Indian River County
Unified Local Mitigation Strategy

2020 Update (Approved Pending Adoption)

Indian River County
City of Fellsmere
Town of Indian River Shores
Town of Orchid
City of Sebastian
City of Vero Beach

RECORD OF CHANGES			
Change Number	**Date of Change**	**Date Entered**	**Change Made and By Whom**
1	1/10/17	1/10/17	Made approved changes to 6.6.2.2 (Declared Emergency Assessment) as a result of post-Hurricane Matthew plan assessment. Etta LoPresti
2	12/7/17	12/7/17	Updated Table 4.3, National Flood Insurance Program repetitive flood loss properties through October 2017. Etta LoPresti
3	12/7/17	12/7/17	Updated List of Figures (xii) Etta LoPresti
4	1/12/19	1/12/19	Began review for 2020 updates. Etta LoPresti
5	7/14/19	7/14/19	Finalized updates for the Executive Summary, Section 1 and Section 2. All updates approved by the LMS Working Group. Etta LoPresti
6	8/9/19	8/9/19	Finalized updates for Sections 3 and 4. All updates approved by the LMS Working Group. Etta LoPresti
7	10/11/19	10/11/19	Finalized updates for Sections 5, 6 and 7. All updates approved by the LMS Working Group. Etta LoPresti
8	12/11/19	12/11/19	Finalized updates for all appendices. All updates approved by the LMS Working Group. Etta LoPresti
9	1/7/20	1/7/20	Page 4-27 – Updated Tropical storm and hurricane probability. Etta LoPresti
10	1/24/20	1/24/20	Page 1-9: Added statement that LMS Working Group will explore ways to improve public participation. Etta LoPresti
11	1/24/20	1/24/20	Removed tsunami hazard from any projects on the Prioritized Project List. Etta LoPresti
12	1/24/20	1/24/20	Page 4-62: The vulnerability assessment for drought was expanded upon. Etta LoPresti
13	1/24/20	1/24/20	Page 4-58: The extent for soil erosion was expanded upon. Etta LoPresti

14	1/24/20	1/24/20	Page 4-71: The extent for tsunami was expanded upon. Etta LoPresti
15	1/24/20	1/24/20	Page 4-52: Added extent of vulnerability for wildfire. Etta LoPresti
16	1/24/20	1/24/20	Page 3-1: Institutional Analysis – added statement about working group reviewing their policies and programs annually. Etta LoPresti
17	1/24/20	1/24/20	Page 6.26: Added a new section to discuss benefit-cost analysis. Etta LoPresti

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EXECUTIVE SUMMARY

OVERVIEW

The United States has sustained 246 weather and climate disasters from 1980 through 2019. Overall damages/costs reached or exceeded $1.6 trillion (https://www.ncdc.noaa.gov/billions/). During this same period, Indian River County alone experienced 19 events and property damage estimates of $1.057 billion. Disaster events, as well as other historic disasters, led the Florida Department of Community Affairs (now known as the Florida Division of Emergency Management) to create the Local Mitigation Strategy (LMS) Program. The goal of the program was to encourage public and private sector entities to take actions that permanently reduce or eliminate the long-term risk to people and property from the different types of hazards faced by Florida residents.

Both public and private sectors win by developing an LMS. It leads to

- reducing future vulnerability to disasters;
- reducing the time (and cost) of recovery from such events when they do happen;
- minimizing disruption to the local economy;
- facilitating recovery and the receipt of post-disaster funding; and
- educating and informing the public about hazards and steps they can take to mitigate the effects.

INITIATING ACTION

In 1998, Indian River County, along with all the municipalities, the local business community, and non-profit organizations such as the American Red Cross, joined together to develop a countywide LMS. During that time, the Indian River County LMS Working Group, the policy body for this program, has had the responsibility for developing the LMS. This group focused on achieving two key results:

- The creation of a long-term LMS planning process; and
- the development of the LMS document itself along with a list of prioritized mitigation projects.

In the year 2000, the Federal Emergency Management Agency's (FEMA's) recognition of the growing costs of responding to and recovering from disasters materialized in the Disaster Mitigation Act of 2000 (DMA2K). DMA2K created a new Pre-Disaster Mitigation (PDM) Program aimed at reducing the cost of disasters as well as risk through comprehensive planning before disasters occur. Indian River County updated this LMS plan compliant with the requirements of DMA2K and on February 22, 2005 the plan was formally adopted by resolution of the Indian River County Board of County Commissioners. The plan was updated and approved once again in 2005. In accordance with the Federal Emergency Management Agency (FEMA) regulations, all Hazard Mitigation plans must be reviewed and updated as appropriate and resubmitted to FEMA for approval every five (5) years. Updates were performed and found to be compliant with the FEMA/FDEM requirements and the plan was once again formally adopted by resolution of the Indian River County Board of County Commissioners on **xxxxxxxxxxxxxxx.**

THE PROCESS

The process by which the LMS was completed involved

- describing current community conditions;
- identifying the potential hazards;
- assessing each community's vulnerabilities to those specific hazards;
- proposing initiatives to reduce these vulnerabilities;
- developing evaluation criteria to rank mitigation projects regardless of jurisdiction; and
- Establishing procedures that will be needed if the LMS Program is to retain long-term viability.

All of these aspects are integrated into this unified LMS document, which has been provided to Indian River County Department of Emergency Services.

FINDINGS

Some of the key findings pertinent to Indian River County include the following:

- Flooding and hurricanes occur the most frequently, place the most people at risk, and produce the greatest amount of damage of all the natural hazards faced by the County.
- While wildland fires do not occur with the frequency of flooding and hurricanes, major drought periods over the past several years have made the County extremely vulnerable to wildland fires. Exposure to the impacts of wildland fire continues to increase as new development pushes further west into wildland areas.
- Agriculture is an important component of the local economy; therefore, drought and agricultural pests and disease are as important to the agriculture community as beach erosion and flooding are to the coastal communities.
- While a major focus of mitigation is on retrofitting, the most effective time to mitigate is before development orders are approved. Adding hazard mitigation requirements may add to the cost of development, but this cost is relatively small. Following a disaster, the cost of recovery and redevelopment can be enormous. Recovery cost tends to become public cost that local governments must assume.
- While all jurisdictions in Indian River County are in the National Flood Insurance Program, not all eligible local governments have participated in the Community Rating System (CRS) Program or the Flood Mitigation Assistance (FMA) Program, to the maximum extent possible. Having a strong CRS Program reduces the cost of flood insurance premiums to Indian River County residents, and the FMA Program is a major source of funding to assist in retrofitting flooding problems.
- Properties on the barrier island are susceptible to both flooding and wind-related storm damage. There are a number of important public facilities in those areas. By hardening these facilities, the chance of them being impacted by storm events can be significantly reduced.
- As the amount of trucking on Interstate 95 increases in the future, the probability of truck rollovers and spilling of toxic contaminants will continue to

increase, and hazard management teams need to plan now for this eventuality.

- The Florida East Coast Railroad passes through several areas of coastal urban population and development, putting an ever increasing number of people at risk from train derailment and potentially significant toxic materials spills. This risk will increase with the addition of Virgin Trains USA, a high-speed train running 32 trains a day. Safety concerns have been brought up regarding the safety and environmental impacts of the proposed train line. (https://www.bizjournals.com/orlando/news/2019/01/17/brightline-faces-new-lawsuit-from-indian-river.html)

PROJECT PRIORITIZATION LIST (PPL)

Indian River County government, as well as the individual cities, has already implemented numerous mitigation projects such as

- installing storm shutters on public buildings;
- retrofitting storm water drainage systems;
- raising finished floor elevation to 18 inches above base elevation;
- distributing informative publications on hurricanes to local residents; and
- installing emergency generators at key critical facilities.

The objective of developing a unified, countywide PPL for mitigation projects is to allow the Indian River County city and county governments to better focus their mitigation efforts and dollars. The existence of this list will speed local receipt of Federal disaster mitigation funds after a disaster, and will place Indian River County in a more competitive position when competing for other, non-disaster-related mitigation grant funds.

To develop the PPL, each local government was invited to submit a list of mitigation projects for inclusion in the unified, countywide list. A project prioritization methodology was developed by the Working Group as a means of scoring each project and developing a ranked list of projects.

Developing this PPL is not a one-time process. To be effective this list must be dynamic. It will need to be revised as old projects are accomplished and new hazards or increased vulnerabilities are identified. The PPL process will be implemented on an ongoing basis.

UPDATING PROCESS

Like all local comprehensive planning efforts, the LMS itself will need to be reviewed and updated from time to time to ensure that it adequately addresses the various types of hazards currently facing the community. An LMS updating process was prepared and adopted by the Working Group. The Indian River County LMS will be updated every 5 years.

Indian River County LMS
2020 Review and Update

Executive Summary – Documentation of all significant changes to update the 2020 plan was added. The Working Group reviewed this section and made no additional recommendations. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on July 14, 2019.**

Section 1.0 (Purpose and Overview) – The Working Group reviewed this section and changes included updating the costliest natural disasters in the United States, composition of the LMS Working Group, change from Central Services to Facilities Management, and the number of Fire-Rescue stations from 12 to 15. When completed, copies of adopted resolutions for each jurisdiction will be inserted. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on July 14, 2019.**

Section 2.0 (Community Profile) - All statistics and references to dates were updated where appropriate. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on July 14, 2019.**

Section 3.0 (Institutional Analysis) – The following sections were updated: 3.3.1.4 (Map Modernization), 3.1.8 (minor changes to description of the United States Army Corps of Engineers; 3.1.10 (minor changes to the number of Federal agencies with responsibilities of the National Response Team), 3.3.1 Florida Department of Community Affairs was replaced with the Florida Division of Emergency Management, Section 3.3.2 (Florida Division of Forestry was changed to Florida Forest Service, 3.5.3 (Update to Florida Building Code), Table 3.1 (Comprehensive Growth Management Plan hazard mitigation inventory) was updated, Table 3.2 (Summary of projects and programs for Indian River County) was updated, Table 3.3 (update to NFIP Summary), and Each municipality was provided with sections 3.6.2 (Municipal Mitigation Policies and Ordinances) and 3.6.3 (Municipal Mitigation Projects/Initiatives) and asked to submit updates. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on August 9, 2019.**

Section 4.0 (Hazard Identification, Vulnerability and Risk) – The following sections were updated: Table 4.1 (Identification and projected impact potential for Indian River County Hazards) Added tsunami as a hazard category, the historical events section was updated, Figure 4.2 (Flood Prone Areas of Indian River County) was updated, Figure 4.3 (Replaced with updated Indian River County Storm Surge Map), 4.1.2.1 (Hazard Identification) – Updated National Hurricane Center definitions for Hurricane Watch and Hurricane Warning, Table 4.3 (Repetitive Losses) updated, removed all references to obsolete resources TAOS and MEMPHIS, updated Hailstorm Intensity Scale, added Tropical Storm Isaac, revised wildfire mitigation section. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on August 9, 2019.**

Section 5.0 (Mitigation Options) – Added tsunami mitigation options. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on October 11, 2019.**

Section 6.0 (Implementation Strategy) – The goals and objectives were reviewed and not changed; however, updated projects were changed under the goals and objectives accordingly. The Working Group also voted on meeting semi-annually rather than quarterly. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on October 11, 2019.**

Section 7.0 (References) – This section was updated and reviewed by the Working Group. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on October 11, 2019.**

Appendices

Appendix A (Policies) – This section was updated to reflect changes to the 2020 Comprehensive Growth Management Plan. Table A-4 (Disaster event damage descriptions) was updated. This section was reviewed/approved by the Working Group. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix B (Mitigation Options) - The Working Group, in reviewing this section, found that no changes were necessary. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix C (Funding Sources) – This section was updated and approved by the Working Group. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix D (Data Sources) - This section was updated and approved by the Working Group. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix E (Participation Documentation) – This section includes copies of public announcements, e-mail notifications, meeting agendas, meeting minutes and sign-in sheets for each LMS meeting. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix F (Acronyms) - The Working Group, in reviewing this section, found that no changes were necessary. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix G (Prioritized Projects and Project Status List) – Updated project list and status list as necessary. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

Appendix H (Hazard Summary Sheets) – Added a summary of hazards to serve as proof of compliance for the Emergency Management Accreditation Program. **The LMS Working Group gave preliminary approval to send this draft section to FDEM for review on December 11, 2019.**

1.0 PURPOSE AND OVERVIEW

1.1 PURPOSE

According to moneywise.com (2019) (https://moneywise.com/a/the-most-expensive-natural-disasters), here are the 10 costliest natural disasters ever seen on U.S. soil: (10) Hurricane Ike (2008: $36 billion), (9) Midwest flooding (1993: $37.3 billion), (8) 1988 drought and heat wave ($44 billion), (7) Hurricane Andrew (1992: $49.7 billion), (6) Hurricane Irma (2017: $51.5 billion), (5) Superstorm Sandy (2012: $72.8 billion), (4) Northridge earthquake (1994: $76.9 billion), (3) Hurricane Maria (2017: $92.7 billion), (2) Hurricane Harvey (2017: $128.8 billion, and (1) Hurricane Katrina (2005: $166.3 billion). Note: Loss estimates from the National Oceanic and Atmospheric Administration (NOAA) and the Insurance Information Institute are in 2019 dollars. In the year 2000, the Federal Emergency Management Agency's (FEMA's) recognition of the growing costs of responding to and recovering from disasters materialized in the Disaster Mitigation Act of 2000 (DMA2K). DMA2K created a new Pre-Disaster Mitigation (PDM) program aimed at reducing the cost of disasters as well as risk through comprehensive planning before disasters occur. On July 13, 2010, Indian River County's revised Unified Local Mitigation Strategy (LMS) was adopted by Resolution #2010—059 of the Indian River County Board of County Commissioners. Based on hazard mitigation assistance program regulations and guidance, local governments and Indian tribal government, acting as subgrantees, must have a FEMA approved hazard mitigation plan in order to apply for and/or receive project grants to continue to be eligible for mitigation grant programs administered by FEMA. This document will be reviewed and updated as appropriate, and resubmitted to FEMA for approval every five (5) years.

Florida is one of the most hazard prone states in the nation. The state is susceptible to a number of hazards including flooding, hurricanes, tornadoes, severe thunderstorms, and wildland fires, to name a few. In Florida, the goals of the new PDM program are being achieved through the Local Mitigation Strategy (LMS) process. LMS is a pre-disaster mitigation planning initiative of the Florida Department of Community Affairs (now known as the Florida Division of Emergency Management (FDEM), and is intended to reduce the disrupting effects of natural disasters on the economic and social fabric of the community. Pre-disaster mitigation is defined as "sustained action that reduces or eliminates long-term risk to people and property from hazards and their effects" as part of the FEMA's National Mitigation Strategy (FEMA, 1996).

This definition generally distinguishes between actions that have a long-term impact from those that are more closely associated with preparedness for, immediate response to, and short-term recovery from a specific hazard event. The intent of the LMS is to focus on practices that have cumulative benefits over time and ensure that fewer of the State's citizens and communities are victims of disasters. One of the most important elements is the idea that the resulting mitigation practices are instituted prior to the disaster occurring.

Mitigation practices can be applied to strengthen homes so that people and their belongings are better protected from hurricanes, tropical storms, and inland floods. Pre-disaster mitigation planning can be used to identify and protect at-risk critical facilities, such as hospitals and fire stations, so they can remain operational or reopen quicker after a hazard event. Mitigation planning allows communities to consider the vulnerability of land that is currently undeveloped but may be developed in the future, as well as the risk to

people and property on existing developed land. The consideration of the potential for damage to properties in vulnerable areas and implementation of actions to reduce the impact can go a long way towards eliminating the disruption a disaster occurrence creates in the community.

The purpose of the Indian River County LMS is to develop a unified approach among County and municipal governments for dealing with identified hazards and hazard management problems in the Indian River County area. This strategy will serve as a tool to direct the County and municipal governments in their ongoing efforts to reduce their vulnerabilities to impacts produced by both the natural, technological, and societal hazards to which southeast Florida is exposed. The strategy also will help establish funding priorities for currently proposed mitigation projects and for such disaster assistance funds as may be made available for disaster mitigation activities.

This LMS is intended to represent the following jurisdictions:

- **Indian River County;**
- **City of Vero Beach;**
- **City of Fellsmere;**
- **Town of Indian River Shores;**
- **Town of Orchid; and**
- **City of Sebastian.**

This plan will be adopted by each of these jurisdictions. Copies of the adopted resolutions can be found at the end of this section.

The ultimate objectives of the LMS process are as follows:

1) Improve the total communities' resistance to damage from known natural, technological, and societal hazards;
2) Place Indian River County in a position to compete more effectively for pre- and post-disaster mitigation funding;
3) Reduce the cost of disasters at all levels; and
4) Speed community recovery from disasters that do occur.

Adoption of this strategy will provide the following benefits to both County and municipal governmental entities:

- Compliance with Administrative Rules 9G-6 and 9G-7, Florida Administrative Code (F.A.C.), requirements for local comprehensive emergency management plans to identify problem areas and planning deficiencies relative to severe and repetitive weather phenomenon, and to identify pre- and post-disaster strategies for rectifying identified problems;
- Compliance with FEMA's updated planning guidance and thus, eligibility for certain FEMA pre- and post-disaster funding programs;
- Credit from the National Flood Insurance Program's Community Rating System Program for developing a Floodplain Management Program, which will help further reduce flood insurance premium rates for property owners;
- Access to FEMA's Flood Mitigation Assistance (FMA) Grant Program, which provides funding for pre-disaster mitigation projects and activities; and

- Identification and prioritization of projects for funding under the State of Florida's Residential Construction Mitigation Program, to help reduce losses from properties subject to repetitive flooding damage.
- Eligibility for local governmental funds from the Emergency Management Preparedness and Assistance (EMPA) Competitive Grant Program.

1.2 PLANNING PROCESS

The original LMS plan was developed by Continental Shelf Associates, Inc. (CSA), a consulting firm, who wrote and facilitated the plan and planning process. All subsequent plans were a collaboration of the Indian River County Department of Emergency Services and the Indian River County LMS Working Group.

Figure 1 In an effort to better define the planning process used to update the Indian River County LMS, the following process description and diagram have been developed (**.1**):

- The Indian River County Department of Emergency Services convened members of the LMS Working Group to oversee the LMS update process. (**Section 1.3.1**);
- The Indian River County Department of Emergency Services identified opportunities for individuals, jurisdictions, community organizations, and other interested stakeholders to become involved in the LMS update process;
- The Working Group reviewed/revised guiding principles for Indian River County (as a single entity composed of both the County and municipal entities) to use to address the issue of hazard mitigation;
- Indian River County Department of Emergency Services updated the community profile describing the County in terms of geography, population, infrastructure, economic resources, environmental resources, historic and cultural resources, critical facilities, and property and development trends (**Section 2.0**, **Community Profile**);
- Indian River County Department of Emergency Services reviewed and evaluated the existing legal, regulatory, and response framework in place to deal with hazard mitigation (**Section 3.0**, **Institutional Analysis**); The following key documents were reviewed as part of this capability assessment:
  - Indian River County 2030 Comprehensive (Growth Management) Plan (Mandatory Elements: Future Land Use, Transportation, Infrastructure, Conservation, Coastal Management, Intergovernmental Coordination, Housing, Recreation and Open Space, and Capital Improvements);
  - Indian River County Land Development Code;
  - Indian River County Comprehensive Emergency Management Plan;
  - Indian River County FMA and Community Rating System related plans;
  - Indian River County Planning Division July 2014 Community Development Report;
  - Indian River County Gifford Neighborhood Plan;
  - Vero Beach Comprehensive Plan (Mandatory Elements: Future Land Use, Transportation, Infrastructure, Intergovernmental Coordination, Conservation, Housing, Recreation and Open Space, Coastal Management, and Capital Improvements);

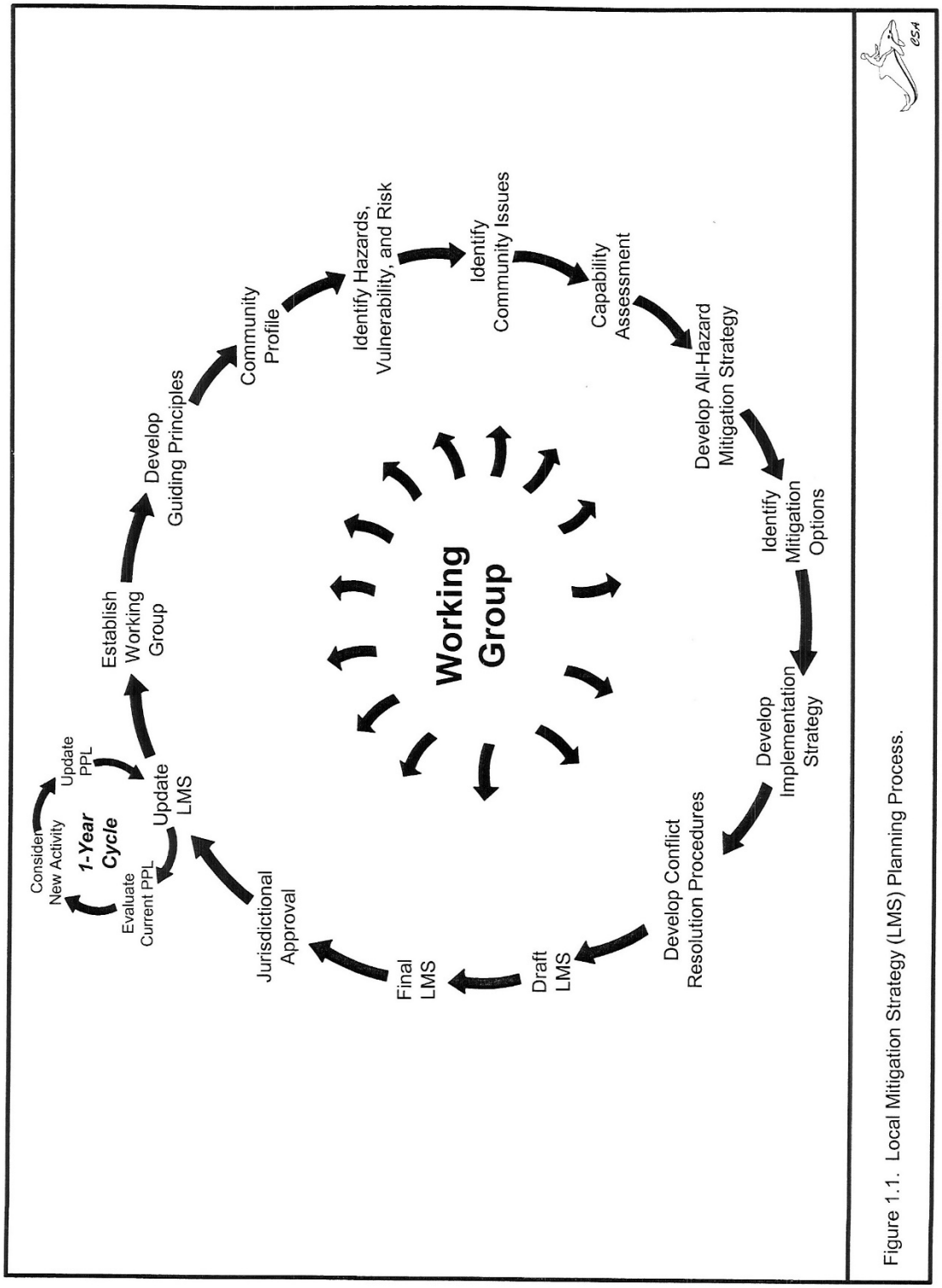


Figure 1.1. LMS Planning Process

- Sebastian Comprehensive Growth Management Plan (Mandatory Elements: Future Land Use, Transportation, Infrastructure, Housing, Recreation and Open Space, Intergovernmental Coordination, Conservation, Coastal Management, and Capital Improvements);
- Orchid Comprehensive Growth Management Plan (Mandatory Elements: Future Land Use, Transportation, Infrastructure, Housing, Recreation and Open Space, Intergovernmental Coordination, Conservation, Coastal Management, and Capital Improvements);
- Fellsmere Comprehensive Growth Management Plan (Mandatory Elements: Future Land Use, Transportation, Infrastructure, Intergovernmental Coordination, Conservation, and Capital Improvements);
- Treasure Coast Regional Strategic Policy Plan, Emergency Management Element; and
- Florida Department of Environmental Protection (FDEP), Division of Water Facilities, Bureau of Beaches and Coastal Systems report entitled "Critical Erosion Areas in Florida."

