable to surge. Coastal areas are at greater risk for high velocity surge and erosion. Low lying areas are more vulnerable to flooding if a storm brings significant rainfall. Uprooted trees can cause damages to underground and overhead utilities. Hurricanes and tropical storms may also cause flying debris that cause additional damages. These storms can also impact the natural and agricultural resources as well, causing severe coastal erosion and flooding or wind damage to agricultural assets. The extent of debris and infrastructure outages and restoration times can complicate and increase

response and recovery timelines. Part 7 provides tables that show how many Commercial, Industrial, Residential and Other types of structures are within Storm Surge Planning Zones.

TABLE 8. BUILDING EXPOSURE BY OCCUPANCY TYPE

Occupancy	Exposure ($1,000)	Percent of Total
Residential	140,918,020	66.1%
Commercial	36,916,484	17.3%
Industrial	2,273,279	1.1%
Agricultural	905,243	0.4%
Religious	2,731,747	1.3%
Government	20,608,864	9.7%
Education	8,935,765	4.2%
Total	**213,289,402**	**100.0%**

Essential Facility Inventory

For essential facilities, there are 38 hospitals in the region with a total bed capacity of 10,829 beds. There are 512 schools, 109 fire stations, 67 police stations and 6 emergency operation facilities.[50]

Mobile/Manufactured Homes

There are currently 59 mobile home parks within Miami-Dade County. On an annual basis the Miami-Dade County Office of Emergency Management conducts an assessment of these sites. This assessment verifies their location and the total number of mobile homes are on-site.

[50] 2018 HAZUS Report for Miami-Dade County

TABLE 9. MOBILE HOME PARKS IN MIAMI-DADE COUNTY[51]

NAME	ADDRESS	CITY	ZIP CODE	PHONE	TOTAL UNITS	TYPE
ALL STAR 36 STREET	3010 NW 36 Street	MIAMI-DADE	33142	305-557-1122	53	MHP
AMERICANA VILLAGE CONDO ASSOC. MHP	19800 SW 180 Avenue	MIAMI-DADE	33187	305-253-6025	525	MHP
AQUARIUS MOBILE HOME PARK	451 SE 8 Street	HOMESTEAD	33030	305-248-9383	190	MHP
BISCAYNE BREEZE PARK	11380 Biscayne Blvd.	MIAMI-DADE	33181	786-220-7482	61	MHP
BLUE BELLE TRAILER PARK	3586 NW 41 Street	MIAMI-DADE	33142	305-635-1755	150	MHP
BOARDWALK MHP	100 NE 6 Avenue	HOMESTEAD	33030	305-248-2487	158	MHP
CARLEY'S MHP	4111 NW 37 Avenue	MIAMI-DADE	33142	305-635-5134	70	MHP
COCOWALK ESTATES	220 NE 12 Avenue	HOMESTEAD	33030	305-246-5867	218	MHP
COLONIAL ACRES MOBILE HOME PARK	9674 NW 10 Avenue	MIAMI-DADE	33150	305-696-6231	296	MHP
COURTLY MANOR MOBILE HOME PARK	12401 West Okeechobee Road	HIALEAH GARDENS	33018	305-821-1400	525	MHP
FLAGAMI PARADISE TRAILER PARK	2750 NW South River Drive	MIAMI	33125	305-634-1002	100	MHP
FLORIDA CITY CAMP SITE & RV PARK	601 NW 3 Avenue	FLORIDA CITY	33034	305-248-7889	280	MHP
GABLES TRAILER PARK	825, 935 & 955 SW 44 Avenue	MIAMI-DADE	33134	305-903-2000	95	MHP
GATEWAY ESTATES MHP	35250 SW 177Court	MIAMI-DADE	33034	305-247-8500	222	MHP
GATEWAY WEST MHP	35303 SW 180 Avenue	MIAMI-DADE	33034	305-246-5867	120	MHP
GATOR PARK RV Park	24050 SW 8 Street	MIAMI-DADE	33194	305-559-2255	30	RV
GOLD COASTER TRAILER PARK	34850 SW 187 Avenue	Homestead	33034	305-248-5462	547	MHP
HIALEAH TRAILER PARK	425 E 33 Street	HIALEAH	33013		32	MHP
HIBISCUS MOBILE HOME PARK INC	3131 West 16 Avenue	HIALEAH	33012		34	MHP

[51] Miami-Dade OEM 2019 Mobile Home List

NAME	ADDRESS	CITY	ZIP CODE	PHONE	TOTAL UNITS	TYPE
HIGHLAND VILLAGE MOBILE HOME PARK	13565 NE 21 Avenue	NORTH MIAMI BEACH	33181	305-948-2928	500	MHP
HOLIDAY ACRES MOBILE HOME PARK INC	1401 W 29 Street	HIALEAH	33012	305-822-4611	84	MHP
HOMESTEAD TRAILER PARK	31 SE 2 Road	HOMESTEAD	33030	305-247-4021	50	MHP
HOMETOWN UNIVERSITY LAKES	12850 SW 14 Street	MIAMI-DADE	33184	305-226-4251	1154	MHP
HONEY HILL MOBILE HOME PARK	4955 NW 199 Street	MIAMI-DADE	33055	305-625-9255	438	MHP
J. BAR J.	2980 NW 79 Street	MIAMI-DADE	33147	305-691-2432	99	MHP
JONES FISHING CAMP TRAILER	14601 NW 185 Street	MIAMI-DADE	33018	954-536-7400	52	MHP
LARRY/PENNY THOMPSON	12451 SW 184 Street	MIAMI-DADE	33177	305-232-1049	240	RV
LEISURE EAST (PALM GARDENS RV PARK)	28300 SW 147 Avenue	MIAMI-DADE	33033	305-247-8915	39	MHP
LIL ABNER MOBILE HOME PARK	11239 NW 4 Terrace	MIAMI-DADE	33172	305-221-7411	908	MHP
MEDLEY LAKESIDE RETIREMENT PARK	10601 NW 105 Way	MEDLEY	33178	305-888-3322	86	MHP
MEDLEY MOBILE HOME PARK	8181 NW South River Drive	MEDLEY	33166	305-885-7070	206	MHP
MIAMI HEIGHTS TRAILER PARK	3520 NW 79 Street	MIAMI-DADE	33147	305-691-2969	127	MHP
LION MIAMI TERRACE MOBILE HOME PARK	1040 SW 70 Avenue	MIAMI-DADE	33144	305-261-0551	92	MHP
MIAMI-EVERGLADES KAMPGROUND	20675 SW 162 Avenue	MIAMI-DADE	33187	305-233-5300 & 786-293-2208	254	RV
PALM GARDENS MOBILE HOME PARK	28501 SW 152 Avenue	MIAMI-DADE	33033	305-247-8915	275	MHP
PALM LAKE MOBILE HOME PARK	7600 NW 27 Avenue	MIAMI-DADE	33147	786-787-6003	118	MHP
PALMETTO TRAILER ESTATES	3205 West 16 Avenue	HIALEAH	33012		95	RV
PINE ISLE MOBILE HOME PARK	28600 SW 132 Avenue	MIAMI-DADE	33033	305-248-0783	282	MHP

NAME	ADDRESS	CITY	ZIP CODE	PHONE	TOTAL UNITS	TYPE
PRINCETONIAN MOBILE HOME PARK	12900 SW 253 Terrace	MIAMI-DADE	33032	(305) 257-3251	191	MHP
REDLAND MO-BILE HOME PARK	17360 SW 232 Street	MIAMI-DADE	33170	305-247-7707	80	MHP
RIVER PARK TRAILER	2260 NW 27 Avenue	MIAMI-DADE	33142	305-635-4803	109	MHP
RIVIERA MOBILE HOME PARK	19900 NW 37 Avenue	MIAMI GAR-DENS	33055	305-624-5888	162	MHP
ROVELL TRAILER PARK	939 NW 81 Street	MIAMI-DADE	33150	305-586-7045	138	MHP
ROYAL COUN-TRY MOBILE HOME PARK	5555 NW 202 Terrace	MIAMI-DADE	33055	305-621-2270	864	MHP
ROYAL DUKE	3620 NW 30 Avenue	MIAMI-DADE	33142	(786) 499-5551	99	MHP
SHADY OAK TRAILER PARK	14701 NE 6 Avenue	MIAMI-DADE	33161		25	MHP
SILVER COURT TRAILER PARK	3170 SW 8 Street	MIAMI	33135	305-266-1727	236	MHP
SILVER PALM MOBILE HOME PARK	17350 SW 232 Street	MIAMI-DADE	33170	954-665-9050	110	MHP
SIX AVENUE TRAILER PARK	14752 NE 6 Avenue	MIAMI-DADE	33161	305-582-0867	22	MHP
SOUTHERN COMFORT R V RESORT LLC	345 East Palm Drive	FLORIDA CITY	33034	305-248-6909	300	RV
STRAWBERRY VILLAGE TRAILER PARK	1451 W 29 Street	HIALEAH	33012		39	MHP
SUNNY GAR-DENS TRAILER PARK	2901 West 16 Avenue	HIALEAH	33012	305-822-5921	93	MHP
SUNNYLAND TRAILER PARK	129 NW 79 Street	MIAMI-DADE	33150	786-505-5239	105	MHP
SUNNYSIDE MO-TEL & TRAILER PK INC	6024 SW 8 Street	WEST MIAMI	33144	305-266-1727	105	MHP
TRINIDAD COURT	7930 NW Miami Court	MIAMI-DADE	33150	786-505-5239	173	MHP
TROPICAL VIL-LAGE	1398 NW 79 Street	MIAMI-DADE	33147	305-696-0059	108	MHP
HOMETOWN UNI-VERSITY LAKES	12850 SW 14 Street	MIAMI-DADE	33184	305-226-4251	1153	MHP
WESTHAVEN TRAILER PARK	6020 SW 8 Street	WEST MIAMI	33144	305-266-0488	21	MHP
WESTLAND MO-BILE HOME PARK	1175 NW 79 Street	MIAMI-DADE	33150		114	MHP

NAME	ADDRESS	CITY	ZIP CODE	PHONE	TOTAL UNITS	TYPE
WYNKEN BLYNKEN & NOD MOBILE HOME PARK	2775 West Okeechobee Road	HIALEAH	33010	305-887-6570	180	MHP

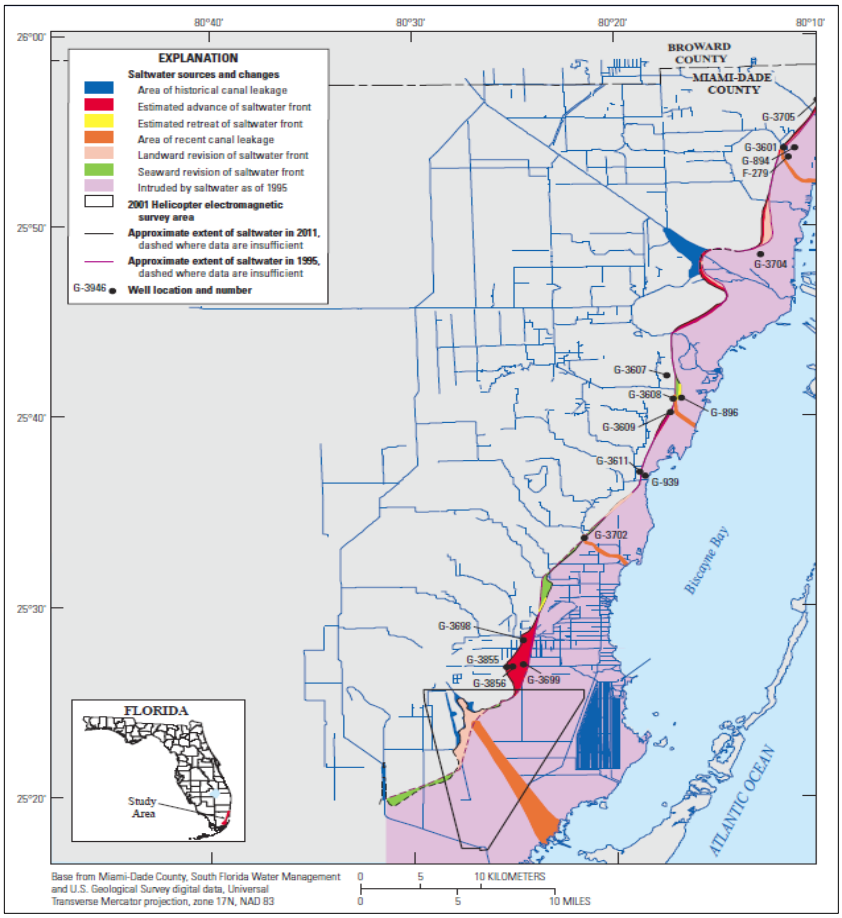
Social Vulnerabilities

Mobile/manufactured home residents, electric dependent, functional needs and persons who may not have adequate resources to protect their homes or access to evacuation resources are at greatest risk for this hazard. Visitors and persons who are new to this area may also be more vulnerable as they may not be familiar with what to do in case an evacuation order is given. Prolonged power outages and gas shortages cause additional challenges to businesses and service providers and can disproportionately impact persons whom rely upon regular home services such as medical services or food delivery.