- Indian River County Department of Emergency Services worked with the Working Group to review the known hazards to which the County is susceptible, discussed their ranges of impacts, and the individual vulnerabilities of the various jurisdictions and population centers within the County (**Section 4.0**, **Hazard Identification**, **Vulnerability**, **and Risk**);
- Indian River County Department of Emergency Services and the Working Group reviewed the description of mitigation options available to reduce risk (**Section 5.0**, **Mitigation Options**);
- An updated all-hazard mitigation strategy aimed at reducing the risks posed by natural hazards in Indian River County was reviewed and approved by the Working Group;
- Methods by which the Indian River County local governments can evaluate and prioritize proposed mitigation projects was reviewed (**Section 6.0**, **Implementation Strategy**);
- The conflict resolution procedure by which city and County governmental entities can resolve any differences that arise over prioritized mitigation projects or mitigation strategies during the update process was reviewed (**Section 6.0**);
- A process and schedule by which this entire Unified LMS will be reviewed, along with guidelines for updating the Project Prioritization List (PPL) was discussed (**Section 6.0**); and
- The PPL (**Section 6.0**) of mitigation projects was updated and cross-referenced with potential funding sources.

Various appendices are provided listing existing policies (**Appendix A**), mitigation options (**Appendix B**), mitigation funding sources (**Appendix C**), hazard data information sources (**Appendix D**), documentation of LMS participation (**Appendix E**), acronyms (**Appendix F**) and Hazard Summary (**Appendix H**).

1.3 LMS WORKING GROUP

Indian River County sought to involve a diverse group of individuals and organizations in planning for natural, technological, and societal hazards within the County. From a broad decision-making body to incorporating public comment to information

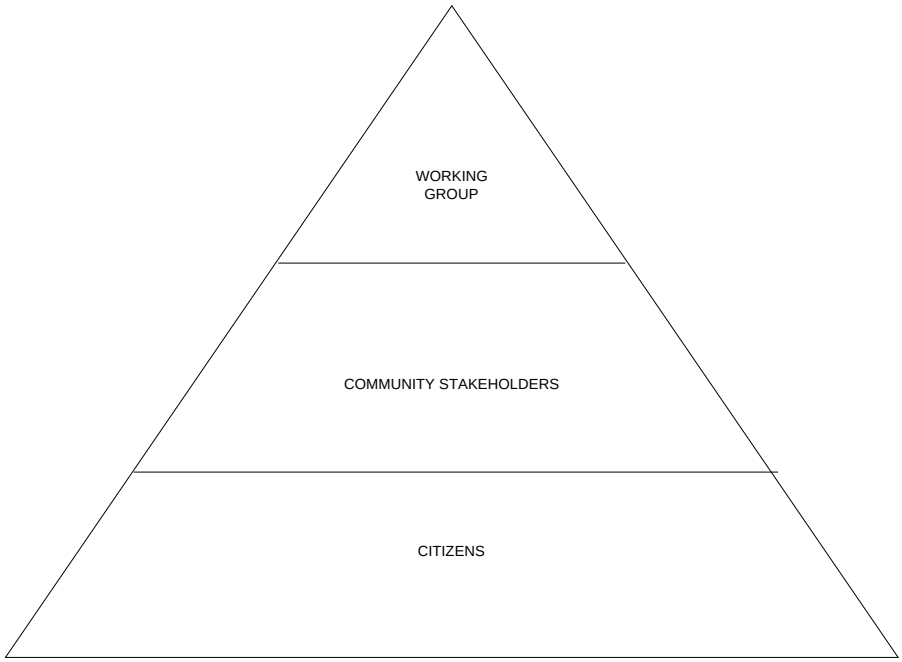
dissemination, multiple methods of involving the jurisdictions, organizations, businesses, and citizens of Indian River County were employed. In designing the public participation process, input has been received from the existing LMS Working Group. The Working Group sought to enhance and expand opportunities for public involvement. The following graphic illustrates how the Working Group will expand participation. The Working Group envisions a three-tiered participation process. Descriptions of each level of participation are discussed as follows.

1.3.1 Working Group

A representative Working Group (Working Group) oversees the Indian River County LMS process.

1.3.1.1 Role of Working Group

The Working Group serves as the policy development body for the LMS program. The role of the Working Group is to advise and assist in the formulation, implementation, administration, and refinement of the Unified Indian River County LMS. The Working Group shall represent the six governmental organizations and several community stakeholders located in Indian River County.



1.3.1.2 Composition

The following organizations were invited to participate on the Indian River County LMS Working Group.

- American Red Cross (ARC)
- BellSouth

- City of Fellsmere
- City of Sebastian Building
- City of Sebastian Planning
- City of Sebastian Public Works
- City of Vero Beach Planning Department
- Florida Forest Service
- Florida Power & Light Company
- Gifford Youth Achievement Center
- Indian River Citrus League
- Indian River County Building Division
- Indian River County Chamber of Commerce
- Indian River County Community Development
- Indian River County Emergency Services
- Indian River County Environmental Health
- Indian River County Public Works
- Indian River County School District
- Indian River County Sheriff's Office
- Indian River Farms Water Control District
- Indian River County Utilities
- Cleveland Clinic Indian River Hospital
- Indian River Shores Public Safety
- Indian River State College
- Town of Indian River Shores
- Town of Orchid
- St. Johns Water Management District
- Sebastian Inlet District
- Sebastian River Area Chamber of Commerce

All jurisdictions in Indian River County (Vero Beach, Fellsmere, Sebastian, Orchid, and Indian River Shores) participated in the development and revisions of this LMS plan by serving on the LMS Working Group and by reviewing, contributing and commenting on draft versions of the plan. These are the same jurisdictions participating since the inception of the LMS plan in 2003.

One representative from each of the organizations listed above was designated to be the contact person for that particular organization.

1.3.1.3 Working Group Responsibilities

The Steering Committee had the following responsibilities:

- To develop and revise the LMS as necessary;
- To coordinate all mitigation activities within the County;
- To set an order of priority for local mitigation projects; and
- To submit annual LMS updates to the Florida Division of Emergency Management by the last working weekday of each January. Updates shall address, at a minimum:
  - Changes to the hazard assessment;
  - Changes to the PPL;
  - Changes to critical facilities;
  - Changes to the repetitive loss list; and

- Revisions to any maps.

The Working Group was collectively responsible for reviewing, analyzing and providing comments on all updated sections of the LMS provided by the Indian River County Department of Emergency Services. A formal voting process took place for approval of draft final and final sections of the LMS. Informal voting took place for issues other than approval of draft final or final sections of the LMS. The participating organization representatives were responsible for attending Working Group meetings, or arranging for another representative of the organization to attend the meeting in their absence. All stakeholders are invited to participate in the LMS update process and general meetings via e-mail.

1.3.1.4 Voting

The voting and approval process for the Working Group was as follows. Each organization listed in **Section 1.3.1.2** received one vote. A simple majority rules procedure was followed when a vote was required. If an organization's representative is not able to attend a meeting, another representative of the organization can assume the voting responsibilities of the designated representative. The LMS Coordinator is responsible for breaking any tie votes. The Director of Emergency Services for Indian River County has been designated as the LMS Coordinator and is responsible for coordinating mitigation activities with the LMS Working Group.

1.3.1.5 Participation Requirement

1) Attend Working Group meetings;
2) Provide input and technical information to the planning process, (if available); and
3) Disseminate information to others within represented sector.

1.3.2 Subcommittees

The LMS Coordinator is authorized to establish ad-hoc subcommittees as needed to further the goals and objectives of the LMS. These groups can be formed to address special issues and can be disbanded once the issue has been properly addressed. Subcommittee members need not be Working Group members, but may be any individual able to provide special expertise and knowledge about specific concerns addressed in the LMS.

1.3.3 Community Stakeholder Groups

Community stakeholder groups are any community group or organization with an interest in reducing the risks posed by natural hazards in Indian River County.

1.3.3.1 Role of Community Stakeholder Groups

In an effort to develop a mitigation planning process that is community based and focused on creating disaster resistant communities in Indian River County, community stakeholder groups were invited to participate. Stakeholders provide the process with valuable information about past, present, and future conditions within the community. Stakeholders were asked to participate in an effort to capture input that is representative of the diverse needs of citizens, businesses, and organizations in Indian River County.

1.3.3.2 Composition

Community stakeholder groups include any community organization that is not represented on the LMS Working Group and can range from neighborhood associations to local businesses, to civic clubs. These groups can provide data and information important in developing the LMS, and may become partners in mitigation activities at some point in the LMS process.

1.3.3.3 Responsibilities

Participation for community stakeholder groups is highly encouraged and voluntary. Groups can participate in the LMS process in the following manners:

1) Attend Working Group meetings; or
2) Provide input and technical information to the planning process; or
3) Review and comment on draft final sections of the LMS; or
4) Disseminate information to others within the stakeholder's organization.

1.3.4 Citizen Participation

1.3.4.1 Role of the Citizen

In an effort to develop a mitigation planning process that is community based and focused on creating disaster resistant communities in Indian River County, citizens are invited to participate. Citizens provide the process with valuable information about past, present, and future conditions within the community. Citizens were asked to participate in an effort to capture input that is representative of the diverse needs of citizens, businesses, and organizations in Indian River County. Citizens were made aware of the opportunity to participate in the LMS process via websites (e.g., County and municipal websites), television (e.g., local government channel), and newspapers. Historically, there has been very little public participation in the LMS. The LMS Working Group will explore ways to improve this lack of participation in the future. Documentation of the opportunity for public participation can be found in **Appendix E**.

1.3.4.2 Participation Responsibilities

Citizen participation is highly encouraged and voluntary. Individuals can participate in the LMS process in the following manners:

1) Review and comment on draft and final plans via County website or library system; or
2) Attend noticed public meetings.

1.3.5 New Jurisdictions/Entities

In the event of restructuring that duly adds, deletes, or merges jurisdictions within the County, the voting member rolls will be adjusted appropriately.

1.3.6 Documentation

Following each meeting, a summary will be prepared containing how solicitation was completed for that specific meeting along with any comments and suggestions made by the public and/or community stakeholder groups. For each meeting, a meeting summary, attendance list, public invite, public comments, and all other solicitation efforts concerning public comments will be located in **Appendix E** of the LMS.

In order to invite and promote the opportunity for broad participation, at a minimum, meeting notices and agendas will be posted through some combination of the following: newspaper ads or public service announcements, postings on County and municipal websites, announcements on the County's TV station, postings in County and municipal newsletters and calendars, and faxes and e-mailings to previous participants. The procedures of invitation will be documented along with comments in the meeting summaries located in **Appendix E** of the LMS. The various invitation notices are to ensure the continuation of public participation in the LMS update process and other activities in the future.

RESOLUTION - INDIAN RIVER COUNTY (PENDING APPROVAL)

RESOLUTION NO. 2020 -

A Resolution of
the Board of County Commissioners
of Indian River County, Florida,
for Approval of the 2015
Revised Indian River County
Unified Local Mitigation Strategy

WHEREAS, on July 7, 2015, Indian River County's updated Unified Local Mitigation Strategy (LMS) was adopted by Resolution No. 2015-078; and

WHEREAS, the Federal Emergency Management Agency requires that all Hazard Mitigation plans must be reviewed and updated as appropriate, and resubmitted to FEMA for approval within five (5) years; and

WHEREAS, FEMA staff has reviewed and approved Indian River County's hazard mitigation plan and determined that it is compliant with federal standards and is now ready for approval by the Board.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF INDIAN RIVER COUNTY, that:

1. The updated Unified Local Mitigation Strategy (a copy of which is located in the Clerk to the Board's Office) is hereby adopted as the official document for inclusion in the State-wide Hazard Mitigation Strategy.
2. The 2020 Revised Indian River County Unified Local Mitigation Strategy Plan will be forwarded to each municipality for their formal approval.

The Resolution was moved for adoption by Commissioner _____. The motion was seconded by Commissioner _____, and, upon being put to a vote, the vote was as follows:

Chairman	Susan Adams	_____
Vice-Chairman	Joseph E. Flescher	_____
Commissioner	Peter D. O'Bryan	_____
Commissioner	Bob Solari	_____
Commissioner	Tim Zorc	_____

The Chair thereupon declared the Resolution duly passed and adopted this _____day of _____, 2020.

BOARD OF COUNTY COMMISSIONERS
INDIAN RIVER COUNTY, FLORIDA

Attest: Jeffrey R. Smith, Clerk and Comptroller

By: _____
Deputy Clerk

By: _____
Susan Adams, Chairman

Approved as to form and legal sufficiency:

By: _____
Dylan Reingold, County Attorney

APPROVED RESOLUTION – CITY OF VERO BEACH (PENDING APPROVAL)

APPROVED RESOLUTION – CITY OF FELLSMERE (PENDING APPROVAL)

APPROVED RESOLUTION – TOWN OF INDIAN RIVER SHORES
(PENDING APPROVAL)

APPROVED RESOLUTION – TOWN OF ORCHID (PENDING APPROVAL)

APPROVED RESOLUTION – CITY OF SEBASTIAN (PENDING APPROVAL)

2.0 COMMUNITY PROFILE

This section describes the geography, population, infrastructure, property and development trends, economic resources, environmental resources, historic and cultural resources, and critical facilities within Indian River County and the municipalities therein. The two main sources of information for this section are the 2010 US Census, University of Florida (2018) and the Indian River County 2030 Comprehensive Plan

2.1 GEOGRAPHY

Indian River County is located in southeast central Florida, along the Atlantic Ocean coast. The County has a total area of approximately 543 square miles (347,520 acres) of which 41.1 square miles (26,298 acres) are water, and 502 square miles (321,280 acres) are land area. Included in the land area are 5 municipalities containing approximately 37.2 square miles (23,830 acres).

Indian River County is about 33 miles wide from east to west and 22 miles long from north to south. In addition to the Atlantic Ocean, the County is bounded by Brevard County on the north, St. Lucie County on the south, Osceola County on the west, and Okeechobee County on the southwest. Indian River County receives an average of 52.01 (http://www.usa.com/indian-river-county-fl-weather.htm) inches of rain per year and sees approximately 127 days of rain per year.

Nearly two-thirds of the total land area is west of I-95; however, more than 90% of the population resides in the eastern third of the County. The City of Fellsmere is the only community in the western portion of the County. The land along the western boundary of the County is used primarily for range and pasture land with little residential development. To the east of that area is St. Johns Marsh, a large freshwater marsh extending the entire length of the County. Included in this significant wetland is the 6,000-acre Blue Cypress Lake. The land between the marsh and I-95 is devoted primarily to agriculture. Much of this land is drained marshland now used for citrus or pasture. Other than the City of Fellsmere in the north, there is little human settlement in this area.

The mainland topography of Indian River County is generally low in elevation, without significant deviation. However, two ridges parallel the coast, one about 1 mile inland from the Indian River with elevations up to 30 feet, the other about 10 miles inland with similar elevations. The coastal barrier islands have typical dune topography with dune elevations of about 15 feet.

The majority of the land in the County is devoted to agriculture. Residential, commercial, and industrial development occurs along the coastal barrier island and the western shore of the Indian River.

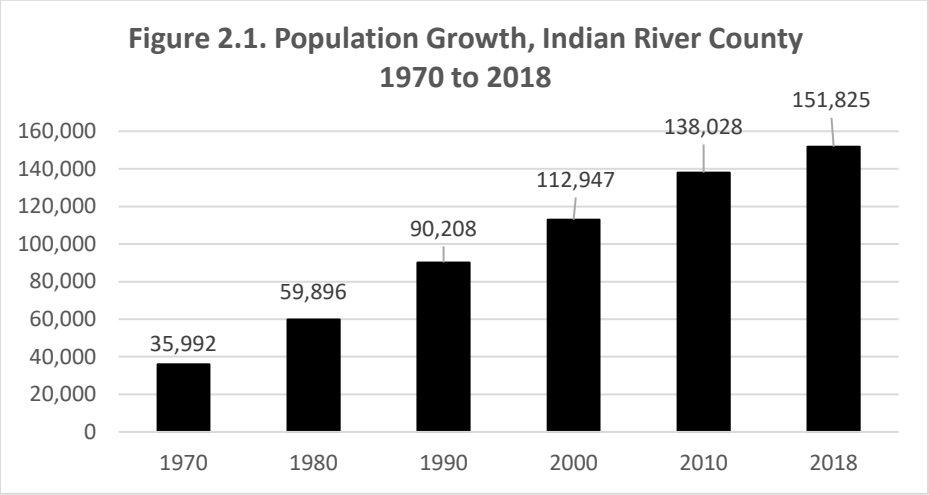
The climate of Indian River is mild subtropical, with an annual average temperature of 73°. Average rainfall is about 52.01 inches (http://www.usa.com/indian-river-county-fl-weather.htm) . Prevailing winds are from the southeast and east in the spring and summer, and from the northeast in the fall.

The drainage area of Indian River County is generally divided by the two geographic ridges that parallel the coast. Areas west of the inland ridge are relatively flat

and drain westward to the St. Johns Marsh, aided by extensive canals, which have been constructed for agricultural use. The basin area between the ridges is generally low and relatively flat. Drainage of the northern portion of this basin area is provided by South Prong Creek and a network of manmade canals. The central and southern portions have essentially no natural watercourses. These areas are drained by an extensive network of manmade canals and ditches that are interconnected and joined with Main Relief, North Relief, and South Relief Canals and discharge into the Indian River.

2.2 POPULATION

In 2018, the estimated countywide population is 151,825, up 10% from 2010 (**Table 2.1**). The Treasure Coast has experienced tremendous growth since the 1960's, and this trend is expected to continue. According to Indian River County's population has grown 34.42% since 2000. The population growth rate is higher than the state average rate of 21.14% and is much higher than the national average rate of 11.61%. **Figure 2.1** illustrates population growth in Indian River County between 1970 and 2018. **Figure 2.2** illustrates the projected population according to University of Florida (2009) for Indian River County between 2010 and 2030.



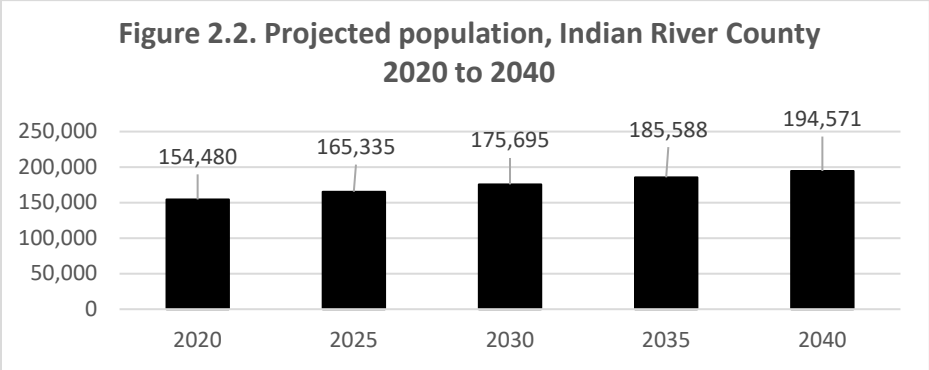


Table 2.1. Population growth in Indian River County.

City/County	2010 Census Data	2018 Estimated Data	% Increase 2010-2018
Vero Beach	15,223	16,274	6.9%
Sebastian	21,929	24,630	12.32%
Fellsmere	5,197	5,571	7.2%
Indian River Shores	3,901	4,208	7.87%
Orchid	415	423	1.93%
Unincorporated	91,363	100,719	10.24%
Countywide Totals	138,028	151,825	10%

Sources: Bebr.ufl.edu

There are five municipalities in the County: Fellsmere, Indian River Shores, Orchid, Sebastian, and Vero Beach. In terms of population, there is significant variation among them. The 2018 population for Fellsmere was 5,571. Fellsmere's population is expected to grow by 70% between 2005 and 2030. Indian River Shores has a population of 4,208 and is expected to grow by 43% in the next 20 years. Orchid has a population of 423 and is expected to grow 115% in the next 20 years. Sebastian has a population of 24,630 and very little grown is expected by 2030. Vero Beach has a population of 16,274 and is expected to grow by only 4% by 2030. The County Community Development Department has projected populations for municipalities as well as unincorporated communities. Those areas with growth rates greater than 50% between 2005 and 2030 include Sebastian, Fellsmere, Orchid, Florida Ridge, North Beach, and Wabasso Beach.

Other significant population characteristics include age, race, income, and special needs. The median age of Indian River County residents is 50.8. In 2017, 30% of the County is estimated to be over the age of 65. This is significant because elderly populations may require additional or special assistance during a disaster. Because cultural differences can influence an individual's response to an event, it is important to define the County population in terms of race. Approximately 12.5 of Indian River County's residents are Hispanic or Latino, while 9.5% are Black or African American. Nearly 14% of residents speak a language other than English at home. Language is an important consideration when developing preparedness materials for residents. The median household income in Indian River County is $49,009 (2017), and 10.6% (2017) of families are considered to live below the poverty level. Per capita personal income in Indian River is approximately 29% higher than the State average.

2.3 INFRASTRUCTURE

2.3.1 Public Buildings

Indian River County Facilities Management is responsible for 1.4 million square feet of building space. In addition, there are a total of 15 fire rescue stations operating in the County, as well as a total of 24 public schools, which are operated by the Indian River County School District.

2.3.2 Transportation

There are two major traffic corridors (i.e., Interstate 95 [I-95] and the Florida Turnpike), U.S. Highway 1, the main north-south route serving the coastal areas, and the Florida East Coast Railroad. The major State Road (SR) in Indian River County is SR 60, which constitutes the County's major east-west traffic corridor.

2.3.3 Utilities

Florida Power & Light Company provides electric service in the County. The cities of Sebastian, Vero Beach, Fellsmere, as well as Indian River County, provide water and sewer services in the County. NVL-City Gas provides gas service to Indian River County residents, Vero Beach, Fellsmere, and Sebastian residents. There are many telephone companies that provide service in Indian River County and with the growing popularity of Voice over IP (Voice over Internet Protocol – VoIP), the industry in constantly growing with approximately 36% of businesses using VoIP today.

2.4 PROPERTY AND DEVELOPMENT

Indian River County has seen significant land use changes over the last 76 years. **Table 2.2** illustrates the change in historic land use between 1943 and 2019.

Table 2.2. Land use changes, Indian River County, 1943 –2019.

Land Use	Percent Change				
	1943	1969	1984	2008	2019
Urban	3.2%	9.6%	11.5%	15.0%	17.06%
Agriculture	27.5%	46.7%	60.5%	51.4%	47.6%
Natural	69.3%	43.7%	28.0%	33.5%	35.31%

Source: Indian River County Comprehensive Growth Management Plan – Future Land Use Element.

Residential land use in unincorporated Indian River County constitutes the largest acreage of land developed for non-agricultural purposes. While individual residences may be found in all areas of the County, the vast majority are located within 11 miles of the coastline, east of I-95. The exception to this is the City of Fellsmere, located about 2½ miles west of I-95 on County Road (CR) 512, in the northern part of the County.

Commercial land uses in Indian River County are confined primarily to commercial/industrial nodes. Nodes are areas with defined boundaries containing a concentration of similar land uses in a non-linear pattern surrounded by other land uses. Existing commercial/industrial nodes contain approximately 5,235 acres of land. Currently, 43% of the total commercial/industrial node acreage (or 2,394 acres) is developed with commercial and/or industrial uses. The remaining 57% of node acreage is either vacant or developed with noncommercial or non-industrial uses such as agricultural, residential, public, and other uses.

Agricultural land use constitutes the largest land use category in the County. As of 2008, more than 136,896 acres were in agricultural use. This represents over 51% of the County area. Agricultural land uses are located throughout the County. This includes virtually all land west of I-95 except the City of Fellsmere, the St. John's Marsh, and a small portion of the I-95/SR 60 Commercial/Industrial Node. There are also significant areas of agricultural land within the area bounded by I-95, 58th Avenue, SR 60, and the City of Sebastian. In the south County, land between I-95 and 43rd Avenue also contains large agricultural areas; however, several other significant land uses in this area include the Oslo Road/I-95 Commercial/Industrial Node, the County Landfill, and the State Department of Corrections facility. Other areas that contain agricultural land are the northern portion of the barrier island and the area along the Indian River Lagoon between Vero Beach and Sebastian.

The mainland portion of Vero Beach shares its boundaries with the County on the north, west, and south sides. At the northern limits of the city, east of U.S. Highway 1, low density residential development and a golf club constitute the primary city land uses; however, mangrove wetlands are found along the Indian River. West of U.S. Highway 1, the Vero Beach Municipal Airport occupies the northern limit of the city, west to 43rd Avenue. A large portion of the airport perimeter land is undeveloped vegetated land, which provides a buffer for the high density Gifford area of the County. Most of the area east of 43rd Avenue

and north of 26th Street constitutes undeveloped, vegetated land; a golf course; and low density residential development.