Saltwater Intrusion

Description

According to the United States Geological Survey (USGS), saltwater intrusion is a generic term referring to an influx of saltwater through various pathways into an aquifer. The South Florida Water Management District defines it as chloride concentrations exceeding drinking water standards of 250 mg/1.[52] Saltwater Intrusion is a major threat to the freshwater resources of the coastal areas in southeastern Florida.



[52] Miami-Dade Water and Sewer Department, *20-year Water Supply Facilities Work Plan (2014-2033)*, Support Data, November 2014 http://www.miamidade.gov/water/library/20-year-water-supply-facilities-work-plan.pdf

There are three primary mechanisms by which saltwater contaminates the freshwater reservoir in the unconfined, surficial aquifers of the region: (1) encroachment of saltwater from the ocean along the base of the aquifer; (2) infiltration of saltwater from coastal saltwater mangrove marshes: and (3) the flow of saltwater inland through canals where it leaked into the aquifer. Per the USGS paper referenced below, "Saltwater intrusion of the Biscayne aquifer began when the Everglades were drained to provide dry land for urban development and agriculture."

Location

The above 2014 map was produces by the U.S. Geological Survey (USGS) and shows the areas of Miami-Dade that are experiencing saltwater intrusion. This includes unincorporated Miami-Dade County and the municipalities of Homestead, Cutler Bay, Palmetto Bay, Pinecrest, South Miami, Coral Gables, Miami, Miami Shores, North Miami, North Miami Beach and Aventura.

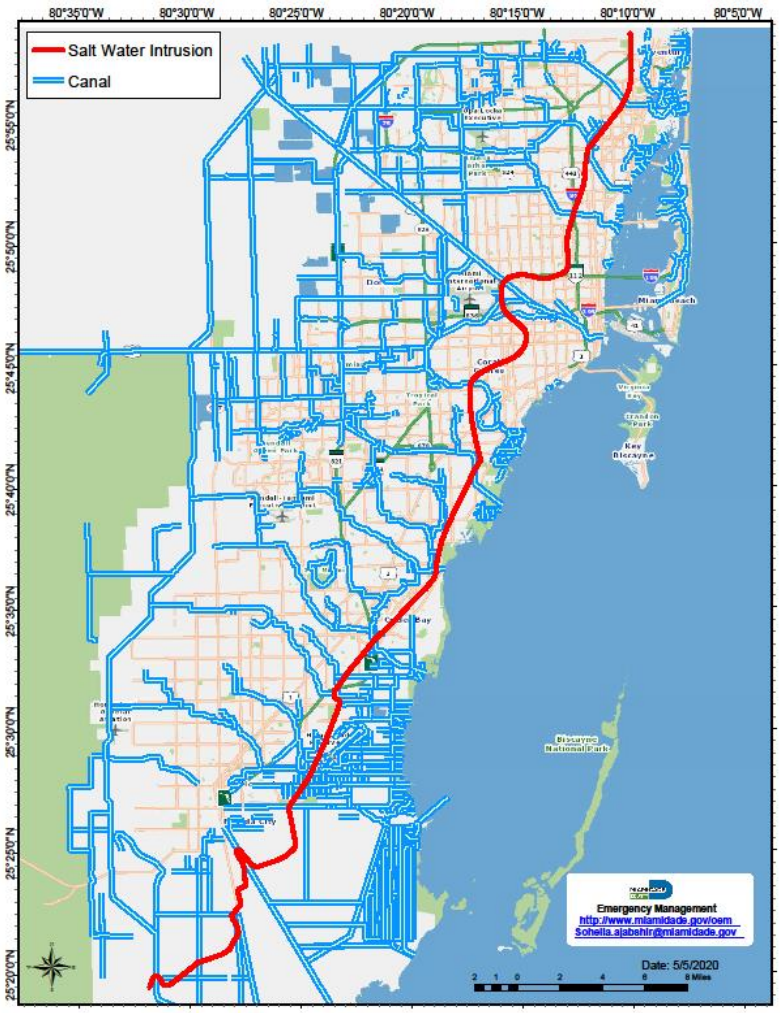
Extent

The USGS and Miami-Dade Water and Sewer Department actively monitor saltwater intrusion. As of 2011, approximately 1,200 square kilometers of the mainland part of the Biscayne Aquifer were intruded by saltwater.[53] The map on the next page shows future salt water intrusion impacted by projected sea level rise for year 2040, with projected pumpage rates for year 2030. The red line indicates the expected minimal change to the salt front.

[53] Report on Flooding and Salt Water Intrusion, September 2016: https://www.miamidade.gov/green/library/sea-level-rise-flooding-saltwater-intrusion.pdf

Impact

There is concern that saltwater intrusion can threaten the coastal drinking water supply well fields. Shallow-water marine organisms are very sensitive to environmental changes in salinity, temperature, nutrient input, and dissolved oxygen. Temporal and spatial salinity patterns in Biscayne Bay have profoundly affected the marine ecosystem caused by water-management driven changes in surface and ground-water discharge. In addition to those changes caused by natural events, long-term change in land and water uses during the 20th century in the bay watershed contributed greatly to the deterioration of marine conditions. Water quality has been greatly degraded by increased nutrient loads, trace metals, and other pollutants.[54] An increase in mangrove areas and reduction in sawgrass habitat have been recorded in the Everglades. Less salt-tolerant plants like sawgrass, spike rush and tropical hardwood hammocks are retreating as salt-loving mangroves expand.



Previous Occurrences

Saltwater intrusion has been monitored by the USGS since 1939. Per the USGS "in 1904 (prior to any human-induced drainage), the saltwater interface was estimated to be at or near the coast because of the very high-water levels which occurred naturally in the Everglades. Freshwater was reported to seep from the Biscayne aquifer offshore into Biscayne Bay in sufficient quantities to be used as a supply of freshwater for ships. Beginning in 1909 with the extension of the Miami River and continuing through the 1930's, construction of drainage canals (with no control structures) and pumpage from coastal well fields resulted in the lowering of water levels in the Biscayne aquifer, thereby inducing the inland movement of saltwater into the aquifer. Additionally, seawater driven by tides

[54] USGS South Florida Information Access: http://sofia.usgs.gov/publications/circular/1275/changebb.html

flowed inland in the drainage canals, resulting in the seepage of saltwater into the Biscayne aquifer from the canals. By 1946, salinity-control structures had been installed in all primary canals as far seaward as possible. These controls prevented saltwater driven by tidal changes from moving upstream in the canals beyond the controls. The controls also served to backup freshwater which maintained higher water levels in the Biscayne aquifer near the coastline. These water levels are higher than those that occurred during the period of uncontrolled drainage. The inland migration of saltwater in northern Miami-Dade County slowed or reversed in some areas as a result of the effects of these controls on water levels.

In the early 1960's, the existing canal system in southern Miami-Dade County was expanded to provide for flood control. The canals were equipped with flow-regulation structures both near the coast and inland, allowing water levels to be stepped down from structure to structure to prevent excessive drainage. However, the design and operation of this system lowered freshwater levels in the Biscayne aquifer, especially near the coast, allowing for the inland movement of saltwater during the drought years of 1970 and 1971. In 1976, additional water was routed to southern Miami-Dade County, raising water levels along the coast and slowing or reversing the inland movement of the saltwater interface.[55]

Since 1984, additional events have occurred which have affected water levels in the Biscayne aquifer and, hence, the movement of the saltwater interface. Among these events are the initial operation of the Northwest Well Field and a consequent reduction in pumping from the Hialeah-Miami Springs Well Field, expansion of the Southwest Well Field, and changes in the delivery schedule of water to southern Dade County and Everglades National Park. Future changes in water levels might occur as a result of changes in the management of the ecosystem of south Florida. These changes will be based on the results of studies being conducted as part of the U.S. Geological Survey South Florida Ecosystem Program and other studies.[56]

Per the USGS paper referenced below, “some saltwater likely leaked from canals prior to the installation of water control structures. Near the Miami Canal northwest of the water control structure S-26, this saltwater is gradually mixing with the groundwater and salinity is gradually decreasing. Modern leakage of saltwater likely is occurring along the Card Sound Road canal and upstream of salinity control structures in the Biscayne, Black Creek and Snapper Creek Canals. Saltwater also may have leaked from the Princeton Canal and the canal adjacent to well G-3698, although this leakage could not be confirmed or refuted with available information.”

[55] USGS Caribbean-Florida Water Science Center: http://fl.water.usgs.gov/Miami/online_reports/wri964285/index.html#Klein
[56] USGS Caribbean-Florida Water Science Center: http://fl.water.usgs.gov/Miami/online_reports/wri964285

Vulnerability

Physical Vulnerabilities
The SFWMD has identified "Utilities at Risk" for salt water intrusion, which include utilities with well fields near the saltwater/freshwater interface that do not have an inland well field, have not developed adequate alternative sources of water, and have limited ability to meet user needs through interconnects with other utilities; and "Utilities of Concern", which include utilities having well fields near the saltwater/freshwater interface, the ability to shift pumpages to an inland well field, or an alternative source that is not impacted by the drought (SFWMD, 2007). Miami-Dade WASD well fields included as "Utility at Risk" are South Miami-Dade Well fields (Newton, Elevated Tank, Naranja, Leisure City, Roberta Hunter Park and Caribbean Park). MDWASD Utilities of Concern include the North and Central Miami-Dade Well fields (Hialeah-Preston and Alexander Orr).

Well fields are at risk and as such protection areas have been delineated and are monitored. Saltwater intrusion can impact the rates at which groundwater is pumped to supply drinking water supplies and also may require deeper wells to be drilled. Agricultural crops may be impacted by the salinity levels. Saltwater intrusion can also displace the fresh groundwater thereby impacting the water-table elevations in urban areas levels that could increase localized flooding.

Social Vulnerabilities
This hazard does not tend to affect one population over another.

Sea Level Rise

Description
Sea Level Rise refers to the increase currently observed in the average Global Sea Level Trend, which is primarily attributed to changes in ocean volume due to two factors: ice melt and thermal expansion. Melting of glaciers and continental ice masses, such as the Greenland ice sheet, which are linked to changes in atmospheric temperature, can contribute significant amounts of freshwater input to the Earth's oceans. Additionally, a steady increase in global atmospheric temperature creates an expansion of saline sea water (i.e., salt water) molecules (called thermal expansion), thereby increasing ocean volume.

Sea level rise is occurring due to three main factors, all of which are occurring due to global climate change:

- Thermal Expansion: As with all water, when the ocean heats up, it expands. About 50% of the sea level rise in the past 100 years is because the ocean is warmer, and therefore takes up more space.