The western limits of the city constitute 43rd Avenue from 26th Street south to 14th Street. The Jackie Robinson Training Complex, the former spring training complex of the Los Angeles Dodgers, occupies land south to the main canal. Land from the canal south to 16th Street (including the SR 60 intersection) is predominately commercial. The County has a commercial node at the SR 60/43rd Avenue intersection. Medium density residential uses dominate 43rd Avenue from 16th Street to 14th Street.

The southern limits of the city, along 14th Street, are dominated by single-family residential development east to old Dixie Highway and the city cemetery. The land uses in the city from the cemetery north and east along the U.S. Highway 1 corridor to 6th Avenue are dominated by commercial uses; however, several older residential areas are interspersed. Moderate density residential uses dominate east of 6th Avenue to the Indian River. The city power plant and wastewater treatment plant are located along the river at the 17th Street Bridge. Land uses on the barrier island at the city limits are restricted to single-family homes.

The **City of Sebastian**, the largest municipality in the County, is located in the northern area of the mainland, along the Indian River. The most significant land use feature of Sebastian is low density single-family residential. This suburban land pattern dominates the southern and western limits of the city. The second most dominant land use is the municipal airport. This general aviation facility is located in the northwest portion of the city. Land uses east of the airport consist primarily of undeveloped conservation land. Industrial and commercial uses are concentrated along the U.S. Highway 1 corridor in the northern portion of the city. The eastern boundary of Sebastian is an irregular shape and consists primarily of residential uses except that commercial and industrial uses are present where the city limits extend to the U.S. Highway 1 corridor or the Indian River Lagoon.

The **City of Fellsmere** is the only municipality west of I-95 and is also the county's largest municipality in land area. The city is laid out on a grid pattern in the predominantly agricultural area of the northern County. The core area of Fellsmere is easily divided into quadrants using CR 512 and Broadway as the axes. The northwest quadrant is developed in a single-family residential pattern, and the southeast quadrant is partially developed with single-family homes and mobile homes. The southeast quadrant is primarily undeveloped; however, mobile homes are present along the city's southern limit. The northeast quadrant is a partially developed single-family area. A commercial area exists that the central intersection and between the northeast and northeast quadrants.

Between 1998 and 2008, the city's land area increased significantly. During that 10-year period, the City of Fellsmere annexed 23,973 acres, or 37.5 square miles, of unincorporated area. As a result of those annexations, the City of Fellsmere increased from 1,481 acres in 1998 to 25,454 acres in 2008. Agricultural land accounted for the vast majority of land annexed into Fellsmere during that time.

Indian River Shores is an affluent residential community on the barrier island. The Indian River provides a common boundary between this municipality and the County on the west. On the south, the town abuts the City of Vero Beach, and the Atlantic Ocean forms its eastern limits. Only on the north does it share a common land boundary with the County. Land uses along this common boundary consist of single and multi-family

residences in planned residential developments. The desirability of ocean and other waterfront lots has resulted in the barrier island becoming an area dominated by high income housing.

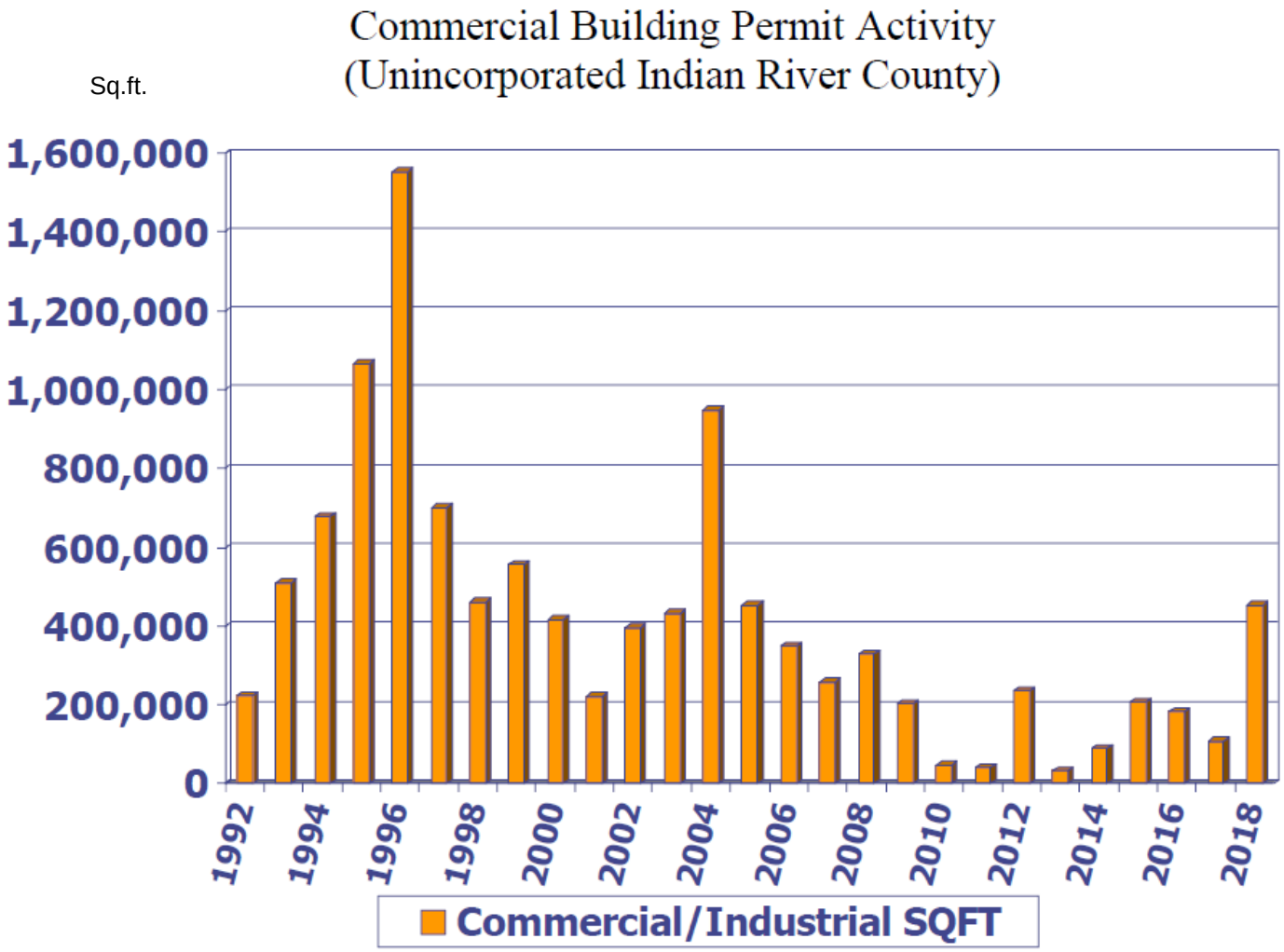
The **Town of Orchid** is the second municipality located exclusively on the barrier island. At the present time, land uses in the town consist of developed and undeveloped single-family lots, a golf course, a beach club, and approximately 110 acres of wetland along the Indian River Lagoon. The wetland is protected under a conservation easement. Although unlikely to be developed at the maximum allowable density, the town's approved master plan allows up to 425 residential units, approximately 340 of which are planned to be single-family homes. The town's master plan also calls for limited commercial development on +/- 7 and +/-3 acre parcels located on CR 510 and SR A1A, respectively.

Table 2.3 displays community characteristics within Indian River County.

According to the Indian River County Property Appraiser's 2019 data, the County contains approximately 15,557 acres of vacant land. Of that total, 2,489 acres are classified as vacant commercial/industrial, and 13,068 acres are classified as vacant residential.

In the year 2018, commercial and industrial building permits were issued for a total of 561,579 square feet. **Figure 2.3** illustrates commercial development trends within the County between 1993 and 2013. As shown in that figure, there were surges in building permit activity for industrial and commercial uses in the mid 1990's and in 2004 and 2005. The first surge in commercial/industrial building permit activity was largely associated with the construction of the Indian River Mall and nearby commercial developments along S.R. 60. The second surge in commercial building permit activity can be attributed to the effects of the 2004 hurricanes as well as an economic boom that brought new commercial/industrial uses to the county.

Figure 2.3. Commercial Building Permit Activity, Unincorporated Indian River County, 1992 - 2018.



Source: Indian River County Community Development Department 2019

Table 2.3. Community characteristics within Indian River County.

City	Location	Urban/Rural	Community Character (Residential/Working/ Retirement)	Economic Base (Industrial/Agricultural/ Retirement/Business)
Fellsmere	Inland	Rural	Residential	Residential/Industrial
Indian River Shores	Intracoastal	Urban	Residential	Residential/Commercial
Orchid	Coastal	Urban	Working	Agricultural
Sebastian	Inland/Intracoastal	Urban	Retirement	Residential/Commercial
Vero Beach	Coastal	Urban	Residential/Working	Business

In 2018, Indian River County Community Development identified a total of 85,908 housing units comprised mostly of single-family detached units (69.3%), mobile homes (8.8%), and multi-family units (21.9%). The County's Comprehensive Growth Management Plan estimates that close to 10% of these housing units are for seasonal residents. Prior to 1960, fewer than 10,000 residences existed in Indian River County. By 1990 there were 47,128 total housing units with almost 59% of homes in Indian River County were built prior to that time. Nearly 66% of residents own their own home in Indian River County.

Table 2.4 displays U.S. Department of Housing and Urban Development building permit data for the County and its municipalities.

Table 2.4. Building permit data, Indian River County, 1980 – 2019.

Location	1980		1990		2000		2018	
	Single-Family	Multi-Family	Single-Family	Multi-Family	Single-Family	Multi-Family	Single-Family	Multi-Family
Unincorporated County	667	205	560	210	816	759	985	104
Fellsmere	7	20	14	0	20	5	5	0
Indian River Shores	29	26	36	0	40	18	41	0
Orchid	0	0	8	0	45	30	1	1
Sebastian	440	10	372	8	269	18	176	0
Vero Beach	71	119	50	8	24	15	21	0
Total	1,214	380	1,040	226	1,214	845	1,229	105

Source: IRC Community Development Department 2019.

During 2018, Indian River County and its municipalities had 1,229 single-family housing starts (new construction) and 105 multi-family housing starts.

The County's Future Land Use Element of the Comprehensive Plan has identified several areas where development opportunities exist. Those areas include the corridor planning opportunities along CR 510, U.S. Highway 1, and SR 60, potential for agricultural planned communities that allow clustered residential on agricultural lands, and nodal development at Oslo Road and 74th Avenue.

2.5 ECONOMIC RESOURCES

There are three Chambers of Commerce within Indian River County, with two locations in Vero Beach and one location in Sebastian. In the top three occupations were management/professional, sales and office, and service jobs. In 2018, the top three industries were retail, healthcare, accommodations & food services (**Table 2.5**). According to the IRC Chamber of Commerce (June 2019) the top three private sector employers in the County are the School District of Indian River County (2,121) Cleveland Clinic Indian River Hospital (2,027), Publix Supermarkets (1,380), and Piper Aircraft 1,000.

Table 2.5. Industry classifications within Indian River County for 2017.

Industry Classification	Employees	% of Total Employment	Average Annual Wage
Accommodations & Food Service	5,812	12.4%	$20,280
Agriculture	1,869	4.0%	$28,392
Arts, Entertainment & Recreation	2,593	5.5%	$34,164
Construction	3,847	8.2%	$39,988
Educational Services	3,210	6.9%	$39,260
Finance, Insurance, & Real Estate	2,475	5.3%	$76,648
Health Care	9,442	20.2%	$45,708
Information Technology	567	1.2%	$59,332
Manufacturing	1,948	4.2%	$51,324
Professional, Scientific, Technical Services	2,271	4.9%	$54,496
Public Administration	2,516	5.4%	$49,712
Retail	8,524	18.2%	$27,352
Transportation, & Warehousing	1,020	2.2%	$42,380
Wholesale Trade	714	1.5%	$179,816

Job Grant funds are available to businesses included in the list of the county's target industries indicated in the Economic Development Element of the County Comprehensive Plan. Successful applicants will create at least 5 new full-time jobs (employment positions that are scheduled for at least 35 hours per week). The salary or wage of each new qualified job listed on the application will be equal to or exceed 75% of the county's average annual salary/wage level. **Table 2.6** displays the grant calculation breakdown. Bonuses also are available to businesses located within an Enterprise Zone.

Table 2.6. Job Grant Funds, Indian River County, 2019 (CDR January 2019 -Planning Department).

# of Avg. Wage of New Qualified Jobs	**Grant Amount/Job**
75% of county average wage	$3,000 per job
100% of county average wage	$5,000 per job
150% of county average wage	$7,000 per job

Source: Indian River County (2019).

2.6 ENVIRONMENTAL RESOURCES

In 2019, there are 91 public parks in the County. Of those parks, 27 were located in the unincorporated County. Each of the parks is owned, operated and maintained by one of six separate governments. The cities of Vero Beach, Sebastian, and Fellsmere have their own municipal parks within their respective city limits, while Indian River County, the State of Florida, and the United States Government each administer other park areas. There are a number of natural areas within the County including the Oslo Riverfront Conservation Area, Pelican Island National Wildlife Refuge (NWR), St. Sebastian River Buffer Preserve, and the Archie Carr NWR. The Oslo Riverfront Conservation Area consists of 440 acres on the Indian River Lagoon. The Pelican Island NWR was the first NWR in the nation. The Archie Carr NWR is located on a barrier island between the Indian River and Brevard County, north of the Wabasso Causeway and south of the Sebastian Inlet. The refuge is an important site for turtle nesting.

2.7 HISTORIC AND CULTURAL RESOURCES

According to the National Register of Historic Places, there are 26 designated places in Indian River County. In Vero Beach, designated places include the Driftwood Inn and Restaurant, Judge Henry F. Gregory House, Hallstrom House, Theodore Hausmann Estate, Indian River County Courthouse, Maher Building, McKee Jungle Gardens, Old Palmetto Hotel, Pueblo Arcade, Parkway Plaza, Pelican Island NWR, Old Vero Beach Community Building, Vero Beach Diesel Power Plant, Vero Beach Woman's Club, Vero Railroad Station, and the Vero Theatre. In Fellsmere, the Marian Fell Library, Fellsmere Public School, and the First Methodist Episcopal Church are also designated. The Jungle Trail in Orchid as well as the Bamma Vickers Lawson House, Old Town Sebastian Historic District East, Old Town Historic District West, Pelican Island National Wildlife Refuge, Sebastian Grammar and Junior High School, Archie Smith Wholesale Fish Company, and the Spanish Fleet Survivors and Salvors Campsite (Also known as Sebastian Inlet State Park) in Sebastian are also listed on the National Register.

Annual cultural events and festivals in Indian River County include the Center for the Arts, Gardenfest, Sebastian Riverfront Fine Art & Music Festival, Vero Beach Food, Wine & Music Festival, Firefighter's Fair, Pelican Island Wildlife, May Pops, Sebastian Clambake, Fellsmere Frog Leg Festival, Riverside Theatre, Under the Oaks Arts Show and more.

2.8 CRITICAL FACILITIES

There are many critical facilities located within the County. Certainly, hospitals and medical facilities provide important services during disasters. The medical service facilities in Indian River County include Cleveland Clinic Indian River Hospital and Sebastian River Medical Center. According to the Health Information Site of the Agency for Health Care Administration (2019) Indian River County has a total of 6 nursing homes with 674 beds and 29 assisted living facilities with 1,356 beds. The County has two senior centers, which serve a growing elderly population. Indian River County also has three community health centers available to provide affordable healthcare: Florida Department of Health in Indian River County, and the Treasure Coast Community Health.

Lines of communication are critical in providing information to the public before, during, and after a disaster. There are nine local radio stations broadcasting in Indian River County including:

- WAXE-AM (1370)
- WTTB-AM (1490)
- WQCS-FM (88.9)
- WSCF-FM (91.9)
- WGYL-FM (93.7)
- WOSN-FM (97.1)
- WJKD –FM (99.7)
- WCZR-FM (101.7)
- WQOL-FM (103.7)

There are a variety of locally printed newspapers, including: the Sebastian Daily, Indian River Press Journal, Vero News, and Vero Beach 32963.

Indian River County's Fire Rescue Division provides firefighting, Basic Life Support medical response, Special Operations (marine firefighting, dive rescue, airport firefighting & rescue, high angle rescue, hazardous materials response and confined space rescue) along with providing public education and operates from 15 Fire-Rescue locations. Other emergency operations in Indian River County include the Florida Forest Service, and Indian River Shores Public Safety facilities.

A critical facilities inventory is maintained and on file with the Indian River County Emergency Management office.

3.0 INSTITUTIONAL ANALYSIS

In the mitigation planning process, it is not only important to identify which hazards a community is at risk from, it also is important to identify the resources the community has available to prepare for, mitigate against, respond to, and recover from natural, technological, or societal hazards. This section outlines the current resources available to Indian River County to reduce the risks posed by the hazards identified in **Section 4.0**. Mitigation programs, policies, and projects on the Federal, State, regional, and local levels are described and documented in this section. Sources of intergovernmental coordination, methods of strengthening the role of local governments, and background on private sector involvement also are documented. Each LMS Working Group member has been asked to review their policies and programs annually and to report any additions or deletions to the group. If there are changes, the LMS will be updated accordingly.

3.1 FEDERAL GOVERNMENT

3.1.1 FEMA

The FEMA has the lead Federal role in natural hazard mitigation, preparation, response and recovery. FEMA has several programs aimed at reducing the risks posed by natural hazards in communities nationwide.

3.1.1.1 PDM Program

The PDM Program was authorized by §203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 USC, as amended by §102 of the Disaster Mitigation Act of 2000. Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist states and local governments in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. The Act establishes criteria for State and local hazard mitigation planning. Local governments applying for PDM funds through the states will have to have an approved local mitigation plan prior to the approval of local mitigation project grants. States also will be required to have an approved standard State mitigation plan in order to receive PDM funds for State or local mitigation projects.

3.1.1.2 National Flood Insurance Program (NFIP)

The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods.

3.1.1.3 Community Rating System (CRS)

The NFIP's CRS was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: 1) reduce flood losses; 2) facilitate accurate insurance rating; and 3) promote the awareness of flood insurance. There are ten CRS classes: Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction. The CRS recognizes 19 creditable activities, organized under four categories numbered 300 through 600: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. Through Various flood plain management activities and coordination with FEMA, eligible communities in Indian River County have been assigned the following CRS classes (as of October 1, 2016): Indian River County – CRS Class 6, City of Fellsmere – CRS Class 8, Town of Indian River Shores – CRS Class 6, Town of Orchid (not a participant), City of Sebastian – CRS Class 7, and the City of Vero Beach – CRS Class 7.

3.1.1.4 Map Modernization

The goal of FEMA's Map Modernization Plan is to upgrade its panel flood map inventory nationwide by:

- Developing up-to-date flood hazard data for all flood prone areas nationwide to support sound floodplain management and prudent flood insurance decisions;
- Providing the maps and data in digital format to improve the efficiency and precision with which mapping program customers can use this information;
- Fully integrating FEMA's community and State partners into the mapping process to build on local knowledge and efforts;
- Improving processes to make it faster to create and update the maps; and
- Improving customer services to speed processing of flood map orders and raise public awareness of flood hazards.

In December 2012, after several years of coordination between Indian River County, county municipalities and FEMA, modernized digital flood maps for Indian River County were finalized and formally adopted. The updated digitized flood insurance rate maps (DFIRMS) can be accessed through the County's website (www.ircgov.com) or directly through FEMA's Flood Map Service Center (https://msc.fema.gov/portal). On September 29, 2017, FEMA issued preliminary revised maps relating to a Levee Analysis Mapping Procedure (LAMP) update and Coastal Study Project area update. Those map revisions are on schedule to be finalized and become effective in mid-2020.

3.1.1.5 Flood Mitigation Assistance (FMA) Program

The goal of the FMA Program is to reduce or eliminate claims under the NFIP. FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. There are three types of grants available under FMA: Planning, Project, and Technical Assistance Grants.

3.1.1.6 National Hurricane Program

The National Hurricane Program conducts and supports many projects and activities that help protect communities and their residents from hurricane hazards. Three key components of the Program are Response and Recovery; Planning, Training, and Preparedness; and Mitigation.

3.1.1.7 Other Programs

The National Mitigation Strategy was developed to provide a framework for reducing the exposure of all Americans to the catastrophic losses caused by natural disasters. In addition, FEMA sponsors the Mitigation Assistance, Disaster Preparedness Improvement Grant, Community Assistance, and Fannie Mae Pilot Loan Programs.

3.1.2 United States Environmental Protection Agency (EPA)

The EPA is the lead Federal agency for hazardous materials issues and planning. The EPA is responsible for implementing the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA establishes requirements for Federal, State, and local governments, Native American tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous materials and toxic chemicals. The Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment. The EPA also sponsors several grant programs focusing on environmental health, including Clean Water Act Section 319 Grants, Brownfields Economic Redevelopment Grants, and the Sustainable Development Challenge Grant.

3.1.3 United States Forest Service (USFS)

The Fire and Aviation Management part of the USFS is a diverse group of people working to advance technologies in fire management and suppression, maintain and improve the extremely efficient mobilization and tracking systems in place, and reach out in support of our Federal, State, and international fire partners.

3.1.4 United States Fish and Wildlife Service (USFWS)

The USFWS oversees the implementation of the Coastal Barrier Resources Act (CBRA). The purpose of CBRA was to eliminate Federal development incentives on undeveloped coastal barriers, thereby preventing the loss of human life and property from storms, minimizing Federal expenditures, and protecting habitat for fish and wildlife. Coastal barriers are landscape features that protect the mainland, lagoons, wetlands, and salt marshes from the full force of wind, wave, and tidal energy.

3.1.5 United States Department of Commerce (DOC)

The National Oceanic and Atmospheric Administration (NOAA) located within the DOC conducts research and gathers data about the global oceans, atmosphere, space, and sun, and applies this knowledge to science and service that touch the lives of all Americans.

The DOC manages the Coastal Zone Management Program on the national level. The Economic Development Administration (EDA) within the DOC administers EDA Public Works & Infrastructure Development Grants to promote long-term economic development and assist in the construction of public works and development facilities needed to initiate and support the creation or retention of permanent jobs in the private sector in areas experiencing substantial economic distress.

3.1.6 National Weather Service (NWS)

NWS provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters, and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure, which can be used by other governmental agencies, the private sector, the public, and the global community.

3.1.7 United States Geological Survey (USGS)

The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

3.1.8 Unites States Army Corps of Engineers (USACE)

In addition to building projects, the USACE, through its Flood Plain Management Services, advises communities, industries, and property owners on protection measures they can take themselves, such as zoning regulations, warning systems, and flood proofing. One of the primary missions of the U.S. Army Corps of Engineers to support flood risk management activities of communities in both urban and rural areas throughout the United States. To carry out this mission, the Corps operates projects that reduce flood risk and conducts emergency management activities. The Corps projects have prevented an estimated $706 billion in river and coastal flood damage, most of that within the last 25 years. The cumulative cost for building and maintaining these projects to date is more than $120 billion. That means for every dollar spent, approximately six dollars in potential damages have been saved.

3.1.9 United States Fire Administration (USFA)

As an entity of the Department of Homeland Security and the Federal Emergency Management Agency, the mission of the USFA is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support.

3.1.10 National Response Team (NRT)

The NRT is an organization of 15 Federal departments and agencies responsible for coordinating emergency preparedness and response to oil and hazardous substance pollution incidents. With nationwide responsibilities for interagency planning, policy, and coordination, the NRT ensures that the most valuable tool in an emergency — readiness — is available for pollution incidents of all sizes and kinds. Prior to an incident, the NRT provides policy guidance and assistance. During an incident, the NRT provides technical

advice and access to resources and equipment from its member agencies. The EPA serves as chair of the NRT, and the U.S. Coast Guard serves as vice-chair. This interagency planning and coordination framework is replicated at the regional, sub-regional, and local levels. In addition to interagency coordination, the NRT also engages the private sector in prevention, preparedness, and response efforts. The NRT encourages innovation and collaboration to increase the effectiveness and reduce the cost of industry compliance with planning and response regulations. The NRT receives no direct appropriations for its activities.