- Glacier and Polar Ice Cap Melting: Although glaciers and polar ice caps naturally melt a little each summer, they usually regain lost area during the winter. However, warmer winters have meant less opportunity to regrow this ice, resulting in more melted water remaining in the oceans, contributing to sea level rise.
- Greenland and West Antarctic Ice Loss: Similar to what is happening with glaciers and the polar ice cap, the huge ice sheets that cover Greenland and Antarctica are melting.

Sea level rise increases the impact and frequency of storm surge and the risk of tidal flooding. Sea level rise also increases the damage caused by hurricanes and tropical storms when surge and rainfall occur together, as happened with Tropical Storm Leslie (1999) and Hurricane Irene (2000).

But the rate of sea level rise is uncertain, and the interactions between sea level rise, surge and flooding is a complex technical problem that requires both near-term and long-term coordinated solutions. This is a challenging task. An emerging field of study called 'decision making under deep uncertainty' has developed several approaches to this type of problem. One approach, called Dynamic Adaptive Policy Pathways (DAPP), has been used to look for strategies to mitigate the increased risk of flooding caused by sea level rise in the C7 Basin of Miami-Dade.

The South Florida Water Management District recently completed a two-part FEMA sponsored flood study that, first, examined the impact of sea level rise on flood risk and, second, identified and examined a range of flood mitigation solutions including regional flood mitigation methods (e.g. pumps and stormwater detention), local flood mitigation methods (e.g. flood walls, municipal pumps, exfiltration trenches), and land-use change (e.g. raising minimum floor elevations, raising roads). From this, three flood-mitigation scenarios were developed and modeled and an economic/risk-based approach was used to compare the efficiency of these alternative flood mitigation scenarios, resulting in a first-order adaptation pathway for prioritizing future projects.

This process used a multi-disciplinary approach involving hydraulic engineers, planners, and economists together with stakeholders. Tools and techniques like those used in this study can be applied throughout Miami-Dade County to assess long and short-term options for mitigating flood risk. Pathways planning supports robust and flexible investments to avoid stranded assets and costly retrofitting. This will provide information for resiliency planning related to sea-level rise.

Location

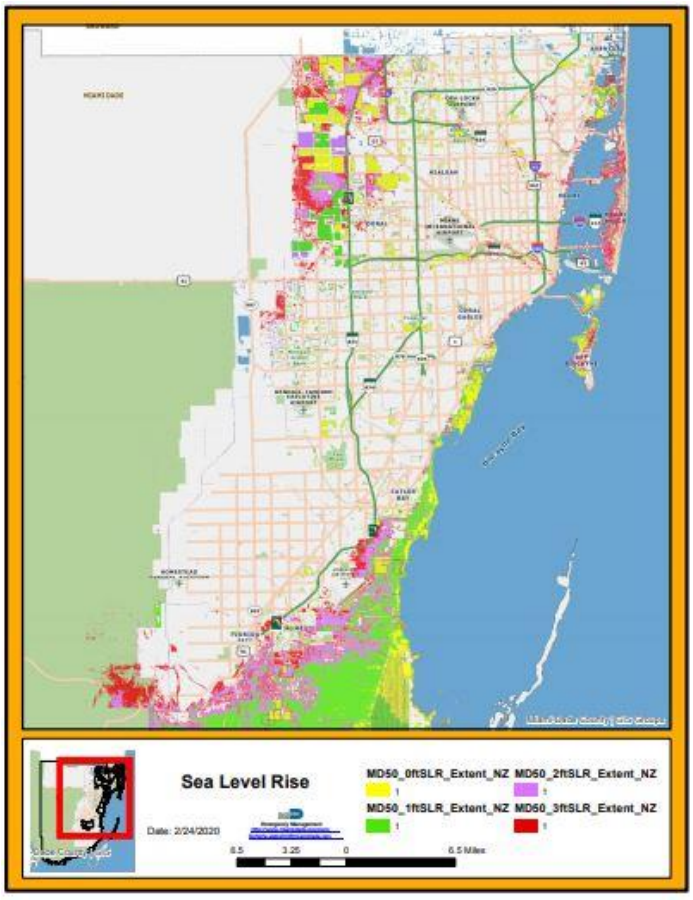
Mapping developed for the Southeast Florida Climate Change Compact (the Compact) illustrates potential areas of Miami-Dade County that may be impacted by sea level rise. These areas include unincorporated Miami-Dade County and portions of the following municipalities: Sunny Isles Beach; North Miami Beach; North Miami; Miami; Miami Beach; Key Biscayne; Coral Gables; South Miami; Palmetto Bay; Cutler Bay; Homestead; Florida City; Doral; Sweetwater; Hialeah Gardens; and Miami Lakes.

Extent

Based on the Compact's sea level rise projection a one-foot scenario could occur between 2040 and 2070, the two-foot scenario from 2060-2115 and the three-foot scenario from 2075-2150.

Impact

Sea level rise is likely to increase coastal flooding during high tides and storm surge events. Sea level rise will likely impact the ability of the canals in low lying areas to drain standing water after rainfall events and impact the ground water elevation. Gravity based outfalls that lie below sea level will be impacted by allowing salt water to flow up through the outfall system into the streets. Many communities in Miami-Dade County are experiencing the effects of sea level rise during king tides events. The king tide is the highest predicted high tide of the year, it is above the highest water level reached at high tide on an average day.[57] In the future, the water level seen during king tide events will be the water level during daily high tides. King tides can occur once or twice a year.



In terms of the amount of land which may be vulnerable, the number of acres impacted in Miami-Dade is three times greater than that experienced in Monroe County for the two and three-foot scenarios. Nearly 80% of the lands affected regionally in the one foot scenario are conservation lands especially coastal wetlands. Low lying natural systems made up of buttonwood, mangrove, scrub mangrove, and herbaceous coastal saline and freshwater wetlands are significantly impacted in all sea level rise scenarios. In terms of the critical infrastructure reviewed, inundation is often confined to marginal areas of the properties or impacting existing drainage infrastructure on site. This is generally true for the region's ports, airports, schools, landfills and hospitals. Within Miami-Dade these are mainly impacted at the 3-foot scenario. Power plants properties in Miami-

[57] EPA, King Tides and Climate Change: http://www.epa.gov/cre/king-tides-and-climate-change

Dade and Broward, as well as energy transmission facilities in Monroe are vulnerable at the one foot scenario. While railroads are negligibly at risk, more than 81 miles of road-way from Miami-Dade through Palm Beach are at elevations below sea level at the one foot scenario, increasing to more than 893 miles at the three-foot scenario.[58]

Upper estimates of taxable property values vulnerable across the region is greater than $4 billion with values rising to over $31 billion at the 3-foot scenario. The following table is taken from the Compact and illustrates Land Use and Property Values in Miami-Dade County vulnerable to Impacts from Sea Level Rise at 1, 2 and 3 feet scenarios.

Acres of Future Land Use Top Three Categories Impacted	1 Foot	Conservation	107,988 acres
		Electrical Generation	5,332 acres
		Agricultural	2,994 acres
	2 Feet	Conservation	126,809 acres
		Electrical Generation	5,999 acres
		Agricultural	7,746 acres
	3 Feet	Conservation	133,088 acres
		Electrical Generation	7,000 acres
		Agricultural	10,890

The Compact estimated that the total number of acres within urban Miami-Dade to be impacted by sea level rise for a 1 foot scenario is 121,378 acres (12%), for 2-foot 150,142 acres (16%) and for the 3 foot scenario it could be 168,896 acres (18%) of the county.

Previous Occurrences

2017 – The October king tides coincided with heavy rainfall and a strong easterly wind, which enhanced the effects of the event. This triggered a Coastal Flood Advisory from October 2nd through the 9th. Through this period, the Virginia Key tide gauge recorded high tides between 0.5 to 1.4 feet above predicted. Areas throughout Miami Beach and City of Miami flooded and reports of stalled vehicles and water entering businesses were recorded. The highest tide recorded for this event was 4.3 feet on October 5th.

Another round of king tides happened during the weekend of November 3rd, but there were no significant reports. The high tides recorded were below 0.3 feet and no Coastal Flood Advisory was issued.

2016 – Communities in Miami-Dade County were affected by the king tides on October and November. In October, increased swells due to Hurricane Nicole (located off the coast from Florida) and a full moon on October 16th enhanced the effects of this king tide event. Miami-Dade County was under a Coastal Flood Advisory from October 14th

[58] Southeast Florida Climate Change Compact: http://www.southeastfloridaclimatecompact.org//wp-content/uploads/2014/09/vulnerability-assessment.pdf

through the 18th. Throughout this period, as recorded by the Virginia Key tide gauge, the high tides were between 0.8 to 1.2 feet above predicted.

The November king tides coincided with the Supermoon. On November 14th, for the first time in over 65 years, the full moon was at its closest distance from Earth. Miami-Dade County was under a Coastal Flood Advisory from November 13th through the 16th. Throughout this period, as recorded by the Virginia Key tide gauge, the high tides were between 0.7 to 0.9 feet above predicted.

2015 – Communities along the coast of Miami-Dade were affected by the king tides on September and October. The king tides that occurred on September 27th – 28th coincided with the annual Supermoon, when the moon is closest to Earth, resulting in higher than predicted tides. South Florida was under a Coastal Flood Advisory until the 28th.

A Coastal Flood Advisory was in effect for Miami-Dade County from October 27th – 28th. Throughout this period, the tides were between 0.7 to 1.0 feet above the predicted.

2013 – There were also some minor street flooding (to the curb level) from astronomical high tides that occurred April 26-27, 2013, October 17-20, 2013 and December 3 2013 in the same South Beach areas.

2012 – On October 29, 2012 Key Biscayne issued a high tide alert to residents regarding water flowing out of the drainage system that was causing flooding on local stress and adjacent areas, especially in low lying areas.[59] There was also an extended period from November 21-27, 2012 with some street flooding in the South Beach areas of Miami Beach (Alton Road area south of 17th Street).

Astronomical high tides have in recent years caused localized flooding with salt water being pushed back up through storm drain outfalls that use gravity to function. According to the National Weather Service Miami, the greatest impacts for astronomical high tides were in combination with Superstorm Sandy from October 27-30, 2012. Certain areas of Miami Beach can flood when the tide reaches an elevation of 0.5 feet, typical high

[59] Village of Key Biscayne, High Tide Alert (October 2012): http://keybiscayne.fl.gov/index.php?src=news&refno=339&category=News

tide in Miami Beach reach about 0.3 feet, but in October and November 2012 levels reached as high as 2.2 feet.

Sea Level Rise is an emerging and future threat and with high tides occurring about two times a year (April and November) as sea levels rise more communities could be at risk from seasonal high tides as well as general sea level rise. The pictures to the right are in Miami Beach during the 2015 King Tide event.

Vulnerability

Physical Vulnerabilities

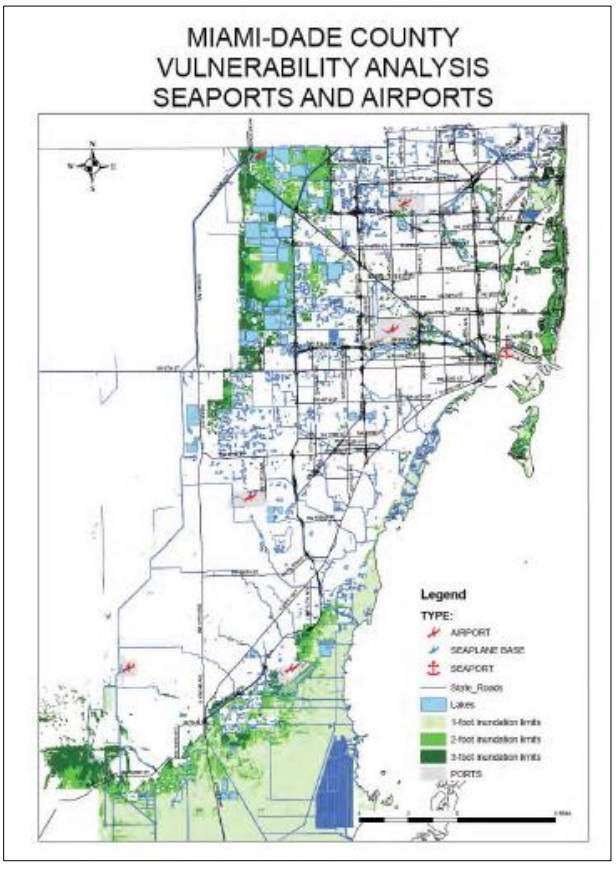
The built environment (Critical Infrastructure, Key Resources, and Building Stock) and natural environment are vulnerable to sea level rise and though some preliminary mapping shows southern portions of the county at highest risk there is risk to other portions as well. Coastal communities, such as Miami Beach, have already begun to experience sunny day flooding in relation to high and king tides that limit the gravitational drainage that drains to the bay. Additional mapping is being done to determine all areas that may be at risk.