3.1.11 United States Department of Housing and Urban Development (HUD)

HUD sponsors a number of programs that can be used to further the goals of hazard mitigation within a community. The Community Development Block Grant (CDBG) Small Cities Program provides funding to improve local housing, streets, utilities, and public facilities in small cities. Disaster Recovery Initiative funds are provided for disaster relief, long-term recovery, and mitigation activities in areas affected by a presidential disaster declaration.

3.1.12 United States Department of the Interior (USDOI)

USDOI sponsors several programs that can help further mitigation. The Federal Land-to-Parks Transfer Program provides funds to identify, assess, and transfer available surplus Federal real property to State and local entities for use as parks, recreation areas, and open space. USDOI also supports land acquisition programs, the North American Wetland Conservation Fund, Partners for Fish and Wildlife, and the Rivers, Trails, and Conservation Assistance Program.

3.1.13 United States Department of Agriculture (USDA)

USDA sponsors the following hazard-related programs: Emergency Watershed Protection Program, Watershed Surveys and Planning, Small Watershed Program, and Rural Utilities Service Water and Waste Disposal Program.

3.1.14 United States Department of Transportation

The Federal Highway Administration sponsors a transportation enhancement program that provides funds for transportation enhancements. The Federal Transit Administration offers funding programs related to transportation capital expenses including Section 5309 Capital Funds.

3.1.14 Center for Disease Control (CDC)

The CDC works 24/7 to protect America from health, safety and security threats, both foreign and in the U.S. Whether diseases start at home or abroad, are chronic or acute, curable or preventable, human error or deliberate attack, CDC fights disease and supports communities and citizens to do the same. The CDC is a great resource for emergency preparedness and response for public health emergencies (http://emergency.cdc.gov/disasters/floods/index.asp)

3.2 NON-GOVERNMENT

3.2.1 Firewise Communities USA

Firewise Communities/USA is a project of the National Wildfire Coordinating Group's Wildland/Urban Interface Working Team and is the newest element of the Firewise program. It provides citizens with the knowledge necessary to maintain an acceptable level of fire readiness, while ensuring firefighters that they can use equipment more efficiently during a wildland fire emergency. The program draws on a community's spirit, its resolve, and its willingness to take responsibility for its ignition potential.

3.2.2 Institute for Business and Home Safety (IBHS)

IBHS is a nonprofit association that engages in communication, education, engineering, and research. The goal of IBHS is to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters.

3.2.3 American Red Cross (ARC)

Although the ARC is not a government agency, its authority to provide disaster relief was formalized when, in 1905, the ARC was chartered by Congress to "carry on a system of national and international relief in time of peace and apply the same in mitigating the sufferings caused by pestilence, famine, fire, floods, and other great national calamities, and to devise and carry on measures for preventing the same." The Charter is not only a grant of power, but also an imposition of duties and obligations to the nation, to disaster victims, and to the people who generously support its work with their donations.

3.2.4 National Fire Protection Association (NFPA)

The mission of the international nonprofit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training, and education.

3.2.5 Association of State Floodplain Managers (ASFPM)

ASFPM goals include reducing the loss of human life and property damage resulting from flooding, preserving the natural and cultural values of floodplains, promoting flood mitigation for the prevention of loss and the wise use of floodplains, and avoiding actions that exacerbate flooding.

3.3 STATE GOVERNMENT

3.3.1 Florida Division of Emergency Management (FDEM)

Formerly within the Florida Department of Community Affairs, the Division became a direct reporting entity to the Executive Office of the Governor (EOG) on a full-time basis when the Florida Governor abolished the Department of Community Affairs effective October 1, 2011.

The division ensures that Florida is prepared to respond to emergencies, recover from them, and mitigate their impacts. DEM is responsible for the State Emergency Response Team (SERT) which is composed of various intergovernmental entities, volunteers, and the private sector. The division coordinates the efforts of the Federal Government with other departments and agencies of state government, with county and municipal governments and school boards, and with private agencies that have a role in emergency management.

When local governments believe an emergency is beyond the capabilities of local resources, or when the Governor determines there is an overriding concern for the safety of the public, the Governor can designate the primary responsibility for emergency response to the State by issuing an Executive Order under the provisions of Section 252.36, Florida Statutes (F.S.).

The DEM is the designated State Warning Point in the event of a hazardous materials incident. As such, the DEM is responsible for receiving notification of an emergency from the County Communications Coordinator, and coordinating the request(s) for County support, if requested. The DEM is responsible for assisting Local Emergency Planning Committees (LEPCs) in providing warnings and instructions to the general public. Other DEM programs include the Emergency Management Preparedness and Assistance Grant, Residential Construction Mitigation Program, and the Florida Warning and Information Network.

3.3.2 Florida Forest Service (FFS)

The Florida Forest Service (FFS) has a mission to protect and manage the forest resources of Florida, ensuring that they are available for future generations. Wildfire prevention and suppression are key components in their efforts to protect homeowners from the threat of damage in a natural, fire-dependent environment.

3.3.3 Florida Department of Environmental Protection (FDEP)

The FDEP Bureau of Beaches and Wetland Resources oversees the listing of critical erosion areas within the state. The Florida Geological Survey, housed in FDEP, is the State lead on geologic hazards such as sinkholes. FDEP sponsors two key mitigation related funding programs – the Revolving Fund Loan Program for Waste Water Treatment and the Pollution Control Bond Program. FDEP also is home to the State Coastal Management Program. The Florida Coastal Management Program (FCMP) coordinates among local, State, and Federal entities involved in coastal management activities. In addition to working with FDEP's programs, the FCMP coordinates among the eight State agencies, five water management districts, and local governments that have responsibilities for coastal management under the federally-approved FCMP. The FCMP also develops partnerships with local communities to actively solve problems related to coastal development.

3.3.4 Florida Fish and Wildlife Conservation Commission

The Fish and Wildlife Conservation Commission sponsors environmental education programs aimed at educating adult Floridians about population growth, habitat loss, and coastal and fresh water ecosystems.

3.3.5 Florida Inland Navigation District (FIND)

FIND provides assistance on certain waterway related projects including navigation channel dredging, channel markers, navigation signs or buoys, boat ramps, docking facilities, fishing & viewing piers, waterfront boardwalks, inlet management, environmental education, law enforcement equipment, boating safety programs, beach renourishment, dredge material management, environment mitigation, and shoreline stabilization.

3.3.6 Florida Department of Transportation (FDOT)

FDOT maintains Federal and State roads as well as airport construction and zoning and various other types of transportation administration.

3.3.7 Building Officials Association of Florida (BOAF)

BOAF coordinates building code enforcement among local building officials.

3.3.8 Florida Department of Insurance (FDOI)

FDOI helps finance the reconstruction of communities following a disaster.

3.3.9 Agency for Health Care Administration (AHCA)

The Agency for the Health Care Administration oversees hospital construction and various health testing services.

3.3.10 Florida Department of Business and Professional Regulation (FDBPR)

The FDBPR oversees elevator maintenance and safety, building inspection, engineering, architecture, and construction contractors.

3.3.11 Florida Department of Corrections (FDOC)

The FDOC builds prisons, local detention facilities, and private contract facilities.

3.3.12 Florida Department of Education (FDOE)

The FDOE oversees school construction and maintenance. The department also has an emergency planning program that focuses on hazardous materials accident preparedness.

3.3.13 Florida Department of Management Services (FDOMS)

The FDOMS manages State public buildings and personnel services.

3.3.14 Florida Department of State

The Division of Historical Resources is one of seven divisions within the Department of State, and the State agency responsible for promoting the historical, archaeological, museum, and folk culture resources in Florida. The Division Director serves as Florida's State Historic Preservation Officer, providing a liaison with the national historic preservation program conducted by the National Park Service. The Bureau of Historic Preservation identifies, evaluates, preserves, and interprets historic structures and properties that reflect the diversity of our past. The Bureau manages the nation's largest historic preservation grants program and oversees the development of State historic markers, heritage publications, and Florida folk life programs.

3.4 REGIONAL GOVERNMENT

3.4.1 Treasure Coast Regional Planning Council (TCRPC)

The TCRPC has been enabled under Section 186.501, F.S. The Council is a multi-county entity covering Indian River, Martin, Palm Beach, and St. Lucie counties. It has major responsibility for addressing growth management issues that are multi-jurisdictional in scope. One of its key roles is to engage in area-wide comprehensive and functional planning; this includes working in cooperation with Federal and State agencies planning for emergency management as described in Section 252.34(4), F.S. The TCRPC provides full-time staffing for the District X LEPC. The LEPC is charged with administering regional compliance with hazardous materials reporting and training laws. Its many initiatives include the State Hazardous Materials Training Task Force; District X Hazardous Materials Emergency Plan; training for emergency first response personnel; hospital and hazardous materials response team needs; public hazardous chemical awareness and reporting seminars; public and private sector hazardous materials emergency exercises; and assisting public and private facilities with chemical emergency preparedness planning.

Section 186.507, F.S. directs regional planning councils to prepare strategic regional policy plans. One of the elements the plan must address is emergency preparedness. The TCRPC promotes mitigation initiatives within Section 5.0, Emergency Preparedness, of its "Strategic Regional Policy Plan." Specific strategies that promote mitigation are summarized below. These strategies and the policies that implement them are listed in **Appendix A**.

Strategy 5.1.1 Direct development away from areas most vulnerable to the effects of natural and manmade disasters.

Strategy 5.2.1 Utilize land use, transportation, and community planning processes to address vulnerability issues.

Strategy 5.3.1 Provide shelter space for residents of areas susceptible to flooding from the effects of hurricanes and other storms.

Strategy 5.4.1 Develop the mechanisms necessary to ensure that emergency planning agencies have input into the local government decision-making process.

Strategy 5.5.1 Initiate disaster preparedness activities that will protect lives and property and reduce evacuation times.

Strategy 5.5.2 Establish mechanisms and regulations necessary for post-disaster reconstruction to occur in a consistent manner, making future disasters less destructive to life and property.

3.4.2 St. Johns River Water Management District (SJRWMD)

In 1972, the Florida Legislature established five water management districts that are recognized in the State Constitution. Each district has responsibilities in four broad categories: water supply (including water allocation and conservation), water quality, natural systems management and flood protection.

The St. Johns River Water Management District (District) encompasses all or part of 18 counties in northeast and east- central Florida that includes 12,283 miles (about 7.8 million acres). The 18-county district had a population of 5.06 million people as of 2017.The District operates from its headquarters in Palatka, and service centers in Palm Bay, Maitland and Jacksonville.

The mission of the St. Johns River Water Management District is “to protect our natural resources and support Florida’s growth by ensuring the sustainable use of Florida’s water for the benefit of the people of the District and the state.”

In April 2013, the District’s Governing Board adopted a strategic plan to replace the *District Water Management Plan.* As outlined in Chapter 373 of the Florida Statutes, the strategic plan is updated annually, is for a minimum five- year planning horizon, and identifies goals, strategic priorities, strategies, success indicators, milestones/deliverables, and funding sources for the District.

The District operates and maintains more than 100 major and minor water control structures, including 11 spillways, three navigational locks, and approximately 300 miles of levees and canals in the headwaters of the St. Johns River in Brevard and Indian River counties, and in the Harris Chain of Lakes in Lake County. Those structures are the only controls the District has of water levels in the St. Johns and Ocklawaha rivers. The District also restores wetlands and floodplain areas that provide flood water storage. Through its permitting program, the District ensures that storm water is managed on development sites and that new drainage ditches or significant changes to existing ditches are coordinated regionally. The District and the Florida Department of Environmental Protection issue permits to install stormwater systems, but it is often the responsibility of a developer or homeowners association to maintain the systems. In addition, the District assists local governments in emergency response during disasters.

3.5 COUNTY GOVERNMENT

3.5.1 Listing of Agencies

Within the existing Indian River County organization structure, there are a number of departments that play key roles in hazard mitigation. They include DES, Community Development Department, and the Department of Public Works.

DES. The DES is composed of five divisions: Emergency Management, Radiological Preparedness, Fire Rescue, 9-1-1 Database and Animal Control. In terms of

hazard mitigation, the Emergency Management Division has the lead role in dealing with hazard-related events. In that role, one of the Division's important functions involves overall coordination responsibility during emergency events. The County Comprehensive Emergency Management Plan (CEMP) serves as the countywide operational management plan for emergency events. It defines the roles and functions of all local governmental agencies and non-profit and private sector entities. Another important function that is highly visible is fire protection. The County provides fire protection in all areas of the County with the exception of Indian River Shores, which has its own public safety department. Besides its firefighting responsibility, the DES also is responsible for ensuring compliance with County fire codes.

The County Commission has assigned lead responsibility for the preparation of the LMS to the DES. In that role, the Department has been charged with the responsibility of facilitating the development of a countywide LMS. An important aspect of the work effort will be to ensure broad participation, not just within County government, but with all municipalities, special districts (e.g., water control districts), non-profits, and private sector businesses.

Community Development Department (CDD). The CDD is comprised of five divisions: Current Development, Environmental & Code Enforcement, Long-range Planning, Metropolitan Planning Organization (MPO) and Building. The CDD has primary responsibility for administering the County Comprehensive Growth Management Plan (CGMP), and appraising and updating from time to time. In addition to its long-range planning role, the CDD is responsible for processing development petitions (i.e., rezoning petitions, site plans). Also, the Department is involved in the evaluation and assessment of environmental projects (e.g., shoreline stabilization projects, beach erosion initiatives). The Building Division issues and oversees compliance with all building permits. The County issues building permits and conducts inspection compliance, not only for the unincorporated portions of the County, but also for the City of Vero Beach. The MPO is responsible for county-wide transportation planning.

Public Works Department (PWD). The Public Works Department is the management center for planning and implementing engineering design, construction, and maintenance programs within the Engineering, Traffic Engineering, Coastal Engineering, Land Acquisition, Facilities Management, Stormwater Engineering, Fleet Management, Telecommunications, and Road and Bridge Divisions. The function of the Public Works Department is to provide complete infrastructure and infrastructure maintenance for transportation, stormwater/drainage, communications, government buildings, parks, recreation, and beaches within Indian River County, as well as meeting the fleet management and building maintenance needs of all County departments and constitutional officers.

Sheriff's Office. The Indian River County Sheriff's Office is involved in a number of emergency related activities to assist in preparing for, mitigating against, responding to, and recovering from disasters. It is the policy of the Indian River County Sheriff's Office to establish the Incident Command System as the method of response to organize both short-term and long-term field level operations for an "All Hazards" approach to a broad spectrum of natural, manmade and accidental emergencies, such as:

Natural Disasters

- Heavy Weather (i.e. Hurricane, Tropical Storm, Tornado, Flooding)
- Wildfire
- Pandemic
- Earthquake/ Tsunami

Man-Made Disasters/ Acts of Terrorism

- Active Shooter
- Bomb Threat/ Bomb Disposal
- Civil Disturbance/ Mass Arrest
- Crisis Situations
    - Hostage Situation
    - Armed Suicidal Person
    - Armed Barricaded Person

Accidental Disasters

- Aircraft/ Railway Accidents
- Pipeline Emergency
- Radiologic Emergency

3.5.2 County Mitigation Policies and Ordinances

All of the resources listed below are considered for inclusion of hazard mitigation goals and objectives for Indian River County and its jurisdictions.

Policy Plans. The two key policy plans that address issues related to natural and technological hazards include the County Comprehensive Plan and the County Comprehensive Emergency Management Plan. They are described briefly below.

CGMP. The CGMP (County Growth Management Plan) contains the County's data, analysis and policies that relate to development and redevelopment. The Plan consists of twelve plan elements: Introductory, Economic Development, Conservation, Coastal Management, Infrastructure (includes potable water, sanitary sewer, stormwater management, solid waste, natural aquifer recharge sub-elements), Future Land Use, Housing, Recreation and Open Space, Transportation, Intergovernmental Coordination, Capital Improvement, and public school facilities. Seven of the elements address hazards. **Table 3.1** identifies what types of hazards are addressed by each plan element. A complete listing of Goals, Objectives, and Policies in the Indian River County 2030 Comprehensive (Growth Management) Plan that relates to hazard mitigation is in **Appendix A**. The following items provide highlights of a few key policies in the CGMP that address the issue of hazard mitigation, which were integrated based on the principles of the Local Mitigation Strategy:

- The county shall not approve plan amendments that increase the residential density or land use intensity within the Coastal High Hazard Area.
- The county shall limit densities in the coastal high hazard area to ensure timely evacuation of the barrier island.

- The County shall prohibit new development of adult congregate living facilities, nursing homes, homes for the aged, total care facilities, and similar developments within the CHHA;
- The county shall ensure that adequate stormwater management facilities are constructed and maintained to prevent major flooding of the road network of Indian River County during storm events.
- All new storm sewers discharging into any canal or receiving waterbody shall be designed to convey the permitted discharge after tailwater conditions are considered.
- All major bridges shall be designed to withstand a 100 year/3-day storm event.
- To ensure stormwater management facilities function properly, the county will establish defined levels of maintenance for public and private stormwater management facilities, and will conduct inspections on a routine basis.
- Contingent upon available funding in the county's environmental lands program, the county shall continue to acquire property in the 100-year floodplain for conservation.
- The county will continue to require reuse of stormwater runoff for irrigation of golf courses and other developments with wet detention/retention ponds with surface area greater than one acre.
- The county will allow only low density land uses in areas designated as flood prone (within the 100 year floodplain) as depicted on the Future Land Use Map. The only exception is where platted subdivisions were developed prior to existing regulations.
- The county shall continue to regulate development within flood prone areas to minimize flood storage capacity reduction and to afford protection to life and property within floodplains.
- The county shall maintain its annual certification as a participating community in the National Flood Insurance Program (NFIP) Community Rating System (CRS).

County CEMP. The County Commission has an adopted Comprehensive Emergency Management Plan (CEMP). It is an operations oriented document that establishes the framework for effective management by the County during emergencies and disasters. The CEMP has a dedicated annex (Annex II - Mitigation Functions) to mitigation where Indian River County's Local Mitigation Strategy principles are integrated to serve as a tool to direct the county and municipal governments in their on-going efforts to reduce their vulnerability to the impacts produced by both natural and man-made hazards, such as:

- Hurricanes and tropical storms;
- Flooding;
- Hazardous materials radiation exposure and contamination;
- Armed violence;
- Mass immigration;
- Coastal oil spill;
- Freezes;
- Wildland fires;
- Tornadoes;
- Drought;
- Dam failure;
- Property loss/agricultural hazards;
- Sinkholes and subsidence; and
- Military ordnance from World War II.

- Table 3.1. Comprehensive Growth Management Plan Hazard Mitigation Inventory (**Note:** Plans are reviewed annually for possible LMS inclusion.)

Comprehensive Plan Elements	Indian River County	Municipalities				
		Town of Fellsmere	Town of Indian River Shores	Town of Orchid	City of Sebastian	City of Vero Beach
Introductory						
Economic Development						
Conservation	A,E,F,H,HZ	F,HZ	A,D,F,H,HZ,NT	A,D,E,F,HZ	A,D,F,H,HZ,NT,W	A,HZ
Coastal Management	E,F,H,NT,P		E,F,H,NT,P	E,F,PDR	A,E,F,P,NT	F,FI,H,HZ,NT,P
Infrastructure	F,H,HZ,WC	D,F,W	D,F,HZ	F,HZ	D,F,HZ,NT,W	D,F
Future Land Use	E,F,FI,H,NT	F,NT	E,F,H	F,FI,H	D,F,H,HZ,W	F,H
Housing						
Recreation and Open Spaces						
Transportation	F,H		E,F,H,NT			
Intergovernmental Coordination			F,H,HZ		F	D,H
Capital Improvement	E,F,H,NT			FI	E,F,H,NT	E,F,H,HZ, P
Ports, Aviation and Associated Facilities						
Utilities						
Health and Human Services						
Public Education						
Fire Rescue						
Economic						
Library						
Historical Preservation						

Bold = Mandatory Comp Plan Element; A = Air Quality; D = Drought; E = Erosion; F = Flood; FI = Fire; H = Hurricane; HZ = Hazardous Waste; N = Nuclear Disaster; NT = Natural and Technological Disasters; PDR = Post-Disaster Redevelopment; WC = Wellfield Contamination.

Other Hazards Plans. Besides the CEMP, the DES has prepared a series of hazard plans that apply to unique situations. They include

- ***Coastal Oil Spill*** - Federal Region IV Oil & Hazardous Substances Regional Contingency Plan;
- ***Hazardous Materials*** - Indian River County Emergency Plan for Hazardous Materials;
- ***Mass Immigration*** - Indian River County Caribbean Refugee Plan;
- ***Airports*** - Vero Beach Municipal Airport Certification Manual: Aircraft and Airport Safety Plan, approved by the Federal Aviation Administration;
- ***Nuclear Power Plants*** - State of Florida Radiological Emergency Management Plan;
- ***Ports/Marinas*** - Indian River County Comprehensive Plan;
- ***Emergency Notification*** - Emergency Alert System Plan (Operational Area 10);
- ***Military Support*** - Florida National Guard Operation Plan for Military Support to Civil Officials;
- ***Beach Preservation Plan*** - Documents existing conditions of the beachfront in the County, identifies areas experiencing beach erosion, and recommended strategies to stabilize and/or enhance the County's beaches;
- ***East Indian River County Stormwater Management Plan***;
- ***Indian River County Wildfire Mitigation Plan***; and
- ***Sebastian Area-wide Florida Scrub Jay Habitat Conservation Plan***.
- ***Tsunami*** - Tsunami Warning and Evacuation Plan
- ***Disaster and Pets*** – Indian River County Pet-Friendly Shelter Plan, Large Animal Disaster Plan (in development)
- ***Disaster Feeding*** – Countywide Disaster Feeding Plan
- ***Post-Disaster*** – Indian River County Post-Disaster Redevelopment Plan

Ordinances/Regulations. Hazard-related ordinances are administered primarily by either the DES or the CDD. The list of relevant ordinances/regulations includes

- Wellfield and Aquifer Protection;
- Building Code;
- Fire Code;
- Zoning;
- Subdivision;
- Stormwater Management and Flood Protection;
- Land Clearing;
- Coastal Management;
- Coastal Construction Code; and
- Open Burning/Air Curtain Incinerator.

The Building Code requires construction east of I-95 to meet a windload requirement of 150 mph for Category 1 structures, 160 mph for Category 2 structures, and 170 mph for Category 3 and 4 structures. Areas west of I-95, the standard to be met is 140 mph for Category 1 structures, 150 mph for Category 2 structures, and 160 mph for Category 3 and 4 structures. The regulatory scope of the Coastal Management Ordinance is fairly broad. It has protection for sea turtles and manatees. It also regulates seawalls, dock structures, and dune protection and maintenance.

Indian River County Code Chapter 930, addresses Stormwater Management and Flood Protection and was updated in November 2012 to reflect County adoption of modernized FEMA Flood Insurance Rate Maps (FIRMs). Subsequently, the County has adopted the Florida Building Code 2017 (6th Edition). The East Indian River County Master Stormwater Management Plan addresses issues of water quality within the Indian River Farms Water Control District in the County. In March 2007, Indian River County adopted a revised Industrial Pretreatment Regulations Ordinance (County Code Chapter 201, Part III) that enables the County to comply with National Pollutant Discharge Elimination System (NPDES) requirements.

3.5.3 County Mitigation Projects/Initiatives

There are a number of projects and initiatives the County has implemented to mitigate potential damage resulting from various hazards. See **Table 3.2** for a summary of projects and programs. Most are related to flooding and hurricanes. Through the Indian River County Environmental Lands Program, the County has purchased a number of important parcels in the CHHA. Most were purchased because they exhibited environmentally significant habitat; however, the County also gains by reducing the intensity and density of development in a high risk area, the CHHA.

Also, the County, like other local governments in Florida, has gone through revisions to the building code since Hurricane Andrew and subsequent storms that have impacted Florida since 1992. The state has since adopted the Statewide building code called the Florida Building Code. The code now requires a finish floor elevation at 6 inches above minimum 100-year flood level. The Florida Building Code also requires corrosion resistant hurricane clips, water resistant adhesives for shingles, and trusses manufactured in accordance with local wind models, and product approvals for all exterior components.