The following information is excerpted from the Southeast Florida Climate Compact.

Analysis of Physical Features

Ports and Airports

One area determined by the group to be critical is Homestead Air Reserve Base. The County has already met with planners developing the long-term use of the base and provided input on sea level rise. Opa-Locka West is vulnerable, but this airport is only a landing strip used for training and so is not considered critical. Below are tables that represent the area that may be below mean high-high water sea level with a 1-, 2-, or 3-feet sea level rise**.**



1-Foot Sea Level Rise

Facility Name	More Likely	Possible	Total Inundation	Total Area of Facility (Acres)	Percent Inundation
Homestead General Aviation	0	4.92	4.92	770.71	0.6%
Kendall-Tamiami	22.86	2.37	25.23	1,428.48	1.8%
Miami International	36.01	2.38	38.39	2,731.06	1.4%
Opa Locka Executive	16.87	4.71	21.58	1,640.89	1.3%
Opa Locka West	12.08	1.46	13.54	412.03	3.3%
Port of Miami (Seaport)	0.61	0.16	0.77	534.5	0.1%
Port of Miami (River Port)	2.32	1.26	3.58	136.23	2.6%
USA Homestead Air Base	195.43	80.4	275.83	1,970.96	14.0%

2-Feet Sea Level Rise

Facility Name	More Likely	Possible	Total Inundation	Total Area of Facility (Acres)	Percent Inundation
Homestead General Aviation	5.6	0.66	6.25	770.71	0.8%
Kendall-Tamiami	26.87	1.6	28.47	1,428.48	2.0%
Miami International	42.34	5.63	47.97	2,731.06	1.8%
Opa Locka Executive	30.58	15.93	46.51	1,640.89	2.8%
Opa Locka West	24.2	68.55	92.75	412.03	22.5%
Port of Miami (Seaport)	0.89	0.22	1.11	534.5	0.2%
Port of Miami (River Port)	4.63	3.61	8.24	136.23	6.0%
USA Homestead Air Base	327.73	119.27	447	1,970.96	22.7%

3-Feet Sea Level Rise

Facility Name	More Likely	Possible	Total Inundation	Total Area of Facility (Acres)	Percent Inundation
Homestead General Aviation	6.58	0.83	7.41	770.71	1.0%
Kendall-Tamiami	31.01	2.82	33.83	1,428.48	2.4%
Miami International	57.47	24.24	81.71	2,731.06	3.0%
Opa Locka Executive	65.51	76.22	141.73	1,640.89	8.6%
Opa Locka West	212.09	96.59	308.68	412.03	74.9%
Port of Miami (Seaport)	1.63	0.5	2.13	534.5	0.4%
Port of Miami (River Port)	14.73	11.47	26.2	136.23	19.2%
USA Homestead Air Base	573.64	202.52	776.16	1,970.96	39.4%

Power Plants

Miami-Dade County has one nuclear power and one coal generation power plant. The generation facilities are not directly impacted. This data below includes impact to the Turkey Point Nuclear Power Plant cooling canals, the coastal wetlands at the Cutler Plant, and some scattered power transfer stations throughout western Miami-Dade County.

Power Plant	More Likely (acres)	Possible (acres)	Total Inundation (acres)	Total Area of Facility (Acres)	Percent Inundation
1-foot Sea Level Rise	4,812	247	5,059	7,228.77	70%
2-foot Sea Level Rise	5,259	233	5,492	7,228.77	76%
3-foot Sea Level Rise	5,707	233	5,940	7,228.77	82%

Railroads

Railroads did not seem to be particularly affected, perhaps due to the fact that most of the rail beds in Miami-Dade County are elevated above the road and surrounding surfaces. The impact reported is limited to FEC Railroad in the northeast coast of Miami-Dade County and to the portion of the CSX railroad serving the rock mine lakes along NW 12 ST in the western portion of the County. This data is reported in **miles**.

FEC and CSX Railroads	More Likely (miles)	Possible (miles)	Total Inundation (miles)	Total Length of Rail (miles)	Percent Inundation
1-foot Sea Level Rise	0.71	0.09	0.8	320.9	0.1%
2-foot Sea Level Rise	0.91	0.23	1	320.9	0.4%
3-foot Sea Level Rise	1.65	0.79	2	320.9	0.7%

Water and Wastewater Treatment Plants

Miami-Dade has three major water and three major wastewater treatment plants within the County boundary. The analysis was performed by land use category as provided by the Department of Planning and Zoning. The results, therefore, do not include the names of the facilities, only the area possibly or more likely affected by the inundation scenario. A more specific analysis is needed to determine if any equipment would be affected or not.

Water Treatment Plants	More Likely (acres)	Possible (acres)	Total Inundation (acres)	Total Area within Land Use Category (acres)	Percent Inundation
1-foot Sea Level Rise	0.38	0.16	0.54	210.37	0.26%
2-foot Sea Level Rise	0.85	0.64	1.49	210.37	0.71%
3-foot Sea Level Rise	2.58	1.6	4.18	210.37	1.99%

Wastewater Treatment Plants	More Likely (acres)	Possible (acres)	Total Inundation (acres)	Total Area within Land Use Category (acres)	Percent Inundation
1-foot Sea Level Rise	11.1	5.32	16.42	460.14	3.57%
2-foot Sea Level Rise	19.91	6.15	26.06	460.14	5.66%
3-foot Sea Level Rise	36.47	8.33	44.8	460.14	9.58%

Landfills

Inundation for all levels of sea level rise were primarily in retention or natural areas surrounding landfills since the landfills themselves are elevated (see graphic on next page). The South Dade Landfill, Munisport landfill, and Dade Recycling are surrounded by low lying areas.

South Dade Landfill, Munisport, & Dade Recycling	More Likely (acres)	Possible (acres)	Total Inundation (acres)
1-foot Sea Level Rise	154	80	234
2-foot Sea Level Rise	266	33	299
3-foot Sea Level Rise	333	30	363

Hospitals
No hospitals in Unincorporated Miami-Dade County were impacted. Of the 34 total hospitals within the county boundaries, only three hospitals were affected in municipalities in the 3-foot sea level rise scenario.

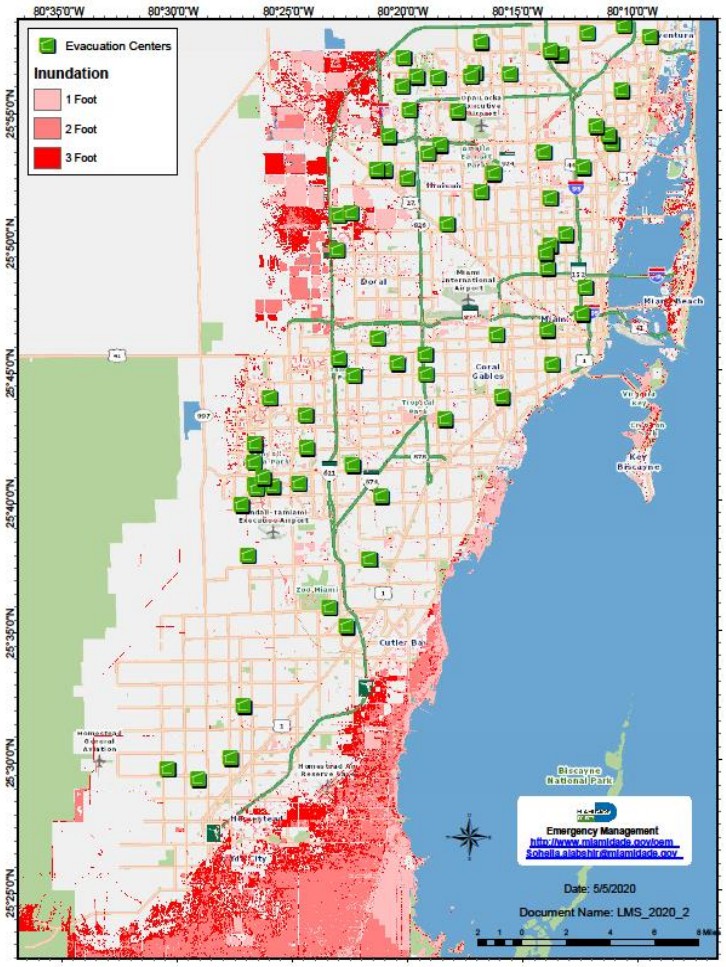
- Selected Specialty Hospital, 955 NW 3rd ST, City of Miami, 33128
- Mount Sinai Medical Center, 4300 Alton Road, City of Miami Beach, 33140
- South Beach Community Hospital[60], 630 Alton Road, City of Miami Beach, 33139

Schools
No schools in Unincorporated Miami-Dade County were impacted. Only three of the 392 public schools were affected in municipalities in the 3-foot sea level rise scenario. However, we need more specific survey information on all affected schools, such as elevation certificates and topographic survey to determine if those would be actually impacted.

- Student Services & Attendance, 489 East Drive, Miami Springs 33166
- School Board Administrative – Annex, 1500 Biscayne Boulevard, Miami 33132
- Biscayne Elementary, 800 77th Street, Miami Beach 33141

Emergency Evacuation Centers

None of the 83 emergency evacuation centers in Miami-Dade County were impacted.[61] However, more specific survey information and finished floor elevation certificates on all shelters are needed to determine actual impacts.



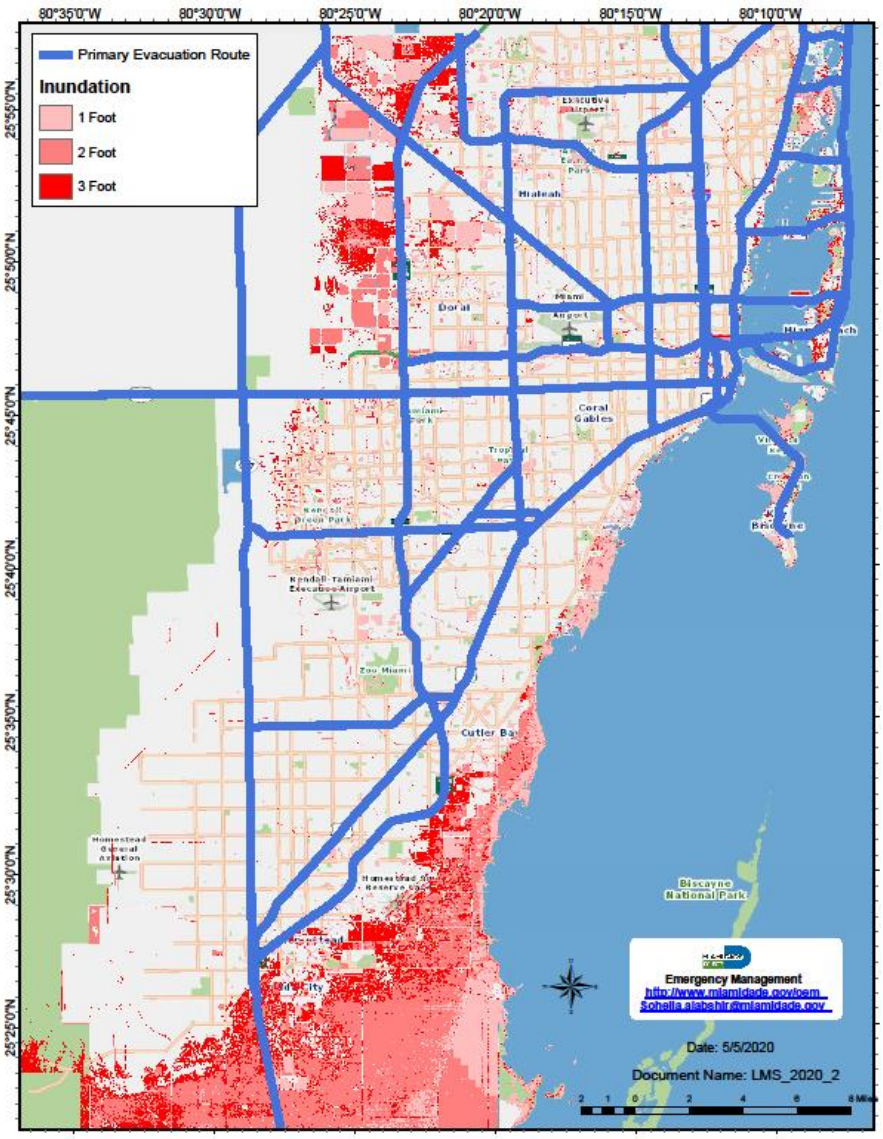
Evacuation Routes

Miami-Dade determined there are at most four miles of impact to all evacuation routes even at the 3-foot inundation because these routes are built at elevations to provide service in a 100-year storm. US1 Overseas Highway to the Florida Keys and the Rickenbacker Causeway to Key Biscayne have been improved in the past two years. Therefore, the 4 miles of impact are probably an over estimation. The concern for the evacuation routes is flooding of the local access roads leading to them. This information is summarized in the section Roads by FDOT Category.

[61] 2020 Florida Emergency Shelter Plan

Marinas

Marine facilities were analyzed using land use category maps provided by the Department of Planning and Zoning. Marine complexes and marine commercial land uses were combined. All marina facilities are located on or next to water features, east of all salinity control structures to give easy access to the ocean. The assumption is that all will be affected in some way, although the extent is only estimated by this current analysis. It is assumed that those docks with fixed infrastructure will be inundated while floating docks will rise with sea levels.



Marine Facilities	Total Inundation (acres)
1-foot Sea Level Rise	31
2-foot Sea Level Rise	75
3-foot Sea Level Rise	150

Results of Analysis
Geographic analysis was done based on the following criteria:

- Miles of road by Florida Department of Transportation category
- Future Land Use
- Habitat/Land Use Land Cover

Taxable Value of Property
Miami-Dade County has chosen not to estimate the taxable value of potentially impacted property until such time as the mapping and analytical methods are more robust. Miami-Dade, through the Stormwater Master Planning Process, has determined that the current assessment tools probably underestimate potential impacts.

Roads by FDOT Category
Roadways are summarized by Functional Class in miles. High volume categories include sections of roadway where bridges were removed from the LiDAR data and represented bare earth rather than the actual roadways.

1-Foot Sea Level Rise – Assumption: 50% Percent Inundation = Whole Segment Affected

Functional Class	Total Inundation (Miles)	Total Coverage (% impacted)
1 – high volume, maximum speed	3	0.08%
2 – high speed, channels traffic to FC1	4	
3 – high speed, lower mobility, connects to FC2	3	
4 – moderate speed, through neighborhoods	62	
5 – low volume, i.e. access roads, parking lanes	Not assessed	
Total	72	

2-Foot Sea Level Rise – Assumption: 50% Percent Inundation = Whole Segment Affected

Functional Class	Total Inundation (Miles)	Total Coverage (% impacted)
1 – high volume, maximum speed	6	3%
2 – high speed, channels traffic to FC1	11	
3 – high speed, lower mobility, connects to FC2	8	
4 – moderate speed, through neighborhoods	232	
5 – low volume, i.e. access roads, parking lanes	Not assessed	
Total	257	

3- Foot Sea Level Rise – Assumption: 50% Percent Inundation = Whole Segment Affected

Functional Class	Total Inundation (Miles)	Total Coverage (% segments impacted)
1 – high volume, maximum speed	12.18	6%
2 – high speed, channels traffic to FC1	26.33	
3 – high speed, lower mobility, connects to FC2	21.22	
4 – moderate speed, through neighborhoods	496.21	
5 – low volume, i.e. access roads, parking lanes	Not assessed	
Total	555.94	

Social Vulnerabilities
This hazard does not tend to affect one population over another.

Severe Storm

Description
A thunderstorm is a meteorological event generated by atmospheric imbalance and turbulence caused by unstable warm air that rises rapidly, heavy moisture, and upward lift of air currents that can bring a combination of heavy rains, strong winds, hail, thunder, lightning, and tornadoes. A thunderstorm does not have the same characteristics as a "severe" thunderstorm.

The National Weather Service classifies a severe storm as a thunderstorm that is capable of producing 1 inch or larger hail, wind gusts greater than 58 mph and/or a tornado. Although lightning and/or excessive rainfall may occur during a severe thunderstorm and have severe consequences, these are not considered primary elements of a severe thunderstorm. Severe thunderstorms, flood threats and lightning are handled through difference sets of warnings and watches by the National Weather Service.

The Southern Florida Rainy season is defined as the time of year when most of the yearly rainfall occurs. The rainy season in South Florida begins in mid-May and ends in mid-October. During this nearly five-month period, South Florida receives about 70% of the rainfall for the entire year.

The rainy season usually has three phases:

- Late May through early July ("stormiest" part of the season).
- Early July through mid-August (hotter with dry periods)
- Late August through mid-October (higher rainfall variability due to potential tropical systems and early-fall cold fronts)

Location
The entire County is vulnerable to severe storms.

Extent
Winds of up to 100 mph, F3 tornado and 4-inch hail during a severe storm.

Impact
Miami-Dade County is particularly susceptible for a variety of severe storms. One of the most powerful of these storms occurred in February 1995. This severe storm caused $5 million in damages. A twisting downdraft damaged four commercial jets, several loading platforms, and a catering truck at concourse G at Miami International Airport. It is estimated that the winds at the site were 100 mph.[62]

Previous Occurrences

May 6, 2019 – Thunderstorms caused damage across Miami-Dade County that resulted in downed trees, power poles, fences and street signs. A tractor trailer was also overturned on the Florida Turnpike.[63]

January 23, 2017 – A strong squall line ahead of a cold front produced a tornado near the Palmetto Expressway and NW 48th Street at 3:45am. The tornado continued a northeast track and moved over Miami Springs and the City of Hialeah producing between EF-0 and EF-1 damage. Damage consisted of an overturned tractor trailer, about 24 empty cargo containers were moved, downed trees and power lines, and damage on roofs. No injuries or fatalities were reported, but 13 families were displaced in Hialeah and required assistance by the American Red Cross.

July 18, 2016 – This thunderstorm produced gusty winds which resulted in property damage in Cutler Bay. This damage, estimated at $5,000 occurred in the vicinity of SW 200th Street between Old Cutler Road and Cutler Ridge Park.[64]

June 18, 2016 – A severe thunderstorm over Miami-Dade County led to wind damage. Power lines, trees, fences, and store signs were knocked down in Westchester. There was also damage in Downtown Miami to furniture being blown off high rise balconies into the streets due to the high winds.[65]

[62] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[63] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[64] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[65] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

February 16, 2016 – On February 15th, a strong squall line developed ahead of a cold front over the Gulf of Mexico and as it moved over the warm waters, it intensified. An unstable environment and strong low level rotation was in place over South Florida ahead of the line. In the overnight hours of February 16th, another squall line developed ahead of the first line. Both of these lines merged over southeast Florida before daybreak. As the squall line moved across Florida, it produced a number of severe thunderstorms throughout. A total of 6 tornadoes were confirmed across southern Florida, including an EF-0 in Northeast Miami-Dade. No injuries or fatalities were reported.

June 29, 2015 – Afternoon showers and thunderstorms caused sporadic tree damage in an area from Doral to Florida International University campus, then east to Fountainbleu. A total of 12,940 customers reported power outages in Miami-Dade County.[66]

June 6, 2012 – Severe thunderstorm with high wind gusts and hail occurred in Miami-Dade. Reports of numerous trees downed reported in Leisure City, South Miami Heights and Princeton. Wind gusts were estimated at 60 mph. In Perrine, several signs from businesses were blown off a building.

May 18, 2012 – Large tree branches were snapped and broken off in a two-square-block area near the intersection of SW 8th Street and SW 142th Avenue, resulting from a down-burst associated with a severe thunderstorm. Trees were also reported down in Sweet-water and Doral. Winds were estimated between 60-70 mph and large trees were up-rooted and a light pole was downed in Doral.

May 15, 2006 – Straight lined winds estimated at 70 to 80mph caused Metal roof sheeting to be torn off a hanger on the grounds of the Opa-Locka Airport. The roofing material was strewn across the adjacent parking lot and struck several parked vehicles.[67]

September 9, 2001 – Five to ten inches of rain fell across southeast Florida, causing widespread street flooding. This event also spawned into tropical storm Gabrielle in the east of the Gulf of Mexico.[68]

August 14, 1998 – A severe thunderstorm in Opa-Locka resulted in thousands of homes to lose power. There was also roof and window damage reported at several homes.[69]

[66] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Data-base: https://www.ncdc.noaa.gov/stormevents/
[67] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[68] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[69] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

February 13, 1995 – A severe thunderstorm with up to 100mph winds caused about $5 million in damages at the Miami International Airport. The damage was done to four commercial jets, several loading platforms and a catering truck at concourse G.[70]

Vulnerability

Physical Vulnerabilities

The entire built environment (Critical Infrastructure, Key Resources, and Building Stock) may be vulnerable to severe storms due to wind or hail damages. These types of events could cause power outages or some structural damages to mobile/manufactured homes (see Hurricanes/Tropical Storms for a listing), communications towers, or damage trees and overhead utilities. Underground utilities could be impacted if trees topple and uproot these systems. Severe weather may also cause flying debris to cause additional damages. Structures in areas where there has been repetitive losses and no mitigation may also be at higher risk but past flooding events do not necessarily indicate future flooding problems. Areas with ongoing construction or drainage problems may also be at greater risk. Parks and open spaces where people congregate outside are vulnerable to severe weather that may roll in with little notice, this includes coastal beaches, Crandon Park, all County and State parks, large venues such as the Homestead- Miami Speedway, Hark Rock Stadium, and Marlins Park.

Social Vulnerabilities

People who live in areas prone to flooding and may be uninsured or underinsured are at greatest risk. The cost of insurance may be prohibitive and people who live outside of a flood zone may believe they are not at risk. People who rent properties may not be aware of their flood risk as it may not be disclosed by the owner or they may not know the history of the area. Electric dependent and persons living in mobile/manufactured homes may be at greater risk when it occurs in their areas.

Tornado

Description

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. Tornado are one of the most violent of atmospheric storms and they come from two types of thunderstorms, supercell and non-supercell. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long. A majority of tornadoes, however, have wind speeds of 112 mph or less. Florida tornadoes occur in the greatest number during June, July and August. These are typically small, short-lived events that can produce minor damage and seldom take lives. Florida's most deadly tornado outbreaks occur in the spring.

[70] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

A tornado's strength is determined by looking at the damage that it caused. From the damage, the winds speeds can be estimated. In 2007, the National Weather Service implemented that Enhanced Fujita Scale (EF scale), which takes into account more variables than the original Fujita Scale (F scale) for a more consistent and accurate manner.