The County has taken a variety of actions to mitigate the impact of coastal erosion along its 22.4 miles of shoreline, of which 15.7 miles has been classified by the Florida Department of Environmental Protection as “critically eroded.” In 1996, the County installed an offshore breakwater, the Prefabricated Erosion Prevention reef, offshore of a 3,000-foot segment of shoreline in downtown Vero Beach that had experienced significant damage in the Thanksgiving storm of 1984. Since installation, the adjacent beach has stabilized. In response to Hurricanes Floyd and Irene 1999, the County, with funding from FEMA, placed 65,000 cubic yards of sand at eight locations in the County to rebuild areas of dune that had been damaged by the storms. In 2003, the County completed its first large-scale beach restoration project, placing 535,505 cubic yards of sand along 2.5 miles of beach in northern Indian River County, in the only area of the barrier island subject to overwash from a Category 3 hurricane. In 2007, the County renourished this area of beach, placing an additional 250,000 cubic yards following the twin 2004 hurricanes. Also in 2007, the County completed nourishment of its southern beaches, placing 362,200 cubic yards of sand along 2 miles of eroding beaches. Between 2010 and 2012 the County nourished its central beaches, placing 560,592 cubic yards of sand along 6.6 miles of beach and is planning to place an additional 155,000 cubic yards in the winter of 2015.In response to Hurricanes Matthew and Irma, the County has begun to design and permit renourishment projects within the Sector 3 and 7 project areas described above, and additionally the Sector 5 project area which encompasses 3.1 miles of beaches located primarily within the City of Vero Beach. The Sector 5 project is expected to commence November of 2019 where we will place approximately 155,000 cubic yards of sand. Both the Sector 3 and 7 renourishment projects are still undergoing permitting and are expected to occur in the winter of 2020. Private property owners have also taken measures to prevent damage from

coastal erosion. The most recent information (2019) on beachfront seawalls is that there are 37 seawalls and other coastal armoring structures in Indian River County. These seawalls protect a total of 10,556 linear feet of developed property. This accounts for 8.8% of our beaches. There is another 0.6%, or 740 linear feet, of other hardened structures along our beaches.

Table 3.2. Summary of projects and programs for Indian River County.

Projects/Initiatives/Programs/Ordinances	Indian River County	Radiological Preparedness Division	Community Development Department	Public Works Department	Municipalities/Organizations					
					Town of Fellsmere	Town of Indian River Shores	Town of Orchid	City of Vero Beach	Florida Power & Light	City of Sebastian
Acquisition of Property	X		X		X	X				
Retrofitting of Public Facilities	X				X	X		X		X
Structural Hazard Control			X	X		X				
Stormwater Drainage	X				X	X				X
Beach Preservation	X		X	X						
Warning Systems	X	X				X				
Hazards-Specific Building Codes	X		X			X	X	X		X
Tax Incentives for Mitigation						X		X	X	
Public Information Campaigns	X	X		X	X	X		X	X	X
Preparedness Training	X	X			X	X	X	X	X	X
Professional Training	X	X	X		X	X		X	X	X
Maintenance Programs	X				X	X	X	X		X
Stormwater Drainage	X				X	X		X		
Hazardous Materials Management	X									
Emergency Operations Plan	X				X	X		X		X
Post-Disaster Redevelopment Plan	X				X	X			X	

The County's Beach Preservation Plan, implemented in 1988, provides long-term strategies for coastal management and sets up a revenue source for shoreline protection activities in Indian River County.

To inform the public about the dangers as well as measures citizens need to take to protect their property as well as themselves, the Indian River County Emergency Management Division speaks to numerous groups on matters of disaster preparedness. The Division has developed a disaster preparedness brochure, and has many other brochures, available for distribution to the public.

Emergency Management staff attends various conferences and seminars during the year and are involved in emergency preparedness drills. Building inspectors are provided opportunities to attend professional development seminars as a means of keeping them up-to-date on new construction methods that mitigate the effects of hazards.

The County Community Development Department engages in a number of mitigation activities including the following:

- Abandoned artesian well plugging program (contingent upon funding availability);
- Environmental Lands Program (conservation lands management ongoing; acquisition contingent upon funding availability);
- NFIP Community Rating Systems Program;
- Maintenance of drainage canals and ditches;
- Annual letter to flood insurance providers;
- BellSouth Yellow Pages/Phone Book Hurricane Preparedness/Flood Protection Information Pages; and
- Beach renourishment programs.

The Department of Public Works engages in a number of mitigation activities including:

- Developing and distributing stormwater awareness brochures;
- Monitoring NPDES Stormwater Phase II permit requirements at construction sites;
- Designing, constructing, and operating the PC Main Pollution Control facility;
- Designing and overseeing the construction of Osprey Marsh Regional Stormwater Park;
- Designing, constructing, and operating Egret Marsh Regional Stormwater Park;
- Education and enforcement of the county fertilizer ordinance;
- Monitoring construction sites for pollution leaving construction sites;
- Being proactive in illicit discharge detection and elimination; and,
- Educating the public regarding pollution caused by stormwater runoff.

3.6 MUNICIPALITIES

Within Indian River County, there are five municipalities: City of Fellsmere, Town of Indian River Shores, Town of Orchid, City of Sebastian, and City of Vero Beach. There is a wide variation among each jurisdiction in terms of community character. This difference in type of community character (i.e., degree of urbanization, size of population, location), affects the perception of each towards specific hazards. Certainly there are hazards that all jurisdictions, regardless of the community character, have concern over -- such as flooding, hurricanes, and tornadoes. However, there are instances where community character definitely affects its perception of hazard priorities. In agricultural areas, agricultural pest and disease, freezes, and drought are more likely to have relevance as compared to the more urban areas. For example, in the Town of Orchid, times have changed its focus from citrus production to residential development. The Town of Orchid, for most of its existence was owned by one family; however, in the eighties, the family sold its property to a development firm, thus changing the character of the Town forever. During earlier times, Orchid's priority listing of hazards might have looked relatively similar to Fellsmere's, where agricultural pest and disease, drought, and freezes would generate considerable concern. However, today, the Town of Orchid's prioritization of hazards may be more reflective of the Town of Indian River Shores since both communities are situated on the barrier island, bordering both the Intracoastal Waterway on the west and the Atlantic Ocean on the east. Now, beach erosion and shoreline stabilization may have more significance to the Town of Orchid than previously due to the change in community character. Being more urbanized, having significant concentrations of commercial and industrial uses, and situated along major transportation corridors, communities like Vero Beach and Sebastian have higher risk of being impacted by a wider variety of hazards than its smaller municipal neighbors.

3.6.1 Listing of Agencies

The organizational structure of each municipality in the County differs in terms of organizational complexity and functional responsibility. The following is a brief discussion of agencies within the municipal organizational structure that may have certain functional responsibilities as they relate to hazard mitigation.

Emergency Management. Vero Beach is the only municipality that has a staff person who is assigned as the City's emergency management planning contact. During emergency events, such as hurricanes, each local government has an "executive group" (e.g., Mayor, city manager, police chief) that coordinates the city's efforts with the DES.

Fire Prevention. The Indian River County Fire Rescue Fire Prevention Bureau provides the fire-related permitting, plan review, new & existing inspections, and code enforcement for unincorporated Indian River County as well as for the City of Vero Beach and Town of Orchid. The Town of Indian River Shores, City of Sebastian, and the City of Fellsmere provide their own fire-related permitting, plan review, inspections, and code enforcement, with the following exceptions. The Fire Prevention Bureau currently provides the existing inspections and special events permitting for the City of Fellsmere and the special events permitting for the City of Sebastian. The Fire Prevention Bureau, as well as all of the municipalities within Indian River County, operate under the authority and enforce the requirements of the Florida Fire Prevention Code and any related county or city ordinances.

Public Safety. The Town of ***Indian River Shores*** is the only municipality in Indian River County that has its own Public Safety Department. As mentioned earlier, fire

service in all other parts of the County are provided by Indian River County Fire Recue, which operates under the administrative umbrella of the DES.

Planning. Indian River County, Sebastian, Fellsmere, and Vero Beach, each have planning departments. The departments review zoning maps, site plans, and other development applications (e.g., variances, special exceptions), as well as administering their local comprehensive plan. The Town of Orchid is assisted with planning by a professional planning consultant, rather than staff. The planning duties for Indian River Shores have generally been assigned to a lay planning and zoning board, and provided support by a professional member of the staff.

Building Departments. Fellsmere, Indian River Shores, Orchid, and Sebastian have their own building departments and issue their own building permits. Within the City of Vero Beach, applicants secure their building permits from the County Building Division. Per Florida Statutes, all building departments are required to enforce the requirements of the Florida Building Code.

Public Works. The City of Vero Beach has a Public Works Department. They are is responsible for implementing structural improvements (e.g., storm water facility retrofit, shuttering buildings). The City of Sebastian has a Public Works Department and the director is a PE. The department is also responsible for implementing structural improvements (e.g., storm water facility retrofit, shuttering buildings). The City of Fellsmere has a Public Works Department and the City Manager is a PE and supervises a rotation of contract engineers for larger jobs. Fellsmere also established a Stormwater Utility on September 20, 2012. The smaller jurisdictions do not have such a formalized structure. Most contract out for engineering services. Overseeing the construction of capital projects is a responsibility of the contract engineer.

3.6.2 Municipal Mitigation Policies and Ordinances

Municipal Comprehensive Plans. Like the County, each municipality has an adopted Comprehensive Plan. They serve as a policy instrument for each city, and defines the particular city's development and redevelopment policies. All plans, with the exception of City of Fellsmere, contain the required nine plan elements: Conservation, Coastal Management, Infrastructure (i.e., potable water, sanitary sewer, stormwater management, solid waste, natural aquifer recharge), Future Land Use, Housing, Recreation and Open Space, Transportation, Intergovernmental Coordination, and Capital Improvement. Six of the nine plan elements address hazards. **Table 3.1** summarizes in a matrix format by municipality, type of hazards by plan element (see page 3-14).

Each municipal comprehensive plan has been reviewed. Specific mitigation-related objectives and policies have been identified and have been described and cross-referenced in **Appendix A.**

Regardless of municipality, most hazard-related issues are addressed in four plan elements of the Comprehensive Plan: Conservation, Future Land Use, Infrastructure, and Coastal Management (exception being Fellsmere). While local government comprehensive plans have a lot of similarities in their objectives and policies, there are variations. Some of the variations are highlighted below.

City of Fellsmere.

- The City coordinates with SJRWMD to plug abandoned, free flowing artesian wells or addresses via code enforcement. After a ruling by the Special Master, the City will plug abandoned, free flowing artesian wells and charge back to property owner.

- The City "shall develop an emergency response plan to handle accidents involving hazardous waste and shall include provisions for the protection of natural resources."

Note: Being a community that is not located in the coastal zone (as defined by Chapter 380, F.S.), the City of Fellsmere's Comprehensive Plan does not contain a Coastal Management Element; therefore, issues relative to hurricanes and hazard mitigation are not required to be addressed.

***Town of Indian River Shores*.**

- The Public Safety Officers, Utility Department and Building Department have undergone extensive training from state agencies and FEMA to determine the appropriate restoration/reconstruction alternatives for damaged public facilities.
- It is the policy of the Town to maintain a contingency fund that is used as match money for recovery activities after a storm.
- Water conservation is emphasized in the Conservation Element. Use of native plants and water saving plumbing fixtures in new developments is encouraged and prohibiting use of potable water sources for irrigation where non-potable alternative sources are available.
- The Green Building Concept and energy and water conservation in town renovations as well as new development is promoted at every opportunity.

Town of Orchid.

- The maximum residential density permitted within the Town shall be two (2) dwelling units per acre.
- It is the policy of the Town that there be "no net loss of flood storage capacity."
- Impounded wetlands shall be maintained in their current state or returned to their natural state, as appropriate, in order to provide flood storage capacity. Requires hurricane contingency plan for any water-dependent facility prior to initiating operation.
- Participates in ISOs Building Code Effectiveness Grading Schedule (BCEGS) every three years. The BCEGS assesses the building codes in effect and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards. Their classification is currently a 4 for one and two family residential properties and commercial and industrial properties.

City of Sebastian.

- The City participates with other Indian River County local governments in issues that have impacts that transcend the City's political jurisdiction. Issues include north County central water and wastewater systems and area-wide drainage and stormwater management master plan, proposed improvements and implementing programs.
- It is the policy of the City not to use public funds to subsidize development within the CHHA.

- The City actively seeks to work with entities capable of providing reclaimed water to the City and its residents for irrigation purposes.

City of Vero Beach.

Limit densities within the CHHA and direct future development outside this area.

- It is the policy of the City to expend funds in the CHHA only for projects that 1) enhance and restore natural resources in the area, 2) relocate threatened infrastructure away from the area, or 3) replace worn out or obsolete facilities.
- To promote water conservation, the City uses an inverted rate structure for potable water, requiring water conserving plumbing fixtures, promotes drought tolerant vegetation for landscaping, and an effluent reuse program.
- The City requires a fuel management/spill contingency plan for any new or expanded marina.
- It is the policy of the City to limit future development on the barrier island through the use of 1) building height limitation to 35 feet; 2) density limitations; 3) open space requirements; and 4) parking restrictions.

Building Codes. The communities in the state use the Florida Building Code; however, they have had the option of tailoring their local Ordinances to meet special local conditions. Examples of building requirements local governments have added to their local code have included shuttering, glazing of glass, and stainless steel hurricane clips. The following is a summary of the building codes by jurisdiction.

City of Fellsmere. The City utilizes the standard statewide building code and fire code and regulates brace gable and roof framing, corrosion resistant hurricane clips, and trusses manufactured in accordance with local wind models as set forth in the statewide building code. The city has also adopted the state required flood provisions.

Town of Indian River Shores. The Town's Building Code includes key hazard-specific provisions. They include brace gable end roof framing, corrosion resistant hurricane clips, and pressure positively treated lumber. Development within the Town must be built to withstand windloads of 150 mph for Risk Category 1 buildings; 160 mph for Risk Category 2 buildings; and, 170 mph for Risk Category 3 and 4 buildings. In addition, the Town has modified its Flood Damage Prevention Ordinance by raising the base floor elevation.

*Town of **Orchid.*** The Town of Orchid's Building Regulations adopt the latest edition of the Florida Building Codes, National Electric Code, and the Florida Fire Prevention code. The Town of Orchid's Code of Ordinances addresses Floodplain Management Regulations and adheres to all the standards of the Flood Insurance Rate Map.

City of Sebastian. The City's local Building Regulation Ordinance adopts the latest edition of the Florida Building Codes, National Electric Code, Florida Fire Prevention Code and the City's Unsafe Structure Abatement Codes. The Ordinance adopts 160 mph Ultimate Wind Speed for the design of most buildings. There are provisions for security job sites during a hurricane watch.

Also, the City requires the finished floor of single family and duplex structures located in a flood zone to be elevated a minimum of 24 inches above the crown of the road on the abutting street. The City of Sebastian has adopted a controlled burn ordinance supporting burning under certain conditions. In becoming CRS qualified in 1997, the City enacted a Flood Damage Prevention ordinance, which was recently updated in 2012.

City of Vero Beach. Pursuant to an intergovernmental agreement building permits within the City are issued by the Indian River County Building Division. Development within the City must be built to withstand windloads of 150 mph for Risk Category 1 buildings; 160 mph for Risk Category 2 buildings; and, 170 mph for Risk Category 3 and 4 buildings. The City requires the lowest portion of all structural members supporting the lowest floor to be located at 18 inches or above the base flood elevation in the Flood Insurance Rate Map (FIRM) "V" zone (see **Table 4.2** for an explanation of zone codes).

Other Ordinances. All the municipalities partner in the County's wellfield protection ordinance. Also, each has provisions in their development code that require buffering between proposed development areas and adjacent wetlands and natural areas. Each jurisdiction has emergency water conservation ordinances in effect.

City of Vero Beach. The City has adopted a Flood Damage Prevention and Drainage Ordinance. It also requires a stormwater management plan for all new construction, substantial improvements to existing development, and increased in impervious area.

3.6.3 Municipal Mitigation Projects/Initiatives

Each jurisdiction was surveyed to update the projects and initiatives each governmental entity had or is implementing. Projects are capital improvements, while initiatives can include purchase of property to upgraded building codes to incentives to public information campaigns to preparedness training and drills to professional development seminars. Existing municipal hazard mitigation projects and programs are summarized in **Table 3.2** (see page 3-16). The following provides a brief discussion of the accomplishments of each jurisdiction.

City of Fellsmere. The City continues to pave dirt roads and improve the drainage systems throughout the City. Also, the City carries out regularly scheduled maintenance of its stormwater drainage system.

Subsequent to the City's establishment of a Stormwater Utility in 2012 the Historic Fellsmere Stormwater & Flood Control Master Plan was promulgated in 2014.

A stormwater utility was implemented in FY16 and currently carries a charge of $5 per equivalent residential unit and a $900 stormwater impact fee for each new 3,250 square feet of impervious area. Funds are dedicated to stormwater management projects.

An approximately 40 acre tract has been purchased south of 89th Street just east of Willow Street and is under construction to enhance flood control and nutrient removal efforts. A 6-acre stormwater retrofit lake was constructed in 2018 along South Carolina Avenue.

Being a non-coastal jurisdiction, the Town's Comprehensive Plan does not contain a coastal management element; therefore, there is no focus on disaster

preparedness issues such as hurricanes or flooding as coastal communities must address in their coastal management elements.

The City is in the NFIP, and has been a participant in the CRS program since 1999. Fellsmere currently has a CRS rating of 8, which enables residents to receive a 10% reduction in their NFIP rates and will continue to participate in activities to comply with NFIP requirements. Fellsmere is thus eligible to receive funding from the NFIP's Flood Mitigation Program to correct drainage problems. Fellsmere recently completed a flood study to help identify flood elevations throughout the historic portions of the city. This information is now available as best available data.

Town of Indian River Shores.
The Town of Indian River Shores has recently installed new generators for the Town Hall Complex and the Public Safety Building. The Town recently completed a Community Center building that could be used as a shelter in an extreme emergency.

Widespread renovations were made to the Public Safety Building. A Public Safety garage area was built to accommodate the ambulances, fire trucks and life safety apparatus. This building was designed to be disaster resistant in all aspects. The administrative section of Public Safety has been rededicated to a higher standard of public awareness. The building now has a large class room and training facility, frequently used for professional training seminars and also resident training, disaster awareness and alertness. In addition, the Town stocks the two Public libraries with all available literature from FEMA. This literature is also available at a disaster preparedness informational booth at public functions and at the Building Department office. Mailings are sent out to each resident twice yearly with disaster recommendations specific to this location.

The Town Public Safety staff has prepared their own Emergency Operation Plan in addition to and in conjunction with the County Emergency Operation Plan. This plan, designed and administered by the Public Safety Director, outlines the chain of command for each employee and their duties in the event of a disaster. Meetings are held to inform and prepare staff for pre event, the event and the aftermath. The plan is based on FEMA training and lessons we all learned firsthand.
To the best of our knowledge all drainage problems have been eliminated. Storm water runoff has been properly directed to discharge into the mosquito impoundment.

Indian River Shores remains in the NFIP. Steps and activities have been initiated to reduce the CRS rating from an eight to a seven. This increased the resident's reduction in their NFIP rate from 10 % to a 15% savings.

Town of Orchid. Orchid has no emergency operations plan. It adheres to the County Emergency Operations Plan.

City of Sebastian. The City has taken a number of actions to reduce its vulnerability to hazards. They include capital projects such as, shuttering City Hall Complex, and installing an emergency power generator at the city maintenance garage. Sebastian has significantly improved the ditch and swale drainage system by removing exotic plant species and implementation of a perpetual management program. Improvements to North Bridge, which crosses the Sebastian River, has recently been completed. The City has prepared a hazmat spill plan that ensures for a coordinated, effective response to spills of hazardous substances should such an event occur.

Sebastian is in the NFIP, and in 1997, the City entered the CRS program. Based on the last completed audit, the City received a rating of 7 on its CRS evaluation and will continue to participate in activities to comply with NFIP requirements. A rating of 7 enables Sebastian residents to receive a 15% reduction in their NFIP rates.

Sebastian has a citywide Emergency Operations Plan. Essentially, the city conducts emergency operations from the Sebastian Police Station. The station has an emergency power supply, has hurricane shutters, and is not in a flood prone area. While the city does not have an official post-disaster redevelopment plan, the issue of redevelopment is discussed in the Coastal Management Element of the Comprehensive Plan.

In terms of preparedness, every week the city Public Works Department conducts tests of their power generators.

Members of the Building Department do attend State-mandated continuing education programs annually.

City of Vero Beach. The City of Vero Beach has undertaken numerous capital projects to retrofit city critical facilities. The City has installed shutters on city hall, police department, airport, public works facility, a transmission & distribution facility, and constructed new hardened operations facilities at the airport, and water and sewer department.

The City administers an ongoing stormwater inspection (twice a year) and maintenance program of the drainage ditches, catch basins, and culverts that comprise the city's stormwater system. The Public Works Department removes all excess debris as needed after major storm events. The City is also actively upgrading stormwater outfalls that are susceptible to storm surge events by installing backflow prevention devices to reduce the impact of storm surge flooding in low lying areas.

The City is in the NFIP, participates in the NFIP's CRS program, and has a CRS rating of 7. This rating enables Vero Beach property owners to receive a 15% reduction in their NFIP rates. In addition, the City is eligible to seek FMA funds to be used to remedy flooding problems and will continue to participate in activities to comply with NFIP requirements.

The City is active in upgrading staff skills by sending them to technical conferences and workshops. Staff attended a conference that focused on effective disaster recovery techniques. The County building officials, who also serve the City, attend State-mandated continuing education programs annually.

In terms of public information, the City prepares and distributes annually to property owners and residents a brochure entitled *Flood Protection Information for the Community*.

National Flood Insurance Program (NFIP) Compliance. Each jurisdiction within the county is an active participant in the NFIP. In an effort to ensure continued compliance with the NFIP, each participating community will:

1. Continue to enforce their adopted Floodplain Management Ordinance requirements, which include regulating all new development and substantial improvements in Special Flood Hazard Areas (SFHA).
2. Continue to maintain all records pertaining to floodplain development, which shall be available for public inspection.
3. Continue to notify the public when there are proposed changes to the floodplain ordinance or Flood Insurance Rate Maps.
4. Maintain the map and Letter of Map Change repositories.
5. Continue to promote Flood Insurance for all properties.
6. Continue their Community Rating System outreach programs, as applicable.

Table 3.3. NFIP Summary (as of 9/30/2018).

Community Name	Policies in Force	Insurance In-Force $	Written Premium In-Force $
Indian River County	13,250	3,592,259,800	6,502,532
Vero Beach	3,924	1,045,578,700	2,336,982
Sebastian	990	297,788,500	468,425
Indian River Shores	3,202	860,001,200	1,825,106
Orchid	322	102,648,900	212,829
Fellsmere	66	13,167,500	47,635

3.7 COMMUNITY ORGANIZATIONS

Community organizations can range from faith-based organizations to Chambers of Commerce to the local historic society. These groups represent the diverse interests present within a community and provide vital services to the community as well. Many services provided by Indian River County's community organizations can help to achieve the goals of hazard mitigation identified in this mitigation strategy. The following lists provide information on services provided by organizations that work within Indian River County to reduce the risks posed by disasters. All participating organizations of the LMS Working Group were invited to provide information; only those who responded are included below.

3.7.1 American Red Cross (ARC)

The ARC is active in promoting hazard preparedness and mitigation in Indian River County. Their efforts include

- Preparedness education;
- Community presentations for children and adults (a variety of preparedness topics and methods);
- Community outreach;
- National initiatives:
  - The Pillowcase Project
    - Classroom-based presentations on ten possible hazards
    - *Monster Guard* Smart Phone game

    - Home Fire Initiative – canvassing, safety checks and smoke alarm provisions
- Smart Phone applications – multiple free interactive disaster applications;
- An education website: www.redcross.org – provides a wide range of preparedness information;
- Community Disaster Education;
- Disaster Drills;
- Evaluation of structures to be used as shelters;
- Conducting volunteer training courses;
- Offering cardiopulmonary resuscitation (CPR) and first aid courses;
- Disaster planning assistance to local businesses; and,
- Hurricane preparedness and mitigation fliers.

3.8 INTERGOVERNMENTAL COORDINATION

Disasters know no boundaries; governments and service providers must work together to strengthen communities against the loss of life and property. An essential element of the hazard mitigation process is intergovernmental coordination. Coordination is important not only horizontally at the local level between County, municipalities, non-profit organizations, and the private sector, but also vertically with key State and Federal agencies. Besides the potential of the LMS initiative, there are several other coordination mechanisms that already exist. They are described briefly below.

3.8.1 Metropolitan Planning Organization

The Metropolitan Planning Organization, commonly known as the MPO, coordinates local, State, and Federal planning and funding for transportation improvements. The policy board is comprised of elected officials from the County, the five municipalities, and the school board. Two key policy documents of the MPO are the long-range transportation plan and the 5-year transportation improvement plan (TIP). The TIP identifies and schedules all future roadway improvements in the near-term. The MPO is housed in the Indian River County Community Development Department.