TABLE 10. OPERATIONAL ENHANCED FUJITA SCALE

EF Number	3 Second Gust (mph)
0	65 – 85
1	86 – 110
2	111 – 135
3	136 – 165
4	166 – 200
5	Over 200

Source: Storm Prediction Center

Waterspouts, tornadoes that occur over bodies of water, are common along the southeast U.S. coast, especially off Southern Florida and the Keys. They are smaller and weaker than the most intense tornadoes, but still can be quite dangerous. Waterspouts can overturn small boats, damage ships, create significant damage when hitting land, and kill people.

Location
The entire county is equally vulnerable to tornadoes.

Extent
EF-3 tornado could be experienced.

Impact
Miami-Dade ranks fourth in the state with eighty-six (86) reported tornadoes from 1971 to 2002. Based on data from 1950-2019, there has been 140 occurrences of tornadoes in Miami-Dade that have resulted in 159 injuries, 1 death and $203 million in damage.[71] The F-3 tornado in 1959 touched down in Coral Gables and moved over the Miami business

[7171] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

district and Biscayne Bay and impacted Sunny Isles. Most injuries were from flying and broken glass. Another occurrence on March 27, 2003 had a tornado that peaked as an F-2 that hit the Brownsville/Liberty City neighborhood. One person was killed in their home by tree debris and fourteen people were injured. FEMA damage estimates included $2.2M for housing assistance and $6.2M for other assistance, totaling $8.4M.[72]

Previous Occurrences

January 27, 2019 – A thunderstorm developed ahead of the main line of storms and produced a brief tornado in Miami-Dade County. The tornado caused some damage to homes, trees and power lines in Hialeah and Palm Lakes. The tornado also overturned two cars and power outages were reported.

January 23, 2017 – During the overnight and pre-dawn hours of January 23rd, a powerful squall line well ahead of a cold front over the Gulf of Mexico moved over South Florida. The line of storms resulted in a tornado touching down several times. The tornado first touchdown was near the Palmetto Expressway and NW 48th Street at 3:45 am. It then touched back down on the east side of the Palmetto Expressway, from NW 50th Street to NW 52nd Street between NW 74th and 69th Avenue. The damages in this area included an overturn tractor trailer, about 24 empty cargo containers were moved and an office building sustained minor roof damage. These were EF-0 borderline EF-1 damages (75-85 mph winds). The tornado continued a northeast track and moved into the Miami Springs area with winds most likely in the EF-1 range (90-95 mph). Loss of roof covering material and downed trees was reported in the "Bird District" between Shadow and Ludlum Avenue and Falcon and Dove Avenue. As it continued its track through Miami Springs, more damage was recorded east of Hammond Drive to Okeechobee Road where downed power lines and trees were reported. Once it crossed Okeechobee Road and entered in to the City of Hialeah it caused EF-1 damage from Red Road to W 2nd Avenue between West 10th and 13th Streets. In this area, four apartment buildings sustained roof damage and although the tornado passed very close to a water plant, it did not sustain any damage. The tornado lifted near W 2nd Avenue and W 13th street. 13 families were displaced in Hialeah and required assistance by the American Red Cross.[73]

February 16, 2016 – A squall line moving through Florida produced an EF-0 tornado in NE Miami-Dade. The tornado had an intermittent path of about 3.4 miles and affected the areas between NE 191st Street and Ives Dairy Road, from NW 8th Avenue to NE 23rd Avenue. Damage consisted of uprooted trees, several leaning poles and minimal structural damage, including several structures with roof damage. No injuries or fatalities were reported.

[72] National Weather Service Miami – South Florida, Series of Tornadoes Hit South Florida Including Miami and Miami-Dade County.
[73] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

June 24, 2012 – Golden Beach Police reported a waterspout moving onshore moving north. The path was approximately 0.5 miles and it was estimated as an EF-0. Beach chairs were tossed about 30 feet in the air and there was damage to trees and a hut. One residence also had damage to a metal gate and trees. The estimated amount of property damage was $10,000.[74]

August 14, 2008 – A thunderstorm in Hialeah produced an EF1 tornado with the highest estimated wind speeds near 90 mph. The tornado damaged eight structures. The estimated property damage was $150,000.[75]

March 27, 2003 – An F1 to F2 tornado touched down in East Hialeah, reached maximum intensity in the Brownsville area, and then lifted just before entering Biscayne Bay. The F1 to F2 damage began in an industrial area where several warehouse roofs were damaged and several empty semi-tractor trailers were overturned. The tornado then heavily damaged 60 houses in Brownsville. A total of 343 other structures sustained damage, mostly to roofs and windows. Also, several cars were overturned. Total damage estimates were around $8 million. Numerous trees, utility poles, and signs were uprooted or knocked down.[76]

March 9, 1998 – An F1 tornado touched down near the Palmetto Expressway and the Terry Lakes area. Broken windows, roof damage, and downed signs were common. There were also numerous trees and utility poles knocked down.[77]

February 2, 1998 – An F2 tornado touched down near the Miami International Airport causing damage to 12 airplanes. The F2 tornado then crossed through the Virginia Gardens and south Miami Springs area in a 100 to 200 yard path, damaging many buildings, houses, trees and utility poles. Then the tornado caused similar damage to south Hialeah. The tornado weakened to F1 status near the Hialeah race track and the path widened to one to three miles, with indications of three or four individual tornados of F1 intensity moving in tandem to the north. The main tornado then re-intensified to F2 status as it approached the Opa Locka airport, severely damaging the roof of the UPS facility, damaging or destroying airplanes, and damaging a hangar at the airport. Finally the tornados weakened to F1 status as they moved through Carol City, damaging homes and utility poles.[78]

[74] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[75] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[76] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[77] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[78] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

January 3, 1996 – An F0 tornado touched down before Westwood Lake with minor roof damage and downed trees. However, the tornado then became an F1, with winds estimated around 110 mph, and it maintained this intensity before lifting. Along this F1 portion of the track, nine persons were injured, three requiring hospitalization. Major damage occurred to 26 buildings, mostly residences, and another 50 buildings sustained minor damage. Six vehicles were also overturned or blown several yards.[79]

January 15, 1991 – An F1 tornado touched down in Hialeah about 2 miles northeast of the Miami International Airport. Cars were overturned, trees were uprooted, and utility poles were knocked down. A few buildings were also damaged.[80]

March 6, 1982 – An F1 tornado moved on a long path through the southwest portion of Miami damaging about 100 homes, hundreds of cars, miles of power lines, and toppling numerous trees. Four people were injured.[81]

December 20, 1973 – An F2 tornado touched down in the eastern portion of Florida City and moved northward through the center of Homestead. 10 houses were destroyed and 40 others had major damage. 22 mobile homes were demolished and 60 others had major damage. Nine people were injured and required hospitalization.[82]

February 19, 1968 – An F2 tornado struck a heavily populated area of North Miami Beach and caused considerable damage but no deaths or serious injuries. 21 people suffered minor injuries, mainly due to flying glass. Damage estimates were around $2 million in 1968 dollars.[83]

June 17, 1959 – An F3 tornado touched down in the southwestern tip of Coconut Grove. The tornado then moved 4 miles northeastward then lifted, temporarily, over the Miami business section. The tornado returned to the ground near the Buena Vista neighborhood of Miami before lifting into Biscayne Bay. 77 people were injured. Most of the injuries sustained in the tornado were cuts from flying or broken glass.[84]

April 5, 1925 – The strongest and most intense tornado that struck Miami-Dade County was an F3 (though other sources said it could have been an F5) on April 5, 1925. It remains the deadliest tornado to affect the county as well. The tornado caused five fatalities and another 35 people were hospitalized because of injuries. The damage total estimates

[79] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[80] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[81] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[82] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[83] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment
[84] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

were up to $300,000 in 1925 dollars. In total, the tornado demolished nearly 50 residences, mostly north of the City of Miami. The exact path and strength of the tornado are uncertain, since it occurred prior to modern records which began in 1950.[85]

Vulnerability

Physical Vulnerabilities

The entire built environment is vulnerable to tornadoes depending on where it hits (may be directly or indirectly impacted). Mobile and manufactured homes tend to sustain the most damage from a tornado due to their lighter weight building materials. A list of mobile home parks in Miami-Dade is provided in the Hurricane/Tropical Storm section. Unreinforced concrete buildings and wood structures may be more vulnerable to tornado damage. Power lines and trees may be downed or underground utilities may be uprooted when trees topple.

Social Vulnerabilities

People with disabilities such as decreased vision or hearing may not be aware of the tornado warnings. Electrically dependent individuals may rely on life-sustaining medical equipment and may be at greater risk due to power outages.

Wildfire

Description

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.
There are four types of wildfires:

- 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.
- Wildland-Urban Interface Fires: Fires occurring within the Wildland-Urban Interface (WUI) in areas where structures and other human developments meet or intermingle with wildlands or vegetative fuels. Homes and other flammable structures can become fuel for WUI fires.

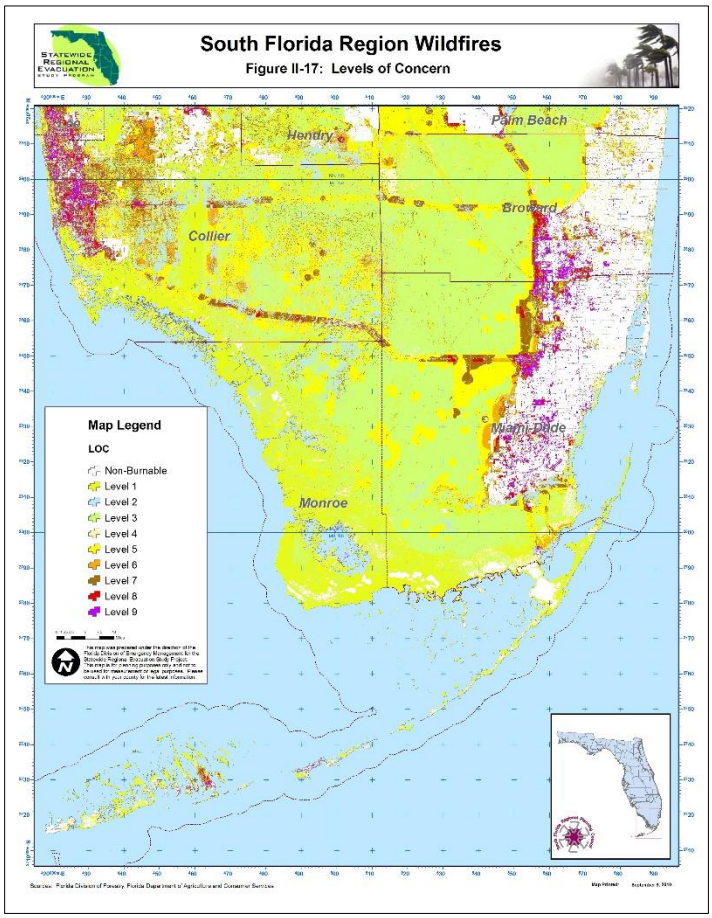
A wildfire is a naturally occurring event, often ignited by lightning or discarded cigarettes, and/or unattended camp fires and fueled by grasses, brush, and trees. Wildfires help to

[85] Miami-Dade 2015 Threat and Hazard Identification and Risk Assessment

control the buildup of woody debris, improve soil conditions, reduce weedy and invasive plants, reduce plant disease, and maintain the habitat conditions thus providing a healthy ecosystem. Fires in the Everglades tend to happen annually, with rapid wet-season fires, often started by lightning. Dry-season fires are less common, but can be more damaging.

Location

The populated areas of Miami-Dade County have on average a greater wildfire likelihood than 47% of counties in Florida.[86] This includes unincorporated Miami-Dade County and the municipalities of Homestead, Florida City, Sweetwater, Medley, Doral and Hialeah Gardens.



Extent

2000 acres.

Impact

In previous events homes have been threatened by wildfire, the Turnpike Extension and the Don Shula Expressway were closed due to heavy smoke, and acres of farmland and fields of grasses were destroyed.