3.8.2 Local Government Comprehensive Plans

One mechanism to achieve intergovernmental coordination is the local comprehensive plan. As previously described, each comprehensive plan contains an intergovernmental coordination plan element.

3.8.3 Indian River County Comprehensive Emergency Plan

A second mechanism that has relevance is the County's CEMP. The CEMP must be integrated into and coordinated with emergency management plans and programs of the State and Federal government. It is operations-oriented and addresses evacuation in terms of local and regional evacuation, public shelter, post-disaster response and recovery, rapid deployment of resources, communications and warning systems, training exercises, and agency responsibilities. These responsibilities are clearly defined as 18 Emergency Support Functions (ESFs) (ESF functions - **Table 3.3**). Each ESF is headed by a lead agency, which has been selected based on its authorities, resources, and capabilities in the functional area. The ESFs also serve as the primary mechanism through which outside assistance to Indian River County is coordinated.

Table 3.4. Emergency Support Functions (ESFs) and their designations.

Emergency Support Function	Designation
Transportation	ESF - 1
Communications	ESF - 2
Public Works and Engineering	ESF - 3
Firefighting	ESF - 4
Information and Planning	ESF - 5
Mass Care	ESF - 6
Resource Support	ESF - 7
Health and Medical Services	ESF - 8
Search and Rescue	ESF - 9
Hazardous Materials	ESF - 10
Food and Water	ESF - 11
Energy and Utilities	ESF - 12
Military Support	ESF - 13
Public Information	ESF - 14
Volunteers and Donations	ESF - 15
Law Enforcement and Security	ESF - 16
Animal Care	ESF - 17
Business & Industry	ESF - 18

3.8.4 District X Local Emergency Planning Committee

The LEPC is an important vehicle to coordinate administering regional compliance with hazardous materials reporting and training laws. The TCRPC provides staff to administer the activities of the Committee.

3.8.5 State Comprehensive Emergency Management Plan

The State of Florida CEMP establishes the framework of a coordination system to ensure that the state of Florida will be prepared to respond to the occurrence of emergencies and disasters. The plan describes roles and responsibilities of State agencies, special districts, local governments, and voluntary organizations. The CEMP unites the efforts of these groups for a comprehensive approach. The plan is divided into three sections.

The Basic Plan: Outlines how the state will assist counties in response, recovery, and mitigation of disasters; details responsibility at various levels of government; describes method of operations and financial management policies; ensures continuity of government; and addresses recovery issues.

Specific Response/Recovery Actions: These actions are unique to a specific hazard and take the place of the Basic Plan and Response Functions sections.

Response Functional Annexes: Present the State's strategies for disaster response by outlining ESFs. ESFs are structured from the Federal Response Plan.

3.9 STRENGTHENING THE ROLE OF THE LOCAL GOVERNMENTS

As has been described in the text, local governments in Indian River County have taken steps to strengthen themselves both in terms of capital facility improvements and ordinances, regulations, and programs. Becoming more disaster-resistant is not limited just to hardening of structures. There are a number of activities that the County and municipalities can undertake to strengthen the role of local governments and to lessen the impacts resulting from emergency events that do not require expending money on capital projects. Plans can be modified, laws and regulations can be amended, informational materials can be published and distributed, and professional training can be augmented. Ideas were generated from a variety of sources: interviews with local jurisdictions, and information generated from LMS datasheets, the LMS Steering Committee, and discussions with local governments. The suggestions resulting from the various discussions with local government include:

1) Projects on the LMS PPL should be incorporated into local government capital improvement elements (CIEs) located in the comprehensive plans, at the time the CIEs are reviewed on an annual basis in accordance with Section 163.3177(3) (a), F.S.

2) As permitted under Section 163.3177(7) (h) & (l), F.S., local governments could incorporate optional comprehensive plan element for public safety, or a hazard mitigation/post-disaster redevelopment plan;

3) Integrating the LMS into the Indian River County CEMP.

4) Making all communities CRS eligible (Orchid is in the NFIP program, but not in the CRS program);

5) Assessing existing CRS programs to determine ways to strengthen and improve the local jurisdiction's CRS rating;

6) Requesting technical assistance from the Treasure Coast Regional Planning Council to augment CRS;

7) Designing and implementing a hazard mitigation retrofit program;

8) Monitoring the outcome of the Florida Building Commission. Be prepared to evaluate the existing building code, identify deficiencies, and recommend desired changes to strengthen the existing building code;

9) The designing and bidding of all public building construction, whether it be new construction or renovation of older public structures, should incorporate hazard mitigation building practices, whenever financially feasible;

10) Requiring all mobile home parks to retrofit a community space engineered to withstand Category 3 hurricane windloads and an F2 tornado. An adequate warning system needs to be incorporated into the retrofit. Such a structure would then provide the mobile home park residents a "safe haven refuge" should such an event occur. Once constructed, the mobile home park administration should conduct mock drills to familiarize the residents with the procedure they need to follow should the occasion arise that they would need to evacuate to the "safe haven refuge."

11) Implementing a "safe room" requirement in the local building codes that addresses, not only new construction, but renovation as well;

12) All jurisdictions should prepare and adopt post-disaster redevelopment plans.

13) Getting year-round coverage in the local media to get the message out to people, not only that it is important to be prepared, but also to sell the idea the hazard mitigation saves dollars in the end.

14) Working with the private sector to develop procedures that ensure coordination and mutual support between the County and business community, before, during, and after a disaster event.

15) Helping the private sector prepare a "business contingency handbook" and provide support in holding training workshop for local business owners.

3.10 PRIVATE SECTOR BACKGROUND AND ANALYSIS

During events such as hurricanes, there can be massive disruption of the local economy. However, due to the lack of frequency over the past 20 years, even with Hurricane Andrew in 1992, people have become somewhat complacent about such events. This also is reflected in the business community. The large firms like Florida Light & Power, Southern Bell, Piper Aircraft, Publix, as well as the banking community have prepared contingency plans in event of such an event. It is primarily among the smaller businesses where hazard mitigation and disaster preparedness have minimal attention. September 11th has again raised the awareness among the business community of the need to be prepared.

As part of the LMS effort, the Indian River County DES extended invitations to the business community to participate as a member of the LMS Working Group. Florida Light & Power Company, the American Red Cross North Treasure Coast Chapter, and Southern Bell Telephone Company have been active in the planning effort. However, key sectors of the community were not represented such as finance, agriculture, medical, building supply, as well as Piper Aircraft (a major local employer), The Indian River County/Vero Beach Chamber of Commerce, and the Sebastian Chamber of Commerce. There is a definite need to augment private sector involvement before the private sector can

become a player in the community's hazard mitigation efforts. The most important activity that needs to be implemented is an LMS Private Sector Subcommittee.

There are a number of activities in which the private sector can become involved in the LMS effort; however, the first and foremost obstacle has been energizing the interest of businesses to become involved in the process in the first place. In most communities, there are businesses that clearly understand that it is in their interest to develop a hazard mitigation plan prior to an actual event occurring. These are the organizations that need to become the core private sector group that spreads the word about the importance of "being prepared," taking steps and creating a plan before the disaster occurs. The private sector body needs to be developing materials that raise awareness and educate businesses of the need to be prepared for potential disasters that may occur.

It is envisioned that expanding the roles and responsibilities of private sector businesses in disaster events, beyond those that have historically been involved, will require educating businesses of the importance of hazard mitigation planning. Besides awareness and education, other roles that businesses can assume to strengthen private sector involvement in the LMS include business contingency planning and creating a private sector - emergency support function (a procedure to assist the business community during a disaster event). Not only does the business community benefit, but the community as a whole benefits as well. Both activities would mitigate against the local economy becoming disrupted following a disaster. A key element in mobilizing the private sector, and an initial task of the Private Sector Subcommittee would be the development of an "Action Plan" that sets out a list of priority activities the Subcommittee would like to achieve in the coming year.

One of the hardest lessons many small businesses are learning after the devastating impacts of a hurricane is that a disaster plan is essential. According to the Federal Emergency Management Agency (FEMA), almost 40 percent of small businesses never reopen their doors after a disaster. Indian River County, in 2017 implemented Emergency Support Function (ESF) #18 for business and industry. The purpose is to have a business and industry representative in the EOC to coordinate the immediate and short-term assistance needs of the business community to expedite economic restoration. ESF #18 will also identify and solicit resources to meet identified needs. The goal is to minimize the potential post-disaster economic effect to our community.

4.0 HAZARD IDENTIFICATION, VULNERABILITY, AND RISK

The purpose of this chapter is to describe the hazards facing Indian River County in terms of potential impact, vulnerability, and loss. The hazards faced in Indian River County fit into three general classifications: natural, technological, and societal hazards. Natural hazards include floods, hurricanes/tropical storms, tornadoes, thunderstorms, lightning, wildland fires, muck fires, extreme temperatures, soil/beach erosion, severe droughts, seismic hazards (including earthquakes, sinkholes, and dam and levee failures), agricultural pests and diseases, and epidemics. Technological hazards include radiological accidents, power failures, hazardous materials accidents, transportation system accidents, wellfield contaminations, communication failures, and unexploded military ordnance. Societal hazards include terrorism and sabotage, civil disturbance, and immigration crises.

The hazard identification subsections for each hazard describe the hazard and provide historical events and impacts if available. When available, maps are provided to illustrate the location and extent of the hazards. Disasters are classified by the magnitude of their effect. The recognized classification system is as follows (Indian River County Department of Emergency Services, 2012):

- **Minor Disaster**: Any disaster that is likely to be within the response capabilities of local government and results in only minimal need for State or Federal assistance.
- **Major Disaster**: Any disaster that will likely exceed local capabilities and require a broad range of State and Federal assistance. The FEMA will be notified, and potential Federal assistance will be predominantly recovery-oriented.
- **Catastrophic Disaster**: Any disaster that will require massive State and Federal assistance, including immediate military involvement. Federal assistance will involve response as well as recovery needs.

The vulnerability assessment for each hazard describes the community assets and potential impact for each hazard. A community's vulnerability depends on the extent of the hazard exposure and the value of potentially vulnerable assets. Higher risk areas with higher potential damage warrant mitigation practices that are more extensive. Communities in this situation may rely on land use and site design rather than on relatively simple measures such as building codes and hardening existing structures. Other factors that influence vulnerability and are important for communities to consider when selecting mitigation practices are for pre-disaster mitigation, the amount of undeveloped and underdeveloped land, and in the case of post-disaster mitigation, the amount of developed land within the community. There are three types of vulnerability – individual, social, and biophysical. Individual vulnerability describes the susceptibility of a person or a structure to potential harm from hazards. Social vulnerability describes demographic characteristics of social groups that make them more or less susceptible to the adverse impacts of hazards. Biophysical vulnerability examines the distribution of hazardous conditions arising from a variety of initiating events such as natural hazards, chemical contaminants, or industrial accidents (Cutter, 2001).

Factors influencing vulnerability include, but are not necessarily limited to a community's location, type of construction, demographics, and cultural characteristics. **Table 4.1** lists the general hazards to which Indian River County is vulnerable and indicates

their projected impact potential across the entire spectrum of community exposure and services. The hazards identified in **Table 4.1** and discussed here are organized based on the maximum projected impact potential (i.e., hazards capable of producing the maximum community-wide impact, such as hurricanes and floods, are discussed first). This does not mean other identified hazards are less important or less worthy of mitigation, only that their potential to affect the total community is lower.

In order to effectively plan hazard mitigation projects and allocate scarce financial resources, a community's vulnerability to a specific hazard must be coupled with other critical factors to perform a risk assessment.

Risk, or the probability of loss depends on three elements:

1) **Frequency** – How frequently does a known hazard produce an impact within the community?
2) **Vulnerability** – How vulnerable is a community to the impacts produced by a known hazard?
3) **Exposure** – What is the community's exposure in terms of life and property to the impacts produced by a specific hazard?

Once these three factors are established, the risk level faced by a community with regard to any specific hazard can be calculated using the "Risk Triangle" approach (Crichton, 1999; see **Figure 4.1**).

In this approach, these three factors become the sides of a triangle, and the risk or probability of loss is represented by the triangle's area (**Figure 4.1a**). The larger the triangle, the higher the community's risk with respect to a given hazard. If a community reduces any of these three factors, they reduce their risk of potential for loss. For example, if a community reduces its exposure to hurricanes, as has actually happened historically, by moving from a barrier island to the mainland, they will reduce their exposure and therefore their risk of loss (**Figure 4.1b**). Likewise, if a community reduces its vulnerability to hurricanes by strengthening its buildings, it also will reduce its risk of loss (**Figure 4.1c**).

In terms of natural hazards, there is very little if anything that can be done to change the frequency with which they produce impacts in a community. Mitigation planning relative to those hazards must therefore focus on reducing the community's vulnerability or exposure. In terms of technological and societal hazards, the most cost-effective type of mitigation is to limit or reduce the frequency with which such hazards actually occur.

At the time of publication, detailed risk assessments were only available for floods and hurricanes. Data sources used to prepare the hazard vulnerability and risk assessments are documented in **Appendix D**.

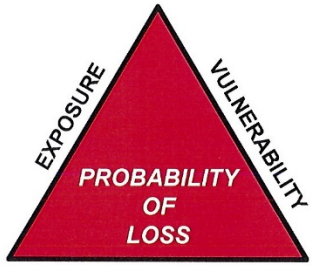
Table 4.1. Identification and projected impact potential for Indian River County hazards.

Hazard Category	Projected Impact Potential (structures, infrastructure, people, environment, etc.)																				
	Excessive wind	Excessive water	Damaging hail	Beach Erosion	Soil Erosion	Electric power outage	Surface and air transportation disruption	Navigable waterway impairment	Potable water system loss or disruption	Sewer system outage	Telecommunications system outage	Human health and safety	Psychological hardship	Economic disruption	Disruption of community services	Agricultural/fisheries damages	Damage to critical environmental resources	Damage to identified historical resources	Fire	Toxic releases	Stormwater drainage impairment
Natural Hazards																					
Flooding		X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Tropical Storms/Hurricanes	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tornadoes	X					X	X				X	X	X	X							
Severe Thunderstorm/Lightning	X	X	X			X	X				X	X	X	X					X		X
Wildfire						X	X				X	X	X	X	X	X	X		X	X	
Extreme Temperatures*						X						X	X	X		X	X				
Erosion (Coastal)				X	X			X						X			X				X
Erosion (Soil)					X							X					X				X
Droughts														X		X	X		X		
Seismic hazards*							X													X	
Agricultural pests and disease*												X	X	X		X	X				
Epidemics*												X	X	X	X						
Tsunami		X						X				X					X				X

Table 4.1. (Continued).

Hazard Category	Projected Impact Potential (structures, infrastructure, people, environment, etc.)																				
	Excessive wind	Excessive water	Damaging hail	Beach Erosion	Soil Erosion	Electric power outage	Surface and air transportation disruption	Navigable waterway impairment	Potable water system loss or disruption	Sewer system outage	Telecommunications system outage	Human health and safety	Psychological hardship	Economic disruption	Disruption of community services	Agricultural/fisheries damages	Damage to critical environmental resources	Damage to identified historical resources	Fire	Toxic releases	Stormwater drainage impairment
Technological Hazards																					
Radiological Accidents (including nuclear power plant accidents)*						X	X				X	X	X	X	X		X			X	
Power Failures (outages)*						X	X		X	X	X	X	X	X	X						
Hazardous Materials Accidents*							X					X	X	X	X				X	X	
Transportation System Accidents*							X	X				X		X	X				X		
Wellfield Contamination*									X	X		X	X	X	X						
Communications Failure*											X	X		X	X						
Unexploded Military Ordnance*												X	X				X			X	
Societal Hazards																					
Terrorism and Sabotage*						X	X		X		X	X	X	X			X	X	X	X	
Civil Disturbance*							X					X	X	X	X			X			
Immigration Crisis*												X	X	X	X						

* Due to the low probability of occurrence, these hazards will not be fully profiled.



FREQUENCY

(a) Area of triangle represents probability of loss - The larger the triangle the higher probability of loss.

FREQUENCY

(b) One element of risk such as exposure can be reduced and therefore the overall probability of loss is reduced.

FREQUENCY

(c) More then one element of risk can be reduced and therefore the overall probability of loss is even greater reduced.

Figure 4.1. Risk triangle.

4.1 NATURAL HAZARDS

Indian River County is susceptible to a number of natural hazards with the potential to cause extensive damage within the community. The cost of responding to and recovering from these disasters has proven to be significant. Planning for these events before they occur can significantly reduce costs in the future. This subsection will now identify those hazards in Indian River County identified as being naturally occurring.

4.1.1 Flooding

4.1.1.1 Hazard Identification

A flood is defined by the National Weather Service as any high flow, overflow, or inundation by water which causes or threatens damage. There are a number of flood types, such as:

River Flood – Occurs when water levels rise over the top of river banks due to excessive rain from tropical systems making landfall, persistent thunderstorms over the same area for extended periods of time, combined rainfall and snowmelt, or an ice jam.

Coastal Flood – The inundation of land areas along the coast causes by higher than average high tide and worsened by heavy rainfall and onshore winds (i.e., wind blowing landward from the ocean).

Storm Surge – An abnormal rise in water level in coastal areas, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure. Storm surge is extremely dangerous, because it is capable of flooding large coastal areas.

Inland Flooding – Occurs when moderate precipitation accumulates over several days, intense precipitation falls over a short period, or a river overflows because of an ice or debris jam, or dam or levee failure.

Flash Flood – Caused by heavy or excessive rainfall in a short period of time, generally less than six hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them.

In Indian River County, several variations of flood hazards occur due to the different effects of severe thunderstorms, hurricanes, seasonal rains, and other weather-related conditions. For the majority of the County, the primary causes of flooding are hurricanes or tropical storms. However, the County's low-lying topography, combined with its subtropical climate, make it vulnerable to riverine as well as storm-associated flooding.

Flooding in Indian River County results from one or a combination of both of the following meteorological events:

1) Tidal surge associated with northeasters, hurricanes, and tropical storms; and
2) Overflow from streams and swamps associated with rain runoff.

When intense rainfall events occur, streams and drainage ditches tend to reach peak flood flow concurrently with tidal water conditions associated with coastal storm surge. This greatly increases the probability of flooding in the low-lying areas of the coastal zone. Areas along the Indian River are particularly susceptible to flooding under these conditions. The most flood prone areas in the eastern portion of the County feature poorly drained soils, a high water table, and relatively flat terrain, all of which contribute to their flooding problems. Flat terrain and heavily wooded areas aggravate flood problems by preventing rapid drainage in some areas.

Riverine flooding occurs when the flow of rainwater runoff exceeds the carrying capacities of the natural drainage systems. During extended periods of heavy rainfall, certain low-lying neighborhoods within the County are subject to considerable flood damage and isolation caused by the inability of natural and mechanical drainage systems to effectively remove the water. Heavy rainfalls can cause considerable damage to County infrastructure including roadbeds, bridges, drainage systems, and the water supply.

The buildup of uncontrolled sediment contributes to the problem of inadequate drainage in natural and mechanical drainage systems. When a storm produces an overwhelming amount of stormwater runoff, the accumulation of loose sediment causes flooding by clogging the drainage systems. This buildup of sediment in Indian River County waterways has led to the degradation of the national estuary. The County is currently working to address this issue by replacing bottom opening radial gates with tilting gates at four water control structures.

Long-term climate monitoring stations indicate that rainfall in Indian River County averages about 51.5 inches annually, with about half of this volume occurring during the 4 months from June through September. Only about 20% of the total annual volume of precipitation occurs during the four driest months, December through March. The maximum annual rainfall that has been recorded for the Vero Beach climatological station is 81.74 inches, (Indian River County Public Works, 2002).

In comparison to riverine flooding, coastal flooding is usually the result of a severe weather system such as a tropical storm or hurricane. The damaging effects of coastal floods are caused by a combination of storm surge, wind, rain, erosion, and battering by debris. All coastal property and inhabitants are subject to severe damage and loss of life resulting from floods caused by hurricane-associated storm surge. Some coastal property, road arteries, and bridge approaches are subject to severe flooding caused by rare astronomical tides as well.

***Historical Flooding Events*.** Data on previous occurrences of flooding events in municipalities are limited; therefore, the following events are based on the best available data. Additional data can be found under the Tropical Storms/Hurricanes heading (4.1.2).

***Flood of 1947*.** This flood is generally considered to be the most severe flood recorded in southern Florida. Heavy rainfall, including the rains from two hurricanes, occurred over a period of 5 months. Many parts of Martin County, to the south, were flooded for months, and there was extensive damage to dairy pastures and agriculture in general. Such a flooding event in Indian River County would be much more significant today because of the increase in land development along the eastern side of the County.

Flood of 1953. As occurred in 1947, this flood was preceded by 5 months of heavier than normal rainfall, which included a tropical storm in October. June through October rainfall was approximately 48 inches. Damage was heaviest in the beef cattle industry, with extensive losses of improved pastureland, which required supplemental feeding of cattle. Vegetable growers and dairy farmers also suffered significant losses as a result of this flood. There were significant damages to buildings and roads in the eastern part of the County as well.

Flash Flood of March 1993. The City of Vero Beach experienced a flash flood following heavy rains causing minor damage in 50 homes and washed out roads around Highway 60. The flood caused an estimated $500,000 in damages.

The Unnamed Storm of October 1995. Almost exactly 1 year after the Tropical Storm Gordon flooding incident in 1994, a stalled frontal system dropped 15.5 inches of rain on Indian River County over a period of 39 hours.

Flooding of August 1999. The City of Sebastian experienced heavy rains in early August that flooded roads along U.S. Highway 1. The high water disabled six vehicles in the area as well. The City of Vero Beach experienced heavy rains producing flooding of some major roadways round the City in late August.

Flooding of June 2002. The Town of Fellsmere experienced flooding from heavy rains, which rendered some roads impassable and flooded two homes in the Fellsmere area. This storm caused an estimated $10,000 in damage.

Flooding of August 2002. The City of Vero Beach experienced heavy rain measuring about 5 inches in a few hours, which flooded streets and three houses in the City. The storm caused an estimated $50,000 in damage.

Flooding of August 19, 2008. The City of Sebastian experienced heavy rainfall associated with Tropical Storm Fay. Rainfall amounts ranged from 10 to 15 inches. There was one indirect fatality when a car hydroplaned and crashed.

Flooding of August 27, 2008. Vero Beach experienced persistent heavy rain bands from Tropical Storm Isaac that caused widespread urban and lowland flooding across much of the county. Rainfall averaged 4 to 8 inches, with isolated totals of 14 to 17 inches. Twenty-seven manufactured homes and two single family homes were damaged by water intrusion and 20 roads were temporarily closed due to standing water during the height of the flooding.

Flooding of May 17, 2016. Sebastian received persistent thunderstorms produced extremely heavy rain with a short time period. Numerous roads were closed due to high water and several cards were flooded. Standing water remained high within many neighborhoods for over 24 hours. The Vero Beach Airport recorded a record 11.22 inches for the day and 8.99 inches accumulated in four hours.

Flooding of October 7, 2016. Rain bands associated with Hurricane Matthew produced rainfall totals between 3.5 and 4.5 inches, resulting in areas of mostly minor urban and poor drainage flooding. Several roadways were impacted by significant ponding.

Flooding of September 10, 2017. Fellsmere, Sebastian and Vero Beach experienced rain bands associated with Hurricane Irma that produced rainfall totals between 8 and 15 inches, resulting in areas of urban and poor drainage flooding, especially across the southern portion of the county. Numerous roadways were impacted by significant levels of standing water and many retention ponds reached capacity or overflowed.

Extent/Probability/Impact*:* Flooding impacts related to tropical events are highlighted in the Tropical Storms/Hurricanes impacts profile. Indian River County has experienced two flood events since the last LMS plan update (2015) and one was due to Tropical Storm Matthew (see below). There have been no flooding events recorded for Indian River County in the National Climatic Data Center database since 2017 (through June 2019). Figure 4.2 can be used to determine the extent of the flooding hazard in each of the jurisdictions. In the past, flood waters in Indian River County have seldom exceeded 6" and would not be expected to ever exceed Flood Insurance Rate Map (FIRM) base flood elevations (BFEs) at any given location (i.e., one to two feet). Indian River County has experienced a total of 8 significant flooding (flood property and/or drown people/domestic animals) events between the periods of 1947-2015; therefore, there is a 12% annual chance of a significant flooding event to occur in Indian River County. See Table 4.2.1 for areas with historical drainage issues. Impacts may include access to homes (homeowner and emergency services), water intrusion and property damage.