[86] Wildfire Risk to Communities: https://wildfirerisk.org/explore/2/12/12086/

TABLE 11. FIRE DANGER LEVELS

Level	Criteria
Low	**Ignition**: Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires. **Spread**: Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. **Spotting**: There is little danger of spotting. Control: Easy
Moderate	**Ignition**: Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. **Spread**: Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. **Spotting**: Short-distance spotting may occur, but is not persistent. **Control**: Fires are not likely to become serious and control is relatively easy.
High	**Ignition**: All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. **Spread**: Fires spread rapidly. High-intensity burning may develop on slopes or in concentrations of fine fuels. **Spotting**: Short-distance spotting is common. **Control**: Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High	**Ignition**: Fires start easily from all causes. **Spread**: Immediately after ignition, spread rapidly and increase quickly in intensity. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels. **Spotting**: Spot fires are a constant danger; long distance spotting likely. **Control**: Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
Extreme	**Ignition**: Fires start quickly and burn intensely. All fires are potentially serious. **Spread**: Furious spread likely, along with intense burning. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. **Spotting**: Spot fires are a constant danger; long distance spotting occurs easily. **Control**: Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

Source: National Fire Danger Rating System

Previous Occurrences

June 28, 2019 - A small wildfire developed in the Tamiami Pinelands Park area. The fire quickly spread causing damage to two vehicles. The estimated damage was $75,000.[87]

May 2008 – The Mustang Corner Fire was a large wildfire that burned over the Everglades of western Miami-Dade County. The fire burned 39,465 acres in the Everglades National Park. The fire also prompted the evacuation of some 1,753 prisoners and 250 employees from the Everglades Correctional facility and 535 detainees from the Krome Detention Center as the fire closed within ten miles. The fire prompted dense smoke advisories for the Miami Metropolitan area from May 17th to May 21st as dense smoke moved into the area during the night and early morning hours.[88]

May 7, 2008 – A wildfire broke out near Southwest 227th Avenue and Southwest 232nd Street in the Redland area of western Miami-Dade County, covering about 20 acres and threatening a home before being extinguished. The fire consumed 20 acres of a 30 acre farm, two vehicles, and some farm equipment. The estimated damage caused by this fire was $30,000.[89]

August 7, 2004 – A lightning-initiated wildfire burned 10,000 acres mostly in an area between the Homestead Extension of the Florida Turnpike and Krome Avenue. Smoke from the fire closed down portions of both roads for hours at a time and one person was killed in a vehicle crash likely caused by the restricted visibility. A local health alert was issued for persons mainly in the Doral area.[90]

April 5, 2000 – A 50-acre wildfire occurred in Homestead and destroyed two mobile homes and two boats. The total estimated damage was $100,000. [91]

March 30-31, 1999 – Redland area about a dozen wildfires burned as winds gusting near 30 mph quickly spread the flames. None of the fires exceeded 100 acres but a plant

[87] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[88] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[89] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[90] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[91] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

nursery was destroyed and several homes were threatened. Smoke closed the Florida Turnpike Extension and the Don Shula Expressway for several hours.[92]

Vulnerability

Physical Vulnerabilities

The built environment (Critical Infrastructure, Key Resources and Building Stock) and natural environment that are closest to the Everglades, agricultural areas or large open spaces are at a higher risk for exposure from wildfires. Critical facilities would include the Homestead Correction Institute, Dade Correctional Institution, Dade Juvenile Residential Facility, Everglades Correctional Institution, Krome North Service Processing Center, South Florida Reception Center, and Metro-West Detention Center. Residential areas of concern would include the Everglades Labor Camp, Gator Park Mobile Home Park, and Jones Fishing Camp Trailer Park. Visibility on roads may be compromised due to smoke and this may lead to the need for road closures or increased traffic accidents.

Social Vulnerabilities

Populations with respiratory complications may be at greater risk due to air quality issues in relation to wildfires. The social vulnerability section should be reviewed for more information on how these types of circumstances may affect populations differently.

Winter Storm

Description

Severe winter weather includes extreme cold, snowfall, ice storms, winter storms, and/or strong winds, and affects every state in the continental United States. Areas where such weather is uncommon, such as Florida, are typically affected more by winter weather than regions that experience this weather more frequently. Winter weather hazard events in Miami-Dade occur when high winds, and cold temperatures occur. In Miami-Dade, most winter concerns revolve around protecting crops from cold temperatures and providing shelter for vulnerable populations such as the homeless. Extreme cold conditions in Florida are considered to be slightly above freezing.

Location

The entire county is vulnerable to winter weather, inland portions tend to see colder temperatures by a few degrees. These areas tend to be south of Kendall Drive and west of the Florida Turnpike, primarily the Redland area and areas west of Homestead and Florida City.

Extent

26 degrees F with cold weather shelters open for over 10 consecutive days.

[92] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

TABLE 13. AVERAGE FREEZE DATES FOR SOUTH FLORIDA[93]

LOCATION	EARLIEST FREEZE	AVERAGE FIRST FREEZE	AVERAGE LAST FREEZE	LATEST FREEZE
HIALEAH	DECEMBER 15	DECEMBER 21-31	JANUARY 21-31	MARCH 3
HOMESTEAD	DECEMBER 28	DECEMBER 21-31	JANUARY 21-31	JANUARY 31
MIAMI BEACH	DECEMBER 24	DECEMBER 21-31	JANUARY 21-31	MARCH 3
MIAMI	DECEMBER 11	DECEMBER 21-31	JANUARY 21-31	MARCH 3

Impact

In January 2010, Miami-Dade experienced two back to back cold fronts, with temperatures below freezing in the interior portions of the county. Crop damage was extensive and severe, with estimates in excess of $500M in the region. Thousands of customers experienced intermittent power outages due to record-setting usage demands. Hazards such as carbon monoxide poisoning and household fires are increased in improperly ventilated homes during severe winter weather events. The loss of utilities stress resources and puts vulnerable populations at risk. Two fatalities were noted from exposure to cold, a homeless man in Fort Lauderdale and an elderly man in an unheated apartment in Miami. Cold weather shelters were open for over 10 consecutive nights in many areas of South Florida.

Previous Occurrences

January 2010 – A strong artic cold front moved through South Florida in the early part of January. This cold front produced freezing temperatures and very low wind chills. Freezing temperatures were noted over almost all of South Florida on the mornings of January 10th and 11th. This front resulted in the coldest 12-day period of temperatures throughout South Florida. Crop damage was extensive with total damage estimates in excess of $500 million. Thousands of customers experienced intermittent power outages during this period due to record-setting usage demands.[94]

January 5, 2001 – A freeze occurred throughout the interior sections of South Florida, causing damage to certain crops. The hardest hit were certain vegetable crops with 30% losses in the farming areas of south Miami-Dade County. Other crops that were damaged included newly planted sugar cane, ornamentals, and tropical fruits.[95]

[93] National Weather Service Miami Office
[94] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[95] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

February 5, 1996 – The coldest temperatures since the "Christmas freeze" of 1989 caused damage to fruit and vegetable crops in South Florida. Strong winds caused wind chill values in the teens, and disrupted electrical service to over 20,000 customers throughout the region.[96]

TABLE 14. PRESIDENTIALLY DECLARED FREEZE EVENTS IN MIAMI-DADE

Disas-ter Type	Disas-ter Number	Title	Incident Begin Date	Declaration Date	Incident End Date	Disaster Close Out Date
DR	1359	SEVERE FREEZE	12/1/2000	2/5/2001	1/25/2001	5/14/2010
DR	851	SEVERE FREEZE	12/23/1989	1/15/1990	12/25/1989	4/23/1996
DR	732	SEVERE FREEZE	3/18/1985	3/18/1985	3/18/1985	10/27/1988
DR	526	SEVERE WINTER WEATHER	1/31/1977	1/31/1977	1/31/1977	12/18/1978
DR	304	FREEZE	3/15/1971	3/15/1971	3/15/1971	6/18/1973

Source: data.gov, FEMA Disaster Declarations Summary

Vulnerability

Physical Vulnerabilities

Little of the built environment (Critical Infrastructure, Key Resources and Building Stock) is vulnerable to winter storms. Pipes carrying water to households could freeze and expand causing pipes to burst. Inadequately heated or insulated homes may resort to heating by kerosene heaters or stoves. These methods of heating are dangerous and contribute to carbon monoxide poisoning and household fires. Agricultural interests are more vulnerable to winter storms and frost can destroy crops. Crops most vulnerable to winter storms and freezes are the ones that are grown during the winter months and harvested in the spring months including cantaloupe, carambola, celery, cucumbers, dragon fruit, eggplant, fennel, guava, green beans, herbs, jackfruit, longyan, lychee, mushrooms, onions, papaya, passion fruit, plantains, radishes, sapodilla, spinach, squash, strawberries, sweetcorn, thyme, tomatoes and zucchini.

[96] National Oceanic and Atmospheric Administration, National Climatic Data Center, Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

Social Vulnerabilities

Extreme cold weather is a particularly dangerous hazard for at risk populations such as the homeless, elderly, low income or people living in homes without heating or means to keep warm. These populations include those who have a difficult time keeping warm or finding a heat source during an extreme cold event. The homeless are particularly at risk. Age groups such as the elderly and infants have limited physiological capability to keep warm. It is estimated that there are 3,472 homeless individuals reside in Miami-Dade County as of April 2019[97]. Larger concentrations of homeless tend to be near the down-town Miami and Miami Beach areas. Body warming mechanisms such as "goose bumps" and shivering are restricted in these groups. Outdoor animals and pets are also at risk of extreme cold temperatures. In the event that ambient temperatures in the county are forecasted to be at or below 50 degrees Fahrenheit for any period of time the Miami-Dade Homeless Trust will open and operate cold weather shelters.

Natural Hazards by Jurisdiction

The following chart depicts the probability risk by location of all of the natural hazards. The estimate of risk is based on the judgment of local planners and the LMS Working Group regarding the likely frequency of occurrence of the hazard event based on the location of the jurisdiction to the hazard potentially occurring. Sea Level Rise probabilities were determined by potential future risk as identified in the map in the Sea Level Rise section. The rankings are Low (L), Medium (M) and High (H).

[97] 2019 Homeless Population Census http://www.homelesstrust.org/library/homeless-census-comparison.pdf

TABLE 15. NATURAL HAZARDS BY JURISDICTION

Jurisdiction	Drought	Erosion	Flooding	Hurricane/ Tropical	Saltwater Intrusion	Sea Level Rise	Severe Storm	Tornado	Wildfires	Winter Storms
Aventura	M	L	H	H	H	H	H	H	L	M
Bal Harbour	M	H	H	H	H	H	H	H	L	M
Bay Harbor	M	H	H	H	H	H	H	H	L	M
Biscayne Park	M	L	H	H	H	L	H	H	L	M
Coral Gables	M	L	H	H	H	H	H	H	L	M
Cutler Bay	M	L	H	H	H	H	H	H	L	M
Doral	M	L	H	H	L	H	H	H	L	M
El Portal	M	L	H	H	H	M	H	H	L	M
Florida City	M	L	H	H	H	H	H	H	M	M
Golden Beach	M	H	H	H	H	H	H	H	L	M
Hialeah	M	L	H	H	L	M	H	H	L	M
Hialeah Gardens	M	L	H	H	L	M	H	H	L	M
Homestead	M	L	H	H	H	H	H	H	M	M
Key Biscayne	M	H	H	H	H	H	H	H	L	M
Medley	M	L	H	H	L	M	H	H	L	M
Miami	M	L	H	H	H	L	H	H	L	M
Miami Beach	M	H	H	H	H	H	H	H	L	M
Miami Gardens	M	L	H	H	L	M	H	H	L	M
Miami Lakes	M	L	H	H	L	M	H	H	L	M
Miami Shores	M	L	H	H	H	M	H	H	L	M
Miami Springs	M	L	H	H	L	M	H	H	L	M
North Bay Village	M	L	H	H	H	M	H	H	L	M
North Miami	M	H	H	H	H	H	H	H	L	M
North Miami Beach	M	L	H	H	H	H	H	H	L	M
Opa-locka	M	L	H	H	L	M	H	H	L	M
Palmetto Bay	M	L	H	H	H	H	H	H	L	M
Pinecrest	M	L	H	H	H	H	H	H	L	M
South Miami	M	L	H	H	L	L	H	H	L	M
Sunny Isles	M	H	H	H	H	H	H	H	L	M
Surfside	M	H	H	H	H	H	H	H	L	M
Sweetwater	M	L	H	H	L	M	H	H	L	M
Virginia Gardens	M	L	H	H	L	L	H	H	L	M
West Miami	M	L	H	H	L	L	H	H	L	M
Unincorporated	M	H	H	H	H	H	H	H	M	M

Miami-Dade County Critical Facilities Inventory

The LMSWG recognizes the importance of mitigation to critical facilities and as such uses data supplied by the municipalities and the various county departments to develop a database which includes the critical facilities inventory, NFIP repetitive loss data, historic flood data and the locations of hazardous materials that fall under the jurisdiction of Section 302 of the Federal Emergency Planning and Community Right-to-Know Act. This data has been supplied by the Miami-Dade County Division of Environmental Resources Management (DERM) and the State Emergency Response Commission.