4.1.1.2 Vulnerability Assessment

In Indian River County, several variations of flood hazards occur due to the different effects of severe thunderstorms, hurricanes, seasonal rains, and other weather related conditions. For the majority of the county, the primary causes of flooding are hurricanes or tropical storms. However, the county's low-lying topography, combined with its subtropical climate, makes it vulnerable to riverine flooding. The most vulnerable areas of flooding/ponding water in Indian River County are areas identified below in Table 4.2.1. These areas are more susceptible to flooding because they are known drainage problem areas.

Flooding events can have the following potential impacts within Indian River County:

- Excessive water;
- Soil/beach erosion;
- Electric power outage;
- Surface and air transportation disruption;
- Navigable waterway impairment;
- Potable water system loss or disruption;
- Sewer system outage;
- Public health and safety: increased rates of diarrhea (including cholera and dysentery), respiratory infections, hepatitis A and E, typhoid fever, leptospirosis, and diseases borne by insects;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Agricultural/fisheries damage;
- Damage to critical environmental resources;
- Damage to identified historical resources;
- Fire;
- Toxic releases; and
- Stormwater drainage impairment.

Figure 4.2 illustrates the flood prone areas of Indian River County based on the FIRMs. Two numerical models predict the effects of storm surge in Indian River County. The older model, developed by NOAA, is called the "Sea, Lake and Overland Surges from Hurricanes" (SLOSH) model. **Figure 4.3** shows the storm Category 1, 3, and 5 surge zones as predicted by the SLOSH model for Indian River County. According to the Florida Coastal Management Program, 43.2% of residents in Indian River County live in the Category 1 Surge Zone.

Table 4.2 can be used to determine the extent of the flooding hazard in each of the six jurisdictions represented by this plan. Overall, the flooding hazard in the unincorporated areas of the County varies. The extreme western unincorporated portions of the County are located in FEMA NFIP flood zones A, AE, and AO.

Table 4.2 Federal Emergency Management Agency Flood Zones.

Zone	Description
A	An area inundated by 1% annual chance flooding, for which no Base Flood Elevations (BFEs) have been determined.
AE	An area inundated by 1% annual chance flooding, for which BFEs have been determined.
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet.
ANI	An area not included in mapping.
AO	An area inundated by 1% annual chance flooding, for which average depths and velocities have been determined; flood depths range from 1 to 3 feet.
OFFFIRM	An area located off of the Flood Insurance Rate Map.
UNDES	A body of water, such as a pond, lake, ocean, etc., located within a community's jurisdictional limits that has no defined hazard.
VE	An area inundated by 1% annual chance flooding with velocity hazard (wave action); no BFEs have been determined.
X	An area that is determined to be outside the 1% and 0.2% annual chance flood plains.
X500	An area inundated by 0.2% annual chance flooding; an area inundated by 1% annual chance flooding with average depths of less than 1 foot or with drainage areas of less than 1 square mile; or an area protected by levees for 1% annual chance flooding.

The western portions of the City of Vero Beach are in the 500-year floodplain, while portions of the City located to the east of the coastal ridge are located in the AE zone. There are also portions of the barrier island in the City of Vero Beach that are subject to wave action.

The Town of Indian River Shores, which is located entirely on the barrier island, has a great potential for flooding. The majority of the coastal land along the Atlantic Ocean is subject to wave action and is located in the NFIP VE flood zone. The remainder of the land in Indian River Shores is located in the AE zone.

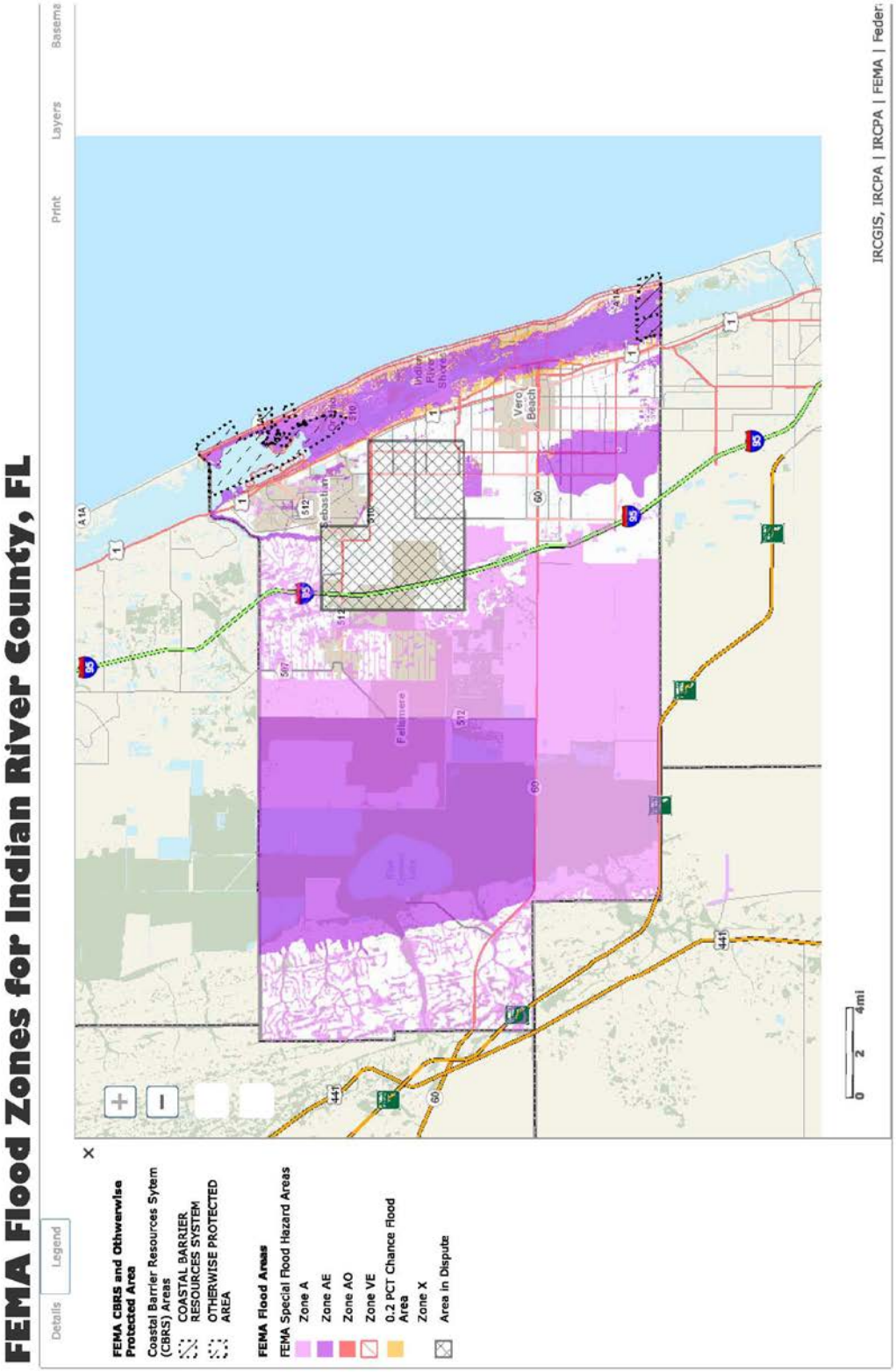


Figure 4.2 FEMA Flood Zones for Indian River County

Table 4.2.1. Identified Drainage Problem Areas.

NORTH COUNTY LOCATIONS	SOUTH COUNTY LOCATIONS
North Jungle Trail **Massy Road (44th Avenue)** • North of C.R. 510 to 8900 Block **Wildwood Subdivision** • 25th Street East of 82nd Avenue to 8100 Block **Eucalyptus Place** • 54th Ave between 22nd St and 24th St **Vero Lake Estates Subdivision** • 90TH Ave between 85th Street and 83rd Street • 83rd St between 91st Ave and 93rd Ave • 101st Ave between 81st St and 79th St • 104th Ave between 91st St and 93rd St	**Idlewild Subdivision** • 46th Ave from 12th Ln to 13th Pl **Rosedale Blvd Subdivision** • 37th Ave from 12th St to 13th St • 36th Ave from 12th St to 13th St • 35th Ave from 12th St to 13th St **Vantrician Subdivision** • 42nd Ave from 12th St to 14th St **Laurel Court Subdivision** • 41st Ave from 12th St to 14th St **Phyl-Ann Terrace Subdivision** • 40th Ave from 12th St to 14th St **Rockridge Subdivision** • 3rd Ct from 13th St to 16th St • 4th Ave from 13th St to 16th St • 4th Ct from 13th St to 16th St **Melrose Gardens Subdivision** • 35th Ave from 12th St to 10th St • 36th Ave from 12th St to 10th St

Like Indian River Shores, the Town of Orchid is located entirely on the barrier island and has a great potential for flooding. Coastal land along the Atlantic Ocean is subject to wave action and is located in the NFIP VE flood zone and quite a few homes (at least 34) fall in the X zone, which is about 10% of residential homes. The remainder of the land in Orchid is located in the AE zone.

The majority of land in the City of Sebastian is located in the X zone, or the 500-year floodplain. Lands lying adjacent to the Sebastian Creek have been identified as being in the NFIP AE zone.

The Town of Fellsmere, located to the west of I-95, consists of interspersed lands identified as being in the NFIP A and X flood zones.

Figure 4.3 can be used to determine the extent of the hurricane hazard for each jurisdiction represented by this LMS. According to the SLOSH model, overall storm surge risk in the County in limited to the eastern coast and lands adjacent to Sebastian Creek. Lands adjacent to either the Atlantic Ocean or the Intracoastal Waterway are subject to storm surge for Category 1 and higher storm events.

The SLOSH model predicts that the eastern portions of the City of Vero Beach will be impacted by storm surge. Portions of the City located on the barrier island and the Intracoastal Waterway will be subject to storm surge in a Category 1 hurricane. Storm surge associated with a Category 3 storm is expected to reach several blocks west of the Intracoastal Waterway. In a Category 5 storm, the surge is expected to impact U.S. Highway 1.

Because of the Town of Indian River Shore's location on the barrier island, land adjacent to the Atlantic Ocean and Intracoastal Waterway is expected to be impacted by storm surge in a Category 1 or higher event.

The Town of Orchid's location on the barrier island makes the potential for storm surge great. The western portions of the Town, located on the Intracoastal Waterway, are expected to be inundated in a Category 1 storm. The eastern portions of the Town can expect higher surge levels than the western portion of the Town during Category 3 or higher storms.

The majority of land in the City of Sebastian is located out of the storm surge zone. However, lands adjacent to the Intracoastal Waterway on the eastern side of the City and lands adjacent to Sebastian Creek on the western side of the City may be at risk from surge during Category 3 or higher storms.

The entire Town of Fellsmere is located outside of the storm surge zone. However, storm surges may extend into the Sebastian River and C-54 Canal to the point of Fellsmere's gravity outfall, thus shutting off further drainage until the waters recede.

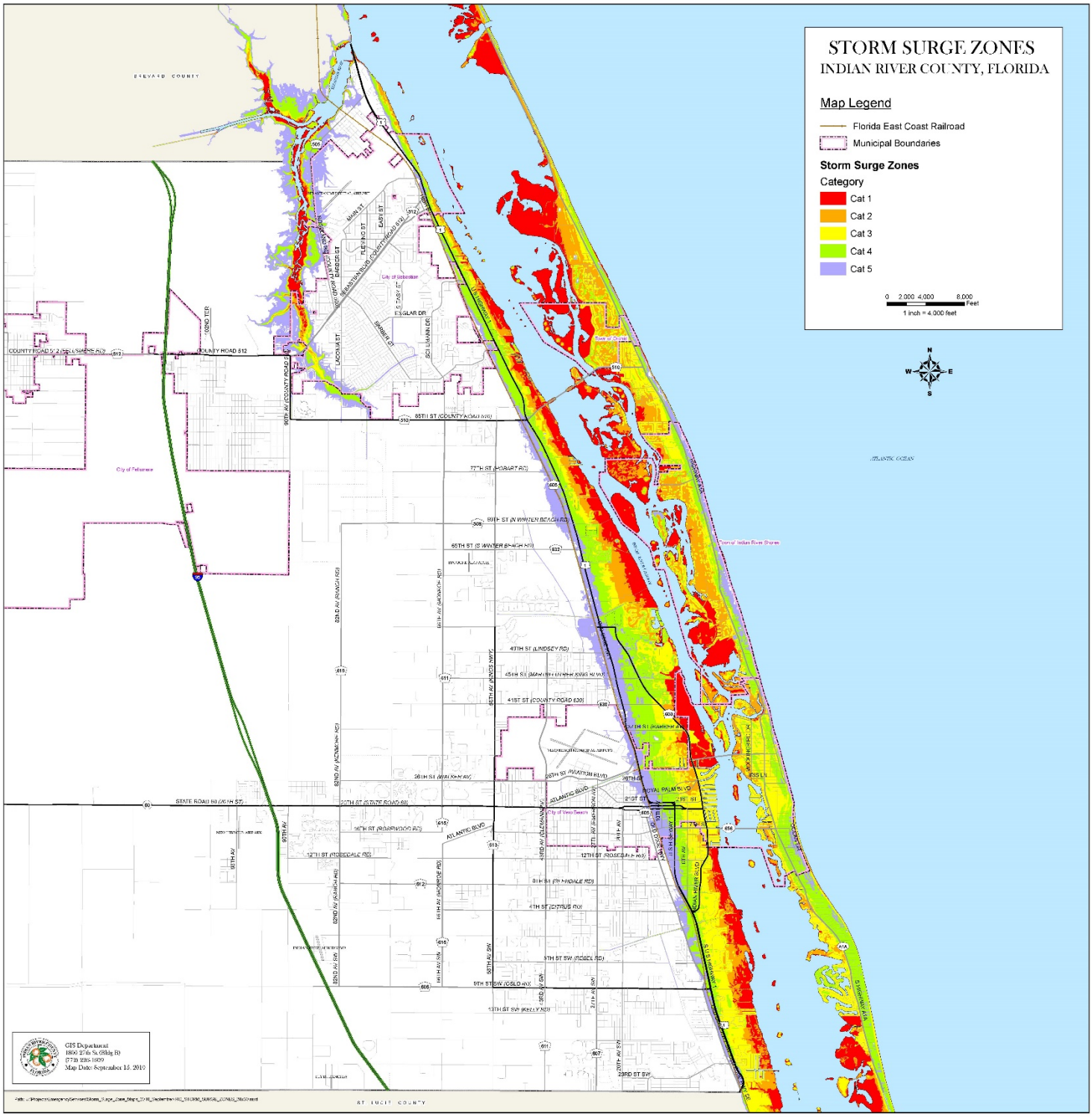


Figure 4.3 Indian River County Storm Surge Zones

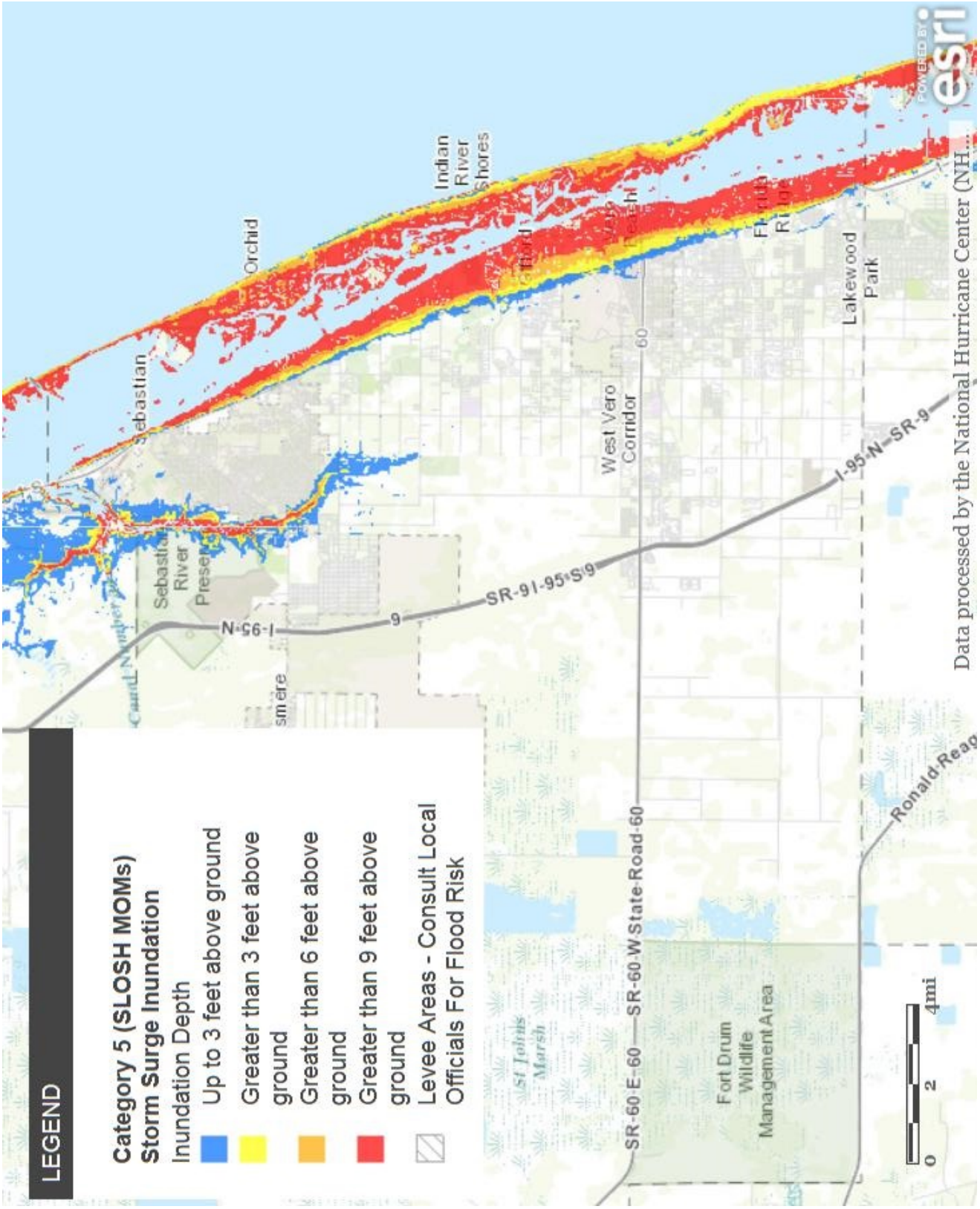


Figure 4.4 Category 5 Storm Surge for Indian River County

Figure 4.4 Surge predictions are based on a Category 5 event. Overall, Category 5 worst case storm surge inundation in Indian River County could result in inundation depths of 3 feet above ground to greater than 9 feet above ground.

Portions of the City of Vero Beach located on the barrier island and adjacent to the Intracoastal Waterway can expect surge from a Category 5 storm to range from 3 feet above ground to greater than 9 feet above ground. Lands located along the western banks of the Intracoastal Waterway will received the largest impact from storm surge. Western portions of the City west of U.S. Highway 1 may be inundated with 3 to 6 feet of surge.

The entire Town of Indian River Shores will be inundated with surge during a Category 5 event. Surge is expected to range from 3 feet above ground to greater than 9 feet above ground.

The entire Town of Orchid will be inundated with surge during a Category 5 event. Surge is expected to range from 3 feet above ground to greater than 9 feet above ground. The central portions of the Town are slightly less at risk.

The City of Sebastian's location on portions of the coastal ridge makes it less likely to experience surge in the western portions of the City. However, those lands adjacent to the Intracoastal Waterway and Sebastian Creek may be impacted by between 1 and greater than 9 feet of surge.

The Town of Fellsmere's location to the west of I-95 makes it less likely to experience the high surge levels found on the coastal areas in the County. Despite its location away from the coastline, the Town may experience between 1 and 8 feet of surge during a Category 5 event. The primary concern with storm surges is the inability of Fellsmere's gravity drainage system to drain during such storm surges. The extent of surge is fairly uniform throughout the Town.

Documented Repetitive Losses. For this analysis, documented repetitive losses are restricted to the narrow FEMA definition and represent only those properties whose owners have made more than one claim on their flood insurance policies as recorded by the NFIP. As of October 2017, Indian River County (including municipalities) had a total of 216 repetitive flood loss properties with a total of 488 claims. Total payments for building damage on these claims was $19,115,361, while total payments for content damage was $4,654,392 (Table 4.3).

Table 4.3 National Flood Insurance Program repetitive flood loss properties by jurisdiction 5/31/18)

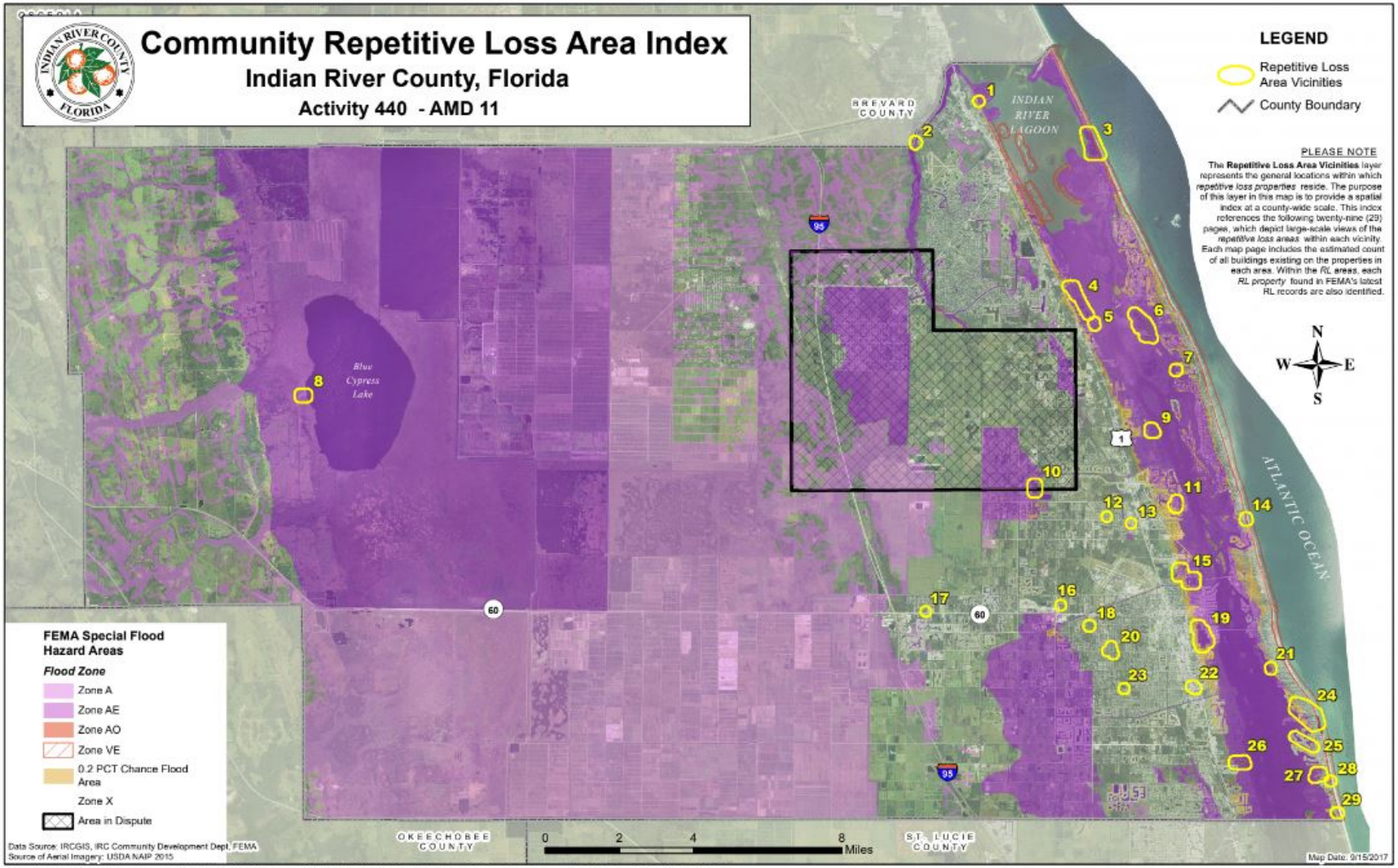
Community	Number of Properties	Number Mitigated	Occupancy Type					Number of Claims	Total Building Payments	Total Content Payments
			Single Family	Multi Family	Non-Resident	Condo	Other			
IRC	114	19	94	1	8	3	8	281	$9,078,847	$1,867,840
Vero Beach	100	12	69	1	20	4	6	215	$10,221,20	$2,781,087
Sebastian	2	0	1	0	1	0	0	4	$212,681	$75,223
Fellsmere	2	0	2	0	0	0	0	4	$83,541	$473
I.R. Shores	3	0	3	0	0	0	0	6	$56,556	$76,724
TOTAL									**$19,115,36**	**$4,654,392**

Note: The Town of Orchid is not a participant in the Community Rating System Program.