Similarly, Miami-Dade and the municipalities control a huge inventory of properties. Therefore, due to its voluminous size, the listing of non-critical municipal public building and facilities will be maintained separately by the county and each municipality.

A critical facilities inventory is maintained by Miami-Dade Office of Emergency Management (OEM) and the Miami-Dade Information Technology Department (ITD) that includes those facilities that have been deemed critical by the state and federal governments. A copy has been supplied to FDEM as well. The inventory includes GIS coverage for the following: the Miami-Dade County street network, day care centers, medical facilities (MMF, hospitals, nursing homes, adult living facilities), Miami-Dade fire stations, municipal fire stations, Miami-Dade police stations, municipal police stations, solid waste management sites, sewage treatment plants, sewer pump stations, water treatment plants, Miami-Dade County schools, hazardous materials sites, municipal critical facilities inventory, the Miami-Dade evacuation network, and hurricane evacuation centers. In 2014 OEM and ITD updated the *Debris Management Plan* to update debris clearance measures including critical facilities.

While the state and federal government defines critical facilities as those listed above, the Miami-Dade LMSWG has defined critical facilities in three types or levels, which are:

- Level 1 – A facility that must remain available in all circumstances and at all times. The community cannot do without this facility at all. Protective measures are an absolute must.
- Level 2 – A facility that must be restored within twenty-four hours or risk dire consequences to the community.
- Level 3 – A facility that must be restored within seventy-two hours or the community may suffer major problems.

The LMSWG concludes that any facility that the community can do without for more than seventy-two hours is not truly critical; important perhaps, but not critical.

Data Sources Identified

We have identified the following data sources as being important and comprehensive to the accomplishment of our mitigation goals. However, additional data sources will surely be discovered as we proceed with the task of mitigation.

Federal Emergency Management Agency (FEMA)

- National Flood Insurance Program repetitive loss inventory.
- Flood Insurance Rate Maps, hurricane storm surge maps, and previous natural hazard computer modeling results. The new FIRM maps are anticipated to be completed in June 2020.
- The FEMA website www.fema.gov has a wealth of accumulated data that can be extremely valuable in developing mitigation measures.

Other U. S. Government Databases and Information Sources

- National Hurricane Center and the National Oceanographic Atmospheric Administration (NOAA) historical storm related data (including, National Climatic Data Center).
- The National Weather Service Miami Forecast Office data files.
- National Hurricane Center "SLOSH" models.
- National Priorities List (NPL)
- Comprehensive Environmental Response, Compensation and Liability Information System List (CERCLIS – the "Superfund")
- No Further Remedial Action Planned List (NFRAP)
- Emergency Response Notification System List (ERNS)
- RCRA Corrective Action Tracking System List (CORRACTS)
- Resource Conservation and Recovery Information System List (RCRIS)
- Hazardous Waste Data Management System List (HWDMS)
- Facility Index Data System List (FINDS)
- Toxic Release Inventory System List (TRIS)
- U. S. Immigration and Naturalization Service databases.

State of Florida

- Florida State University Department of Meteorology hurricane historical database.
- State-Funded Action Sites List (SFAS).
- State Sites List (SITES).
- Solid Waste Facilities List (SLDWST).
- Petroleum Contamination Tracking System Report (PCTS).
- Stationary Tank Inventory System List (TANKS).
- Hazardous Waste Compliance & Enforcement Tracking System List (COMHAZ).
- South Florida Water Management District (SFWMD).

Miami-Dade County

- Municipal and County Emergency Management Plans and Comprehensive Plans.
- Municipal and County Floodplain Management Plans.
- Miami-Dade Stormwater Management Master Plan and Capital Improvements Projects.
- Miami-Dade County, Division of Environmental Resources Management (DERM) GIS database.
- Miami-Dade County, Information Technology Department, Critical Facilities Inventory and other GIS databases.
- Enforcement Case Tracking System Report (ECTS).
- Fuel Spill Report (FSPILL).
- Hazardous Waste Report (HW).
- Industrial Waste Reports.
- Underground Storage Tanks Report (UST).
- Agriculture extension services and databases.

Municipal Agencies

- Staff resources, records and data files.

Additional Resources

- The American Red Cross will provide information regarding shelters, as well as staff resources and records
- Internet web sites provided by the Florida Division of Emergency Management as part of the Local Mitigation Strategy Guidebook

CONFLICT RESOLUTION PROCEDURES

The Miami-Dade County Local Mitigation Strategy Working Group has established procedures to resolve conflicts between member entities that may arise from the development of the LMS. It has borrowed extensively from the *Regional Dispute Resolution Process of the South Florida Regional Planning Council*.

These procedures are designed to clearly identify and resolve problems as early as possible, to utilize procedures in a low-cost to high-cost sequence, to allow flexibility in which procedures are used, to provide for the appropriate involvement of affected and responsible parties, and to provide as much process certainty as possible.

There are two basic components: process initiation and settlement meetings. Additionally, there are five optional components: pre-initiation meeting, situation assessments, mediation, advisory decision-making, and referral to other dispute resolution processes.

The Working Group consists of representatives from Miami-Dade County, its incorporated municipalities, County departments and other participating organizations.

In the event of a dispute, parties named in the Initiation Letter (see below) are automatically allowed to participate. Other jurisdictions, public or private organizations, groups, or individuals must be suggested by a named party and agreed to by a majority of the named parties before inclusion; or recommended for inclusion by a mediator mutually selected by the named parties.

Other jurisdictions, public and private organizations, groups, or individuals seeking to become named parties can submit a written petition to the Working Group. Such groups will become named parties if agreed to by a majority of the named parties or by a mutually selected mediator. Named parties have twenty-one days to respond to the Initiation Letter.

Each named party must appoint a representative who should have authority to act. Jurisdictions are encouraged to designate a representative before one is needed. This person will be responsible for the party's interests and maintain communication throughout the process. The representative must be named in writing.

- Pre-Initiation Meeting: Any jurisdiction, organization, group or individual may request an informal pre-initiation meeting with the Working Group Coordinator.

- Initiation Letter: The conflict resolution process begins with an Initiation Letter from a jurisdiction's governing body, which is sent to all named parties and the Working Group coordinator. This must be accompanied by either a resolution or written authorization from the same governing body.

The Initiation Letter must identify the issues to be discussed; named parties to be involved; name of the initiating party's representative; others who will attend; and a brief history of the dispute that indicates why this dispute is appropriate for this process.

- Response Letter: The named parties must send a response letter to the Working Group coordinator and all other named parties. The response letter must indicate the respondent's willingness to participate in a settlement meeting and include any additional issues for discussion as well as a brief description and history of the dispute from the respondent's point of view.

- Situation Assessment: At the request of a jurisdiction, organization, group, or individual, the Working Group coordinator or other neutral party can perform a situation assessment at any time, before or after initiation of the process. The situation assessment can involve examination of documents, interviews and assessment meetings, and can result in a recommendation concerning the issues to be addressed, parties that may participate, appropriate dispute resolution procedures, and a proposed schedule.

Private interests may ask any member of the Working Group to initiate the process. Any public or private organization, group, or individual may request that the Working Group recommend use of the process. The Working Group can recommend that a potential dispute is suitable for the process and transmit its recommendation to the potential parties.

All requests must be in writing and provide all required information. A Working Group representative must respond after reviewing the petitioner's request; meeting with the requesting organization, group, or individual; and performing a situation assessment. If the Working Group representative agrees with this process, a recommendation will be sent to the potential parties.

- Settlement Meetings: At a minimum, the representatives of the named parties must attend the first settlement meeting. This meeting may be facilitated by a member of the Working Group or a mutually agreed upon neutral facilitator. At the initial settlement meeting the named parties must consider adding named parties; consider guidelines for participation; identify the issues to be addressed; explore options for a solution; and seek agreement.

If the settlement meeting is not held or it produces no agreement to proceed with mediation or advisory decision making, then the participating parties may formally withdraw from the process or proceed to a joint meeting of the governing bodies (as in Florida Statute 164); litigation; administrative hearing; or arbitration.

- Mediation: If two or more named parties submit a request for mediation to the Working Group, then a representative of the Working Group will assist them in selecting and retaining a mediator. Alternatively, the named parties may request that the Working Group coordinator make the selection or request similar assistance from the South Florida Regional Planning Council.

A mediator who understands hazard mitigation issues and is acceptable to the named parties shall mediate all disputes. Mediators shall be guided by the Standards of Professional Conduct, Florida Rules for Certified and Court Appointed Mediators, Rules 10.020-10.150 F.A.C.

- Advisory Decision Making: If two or more named parties submit a request for advisory decision making to the Working Group, then a representative of the Working Group will assist in selecting and retaining an appropriate neutral. Alternatively, the named parties may request that the Working Group coordinator make the selection. A neutral party that understands hazard mitigation issues and is acceptable to the named parties shall handle all disputes.

Initial settlement meetings are scheduled and held within thirty days of receipt of the initiation letter. Additional settlement meetings, mediation, or advisory decision-making must be completed within forty-five days of the date of the conclusion of the initial settlement meeting.

Timeframes may be altered by mutual agreement of the named parties. The optional components of this process may be used in any order.

In the early stages of the process, the parties should address deferring or seeking stays of judicial or administrative proceedings while using this process.

The form of all agreements shall be determined by the named parties and may include: inter-local agreements; concurrent resolutions; memoranda of understanding; contracts; plan amendments; deed restrictions; or other forms as appropriate.

Agreements signed by the party's representative may be in the form of a recommendation to a formal body and subject to its formal approval.

Two or more parties may reach agreements even if all of the named parties don't agree or don't sign a formal agreement.

After settlement meetings, mediation, or advisory decision-making, the named parties must submit a joint report to the Working Group. The report must contain any statements that any of the named parties wants included as well as:

- An identification of the issues discussed;
- A list of potentially affected or involved jurisdictions, public or private organizations, groups, or individuals (even those who are not named parties);
- A timeframe for starting and ending informal negotiations, additional settlement meetings, mediation, advisory decision making, joint meetings of elected bodies, administrative hearings or litigation;
- Any additional assistance required;
- A cost allocation agreement; and
- A description of responsibilities and schedules for implementing and enforcing agreements reached.

Appropriate opportunities for public input should be considered during the process. Applicable public notices and public records requirements must be observed (Chapters 119 and 120, F.S.).

The participants agree to make every effort to keep costs at a minimum. All costs are to be shared equally among the parties unless otherwise agreed upon or as recommended by a mediator mutually selected by the parties.

To the extent possible, the confidentiality provisions of Chapter 44, F.S. will govern mediation under this process. By participating in this process, participants agree not to offer any comments, meeting records, or written or verbal settlement offers as evidence in subsequent judicial or administrative action.

For further information please contact:

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