The majority of the repetitive loss properties in unincorporated Indian River County date back to Hurricanes Frances and Jeanne, which hit Indian River County in August and September 2004. Both hurricanes impacted the County with significant force, causing +-$3 billion in damage (combined) countywide. Indian River County was declared an area of national disaster as a result of each of the two hurricanes, which hurricanes impacted the County within three weeks of each other. Flood and wind damaged affected many homes in the County; the repetitive loss properties reflect areas of particular flooding resulting from the hurricanes.

Figure 4.4.1 gives a general perspective as to the location of repetitive loss properties in the unincorporated portion of county through December 2011, including locations where repetitive loss structures have been mitigated by demolition and/or redevelopment to higher flood protection standards.

Figure 4.4.1: Repetitive loss properties in unincorporated Indian River County.



Based on the location of the repetitive loss properties, the County has established 26 “repetitive loss areas” consistent with FEMA guidelines. Information including flood zone maps, aerial maps and topographic maps – in addition to local knowledge of specific properties and flood prone areas - were used to establish boundaries of each of the repetitive loss areas. In the unincorporated county, the 26 repetitive loss areas encompass a combined total of 747 parcels. Each year, the County sends letters to landowners within the repetitive loss areas advising them of the flood risk and providing them with resource information on ways to reduce the risk and increase flood protection.

Areas of Frequent Flooding. Frequencies from flooding associated with rain events other than tropical storms and hurricanes are more difficult to estimate. Eastern Florida shows an annual dry cycle stretching from early November through mid-May. During this part of the year, monthly rainfall rarely exceeds 3.5 to 4.0 inches per month. The wet season, beginning in mid-May and running through late October, shows monthly rainfall levels in the area to be 6.0 to 8.5 inches. Heaviest rainfall usually occurs in June and September. In Indian River County, the eastern or coastal section of the County receives more rain than the western section. The average annual rainfall in Indian River County ranges between 50 and 55 inches. The County sees its maximum monthly rainfall in September, and its minimal rainfall in January. This rainfall pattern coupled with the hurricane season (June through November) makes Indian River County particularly vulnerable to flooding associated with tropical storms and hurricanes because they typically occur when the water table is high and the ground is saturated. The County’s Flood Insurance Study, dated December 4, 2012, identified the following sources of flooding within the County:

- Sebastian Creek;
- South Prong Creek;
- Schumann Waterway;
- Elkcam Waterway – Collier Waterway;
- Lateral G;
- Lateral H;
- Lateral J;
- North Relief Canal;
- South Relief Canal;
- Main Relief Canal; and
- Vero Lakes Channels A, B, C, and D.

The Department of Public Works has identified the following areas as being chronically flooded:

- 35th Avenue south of 12th Street;
- Vero Lake Estates – 101st Avenue West to 104th between 81st Street and 85th Street
- County Road 512 at U.S. Highway #1

4.1.1.3 Risk Assessment

Flooding is the single hazard producing the most recurrent impacts in Indian River County. All communities within Indian River County are highly vulnerable to flooding, but they are not all vulnerable for the same reasons. The barrier island communities (Town of Orchid, Indian River Shores, and the beach side of the City of Vero Beach) are obviously highly vulnerable to storm surge damage from hurricanes. The communities of Sebastian and Orchid, located near the Sebastian Inlet and along the Sebastian River, also are highly vulnerable to flooding associated with hurricane winds and storm surge. The mainland portion of the City of Vero Beach is less vulnerable to oceanic storm surge due to its location between inlets. Wind packing of the water within the Indian River may still produce substantial flooding along the riverfront. Communities away from the water such as Fellsmere and the urbanized areas along Route 60 west of Vero Beach are more vulnerable to wind damage from hurricanes and flooding associated with rain rather than storm surge.

Activities to reduce flooding risks. Indian River County, as well as municipalities within the county, participates in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP). As participants in the CRS, the County and those municipalities take measures beyond the NFIP's minimum requirements to reduce flooding risks and enhance flood protection. Those measures include:

- Maintaining flood elevation certificates for new and substantially improved buildings, as well as elevation certificates and FIRMs from prior years;

- Providing flood zone information to the public and publicizing the service annually;

- Providing public outreach by placing flood information in local phone books distributed throughout the county on an annual basis, as well as providing flood information through displays at public meetings;

- Requiring hazard disclosure information on recorded plats;

- Maintaining floodplain management documents in County libraries and on County and municipal websites;

- Preserving more than 76,000 acres in Special Flood Hazard Areas (SFHAs) countywide as open space, including open space land that is deed restricted and preserved in a natural state (see Figure 4.4.2, showing special flood hazard areas on designated conservation lands);

- Maintaining higher regulatory standards than the minimum required such as freeboard, compensatory storage ("cut and fill"), and a ten-year cumulative time period for calculating substantial improvement of structures;

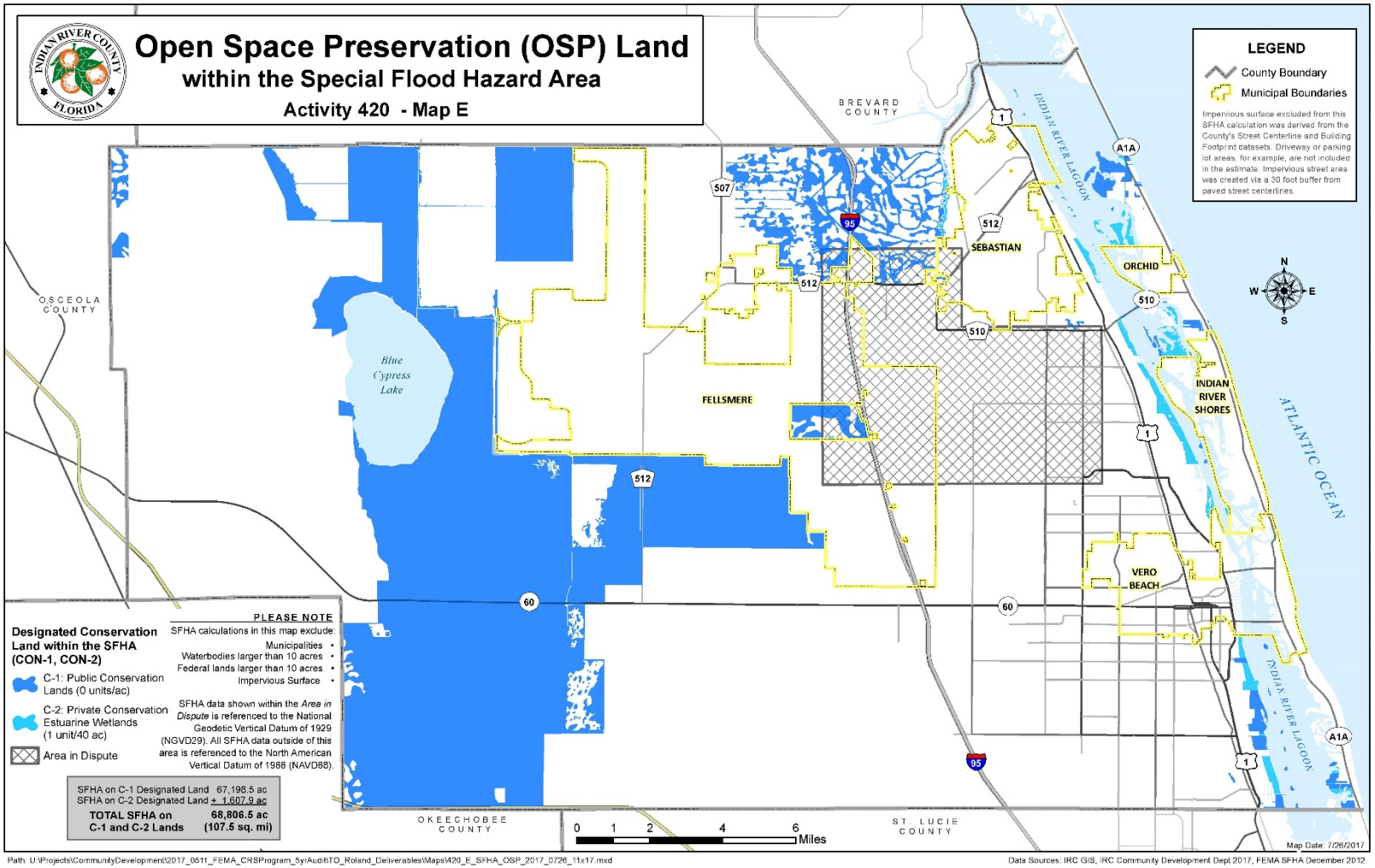
- Inspecting and maintaining public drainage systems, including ongoing capital improvement projects to improvement drainage, and enforcing against illegal dumping in drainage systems; and

- Maintaining a flood warning program.

Table 4.4 NFIP Policy Statistics, Indian River County (As of 11/30/18)

Community Name	Policies in-Force	Coverage Amount in-Force
Fellsmere, City of	66	$13,167,500
Indian River County	13,250	$3,592,259,800
Indian River Shores, Town of	3,202	$860,001,200
Orchid, Town of	322	$102,648,900
Sebastian, City of	990	$297,788,500
Vero Beach, City of	3,924	$1,025,578,700

Figure 4.4.2.: Open Space Preservation Land within the Special Flood Hazard Areas



4.1.2 Tropical Storms/Hurricanes

4.1.2.1 Hazard Identification

A tropical storm is a tropical cyclone with maximum sustained winds of at least 39 mph. Tropical storms are given official names once they reach these wind speeds. Beyond 74 mph, a tropical storm is called a hurricane, typhoon, or cyclone based on the storm location. A tropical cyclone has a defined cyclonic rotation and severe thunderstorms around a central low-pressure zone. A tropical cyclone is one step above a tropical depression, but a step below a hurricane in terms of intensity.

A ***Tropical Storm Watch*** is issued by the National Hurricane Center (NHC) when tropical-storm conditions are possible within the specified area. A ***Tropical Storm Warning*** is issued by the NHC when tropical-storm conditions are expected within the specified area.

Hurricanes are tropical cyclones with winds that exceed 74 mph and blow counter-clockwise about their centers in the Northern Hemisphere. They are essentially heat pumping mechanisms that transfer the sun's heat energy from the tropical to the temperate and polar regions. This helps to maintain the global heat budget and sustain life. Hurricanes are formed from thunderstorms that form over tropical oceans with surface temperatures warmer than 81°F (26.5°C). The ambient heat in the sea's surface and moisture in the rising air column set up a low pressure center and convective conditions that allow formation of self-sustaining circular wind patterns. Under the right conditions, these winds may continue to intensify until they reach hurricane strength. This heat and moisture from the warm ocean water is the energy source of a hurricane. Hurricanes weaken rapidly when deprived of their energy source by traveling over land or entering cooler waters.

When a hurricane threatens the coast, advisories are issued by the NHC. The storm's current location and intensity are described along with its projected path. Advisories are issued at 6-hour intervals: 5:00 A.M., 11:00 A.M., 5:00 P.M., and 11:00 P.M., Eastern Time.

In addition to advisories, the NHC may issue a hurricane watch or warning. A ***Hurricane Watch*** is issued 48 hours in advance of the anticipated arrival of tropical-storm-force winds. A ***Hurricane Warning*** is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

Advisories and hurricane watches and warnings will frequently refer to the category of a storm. Hurricanes are classified using the Saffir-Simpson scale as follows:

- Category 1 – Winds 74 to 95 mph;
- Category 2 – Winds 96 to 110 mph;
- Category 3 – Winds 111 to 129 mph;
- Category 4 – Winds 130 to 156 mph; and
- Category 5 – Winds 157 mph or higher.

Hurricane damage occurs through two means – high winds and storm surge. Generally it is the wind that produces most of the property damage associated with hurricanes, while the greatest threat to life is from flooding and storm surge. Although hurricane winds can exert tremendous pressure against a structure, a large percentage of

hurricane damage is caused not from the wind itself, but from flying debris. Tree limbs, signs and sign posts, roof tiles, metal siding, and other loose objects can become airborne missiles that penetrate the outer shells of buildings, destroying their structural integrity and allowing hurricane winds to act against interior walls not designed to withstand such forces. Once a structure's integrity is breached, the driving rains associated with hurricanes can enter the structure and completely destroy its contents.

Hurricane winds are unique in several ways:

1) They are more turbulent than winds in most other types of storms;
2) They are sustained for a longer period of time (several hours) than any other type of atmospheric disturbance;
3) They change slowly in direction; thus, they are able to seek out the most critical angle of attack on a given structure; and
4) They generate large quantities of flying debris as the built environment is progressively damaged; thus, amplifying their destructive power.

In hurricanes, gusts of wind can be expected to exceed the sustained wind velocity by 25% to 50%. This means a hurricane with sustained winds of 150 mph will have wind gusts exceeding 200 mph. The wind's pressure against a fixed structure increases with the square of the velocity. For example a 100-mph wind will exert a pressure of approximately 40 pounds per square foot on a flat surface, while a 190-mph wind will exert a force of 122 pounds per square foot on that same structure. In terms of a 4- by 8-foot sheet of plywood nailed over a window, there would be 1,280 pounds of pressure against this sheet in a 100-mph wind, and 3,904 pounds or 1.95 tons of pressure against this sheet in a 190-mph wind.

The external and internal pressures generated against a structure vary greatly with increases in elevation, shapes of buildings, openings in the structures, and the surrounding buildings and terrain. Buildings at ground level experience some reductions in wind forces simply because of the drag exerted by the ground against the lowest levels of the air column. High-rise buildings, particularly those located along the beachfront will receive the full strength of hurricane winds on their upper stories. Recent studies estimate that wind speed increases by approximately 37% just 15 feet above ground level.

The wind stream generates uplift as it divides and flows around a structure. The stream following the longest path around a building, generally the path over the roof, speeds up to rejoin the wind streams following shorter paths, generally around the walls. This is the same phenomenon that generates uplift on an aircraft's wing. The roof in effect becomes an airfoil that is attempting to "take off" from the rest of the building. Roof vortexes generally concentrate the wind's uplift force at the corners of a roof. These key points can experience uplift forces two to five times greater than those exerted on other parts of the roof.

Once the envelope of the building has been breached through the loss of a window or door, or because of roof damage, wind pressure on internal surfaces becomes a factor. Openings may cause pressurizing or depressurizing of a building. Pressurizing pushes the walls out, while depressurizing will pull the walls in. Internal pressure coupled with external suction adds to the withdrawal force on sheathing fasteners. Damages from internal pressure fluctuations may range from blowouts of windows and doors to total building collapse due to structural failure.

During Hurricane Andrew, catastrophic failure of one- and two-story wood-frame buildings in residential areas was observed more than catastrophic failures in other types of buildings. Single-family residential construction is particularly vulnerable because less engineering oversight is applied to its design and construction. As opposed to hospitals and public buildings, which are considered "fully engineered," and office and industrial buildings, which are considered "marginally engineered," residential construction is considered "non-engineered." Historically, the bulk of wind damage experienced nationwide has occurred to residential construction. Fully engineered construction usually performs well in high winds due to the attention given to connections and load paths.

Hurricane winds generate massive quantities of debris that can easily exceed a community's entire solid waste capacity by three times or more. Debris removal is an integral first step toward recovery, and as such, must be a critical concern of all those tasked with emergency management and the restoration of community services.

A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from 4 to 5 feet in a Category 1 hurricane and up to 20 feet in a Category 5 storm. The storm surge arrives ahead of the storm's actual landfall, and the more intense the hurricane is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have waited to evacuate flood prone areas. A storm surge is a wave that has outrun its generating source and become a long period swell. The surge is always highest in the right-front quadrant of the direction the hurricane is moving in. As the storm approaches shore, the greatest storm surge will be to the north of the hurricane eye.

Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions. The stronger the hurricane and the shallower the offshore water, the higher the surge will be. In addition, if the storm surge arrives at the same time as the high tide, the water height will be even greater. The storm tide is the combination of the storm surge and the normal astronomical tide.

Damage during hurricanes also may result from possible spawned tornadoes, and inland flooding associated with heavy rainfall that usually accompany these storms. Hurricane Andrew, a relatively "dry" hurricane, dumped 10 inches of rain on south Florida and left many buildings extensively water damaged. Rainwater may seep into gaps in roof sheathing and saturate insulation and ceiling drywall, in some cases causing ceilings to collapse.

Crop damage is another powerful effect of hurricanes and tropical storms. Tropical Storm Mitch in 1998 dropped as much as 10 inches of rain in some south Florida areas, which resulted in approximately $20 million in crop damage in Palm Beach County alone (Associated Press, 1998). According to the University of Florida (2001), of Indian River County's 322,112 acres, 168,399 acres are farmland. With 52% of its land area being farmed, Indian River County is particularly vulnerable to crop damage resulting from the wind and rain from hurricanes and tropical storms. Hurricanes Charley, Frances, and Jeanne crossed citrus-producing counties in Florida in 2004, followed by Hurricane Wilma in 2005. Hurricanes Frances and Jeanne affected the Treasure Coast directly, making landfall three weeks apart in Martin County. A special census to measure the losses was conducted in mid-2005 in the four counties of Indian River, Martin, Palm Beach, and St. Lucie. Because of these hurricanes, Indian River and St. Lucie Counties only produced 36% of the state's grapefruit in 2004-05, compared to the normal 66%. Overall, the number of boxes of Florida citrus was down 42% from the 2003-04 season, bringing a 17% drop in value for the same

period (USDA, 2005). After the 2004 hurricane season, the rate of tree removal and burning efforts were intensified in an effort to eradicate canker from commercial groves before the onset of the 2005 hurricane season. Before the plan could be completed, hurricane Wilma contributed to the spread of canker from south Florida up through central Florida, far beyond the ability to control it with the existing eradication plan. Estimates placed the spread of the disease at 183,000 acres. The existing eradication plan would have required the destruction of one-fourth of the commercial acreage in Florida, an amount that would have devastated the citrus industry (Conner, 2006).

Historic Events. From 1930 through 1959, a total of 58 hurricanes struck the U.S. mainland; 25 of which were Category 3 or higher (major storms). Between 1960 and 1989, 43 hurricanes struck the U.S.; 16 of which were Category 3 or stronger. Most hurricane experts feel we are entering a period of increased hurricane formation similar to the levels seen in the 1930's and 1940's. Current hurricane risk calculations are complicated by climatic factors suggesting the potential for even greater hurricane frequency and severity in all of the world's hurricane spawning grounds. Since 1995, there have been 33 Atlantic hurricanes, and there were 10 in 1998 alone. Global warming may cause changes in storm frequency and the precipitation rates associated with storms. A modest 0.9°F (0.5°C) increase in the mean global temperature will add 20 days to the annual hurricane season and increase the chances of a storm making landfall on the U.S. mainland by 33%. The warmer ocean surface also will allow storms to increase in intensity, survive in higher latitudes, and develop storm tracts that could shift farther north, producing more U.S. landfalls.

Currently an average of 1.6 hurricanes strike the U.S. every year. Severe (Category 4 or 5 on the Saffir-Simpson scale) hurricanes strike the U.S. on the average of one every 5.75 years. Annually, hurricanes are estimated to cause approximately $1.2 billion in damages. The proximity of dense population to the Atlantic Ocean, as well as the generally low coastal elevations, significantly increases the County's vulnerability. The potential for property damage and human casualties in Indian River County has increased over the last several decades primarily because of the rapid growth this County has experienced since 1970, particularly along the vulnerable coastline areas.

From 1871 – 2018, 60 storms of hurricane intensity have passed within 125 miles of Indian River County. This represents an average of one hurricane every 2.45 years. The number of direct hits on the Florida coastline between 1851 and 2017 has been as follows (http://www.hurricanecity.com/city/vero.htm):

Probability. (Source: NMW Melbourne Jan. 2020)

- **Tropical Storm** (winds 39 to 73 mph) = 43 storms (24% annual probability, or return period of once every 4 years);
- **Category 1 Storms** (winds 74 to 95 mph) = 15 storms (8% annual probability, or return period of once every 12 years);
- **Category 2 Storms** (winds 96 to 110 mph) = 13 storms (7% annual probability, or return period of once every 14 years);
- **Category 3 Storms** (winds 111 to 129 mph) = 6 storms (3% annual probability, or return period of once every 30 years);
- **Category 4 Storms** (winds 130 to 156 mph) = 3 storms (2% annual probability or return period of once every 59 years); and
- **Category 5 Storms** (winds 157 mph >) = 0 storm (0% annual probability)

EXTENT: While it is possible for Indian River County to be impacted by a category 4 or 5 hurricane, according to the statistics above it is very unlikely. Indian River County has a history of impacts from tropical storms and category 1-3 hurricanes as defined by the Saffir-Simpson Hurricane Wind Scale. Impacts from these storms can cause major structure damage, trees to be uprooted, and near total power loss for several days to weeks after the storm passes.

Hurricane of September 1928. This hurricane made Florida landfall near the City of Palm Beach as a strong Category 4 hurricane with one of the lowest barometric pressures ever recorded in this area (928.9 millibars [27.43 inches]). It reached Lake Okeechobee with very little decrease in intensity. In all, 1,836 people were killed and another 1,870 injured during this storm's passage. Nearly all the loss of life was in the Okeechobee area and was caused by overflowing of the lake along its southwestern shore.

Hurricane of September 1933. This major Category 3 hurricane passed over Jupiter Island with a barometric pressure of 947.5 millibars (27.98 inches). Maximum winds recorded were 127 mph. There was considerable property damage all along the Florida east coast, mostly in the area between Jupiter and Ft. Pierce. Severe waterfront damage was reported in Stuart, located in Martin County.

Hurricane of August 1949. This Category 3/Category 4 hurricane made landfall in Florida between Delray and Palm Beach with winds of 130 mph and a barometric pressure of 954.0 millibars (28.17 inches). As it moved inland, its center passed over the northern part of Lake Okeechobee. The levees in that area held, and no major flooding occurred. Damages in Florida were estimated at $45 million. Tides of 11.3 feet at Ft. Pierce, 8.5 ft at Stuart, and 6.9 ft at Lake Worth were reported. Statewide, over 500 people lost their homes as a result of this storm.

Tropical Storm (Florence) of September 1960. Tropical Storm Florence deposited a total of 10 to 11 inches of rain countywide over a 5-day period from 20 to 25 September 1960. Fortunately, the previous month's rainfall had been rather low, and overall flooding was not extensive. The most significantly damaged area was in the Allapattah Marsh area north of the St. Lucie Canal. Several dike systems failed and allowed water to overrun several ranches.

Hurricane Andrew of August 1992. Hurricane Andrew was a small and ferocious Cape Verde hurricane that wrought unprecedented economic devastation along a path through the northwestern Bahamas, the southern Florida peninsula, and south-central Louisiana. Damage in the U.S. was estimated to be near 25 billion, making Hurricane Andrew the most expensive natural disaster in U.S. history. The tropical cyclone struck southern Dade County, Florida, especially hard, with violent winds and storm surges characteristic of a Category 4 hurricane on the Saffir/Simpson Hurricane Scale, and with a central pressure (922 millibars) that is the third lowest this century for a hurricane at landfall in the U.S. In Dade County alone, the forces of Hurricane Andrew resulted in 15 deaths and up to one-quarter million people left temporarily homeless. An additional 25 lives were lost in Dade County from the indirect effects of Andrew. The direct loss of life seems remarkably low considering the destruction caused by this hurricane (Rappaport, 1993).

Tropical Storm (Gordon) of October 1994. Indian River County experienced a period of extensive growth during the 1970's and 1980's. Most of this growth took place in the form of residential and commercial land development in the eastern portion of the County

along the major transportation corridor. The rain event associated with Tropical Storm Gordon in October 1994 was the most significant rain event to occur after this period of development.

Hurricane Floyd of September 1999. This large Category 4 storm moved parallel to the southeast Florida coast. While the storm did not make landfall in Florida, it did impact Florida coastal communities. Peak gusts associated with the storm were estimated to be as high as 155 mph. Fifty-seven deaths and 1.3 billion dollars in insured losses were attributed to the storm. Readings taken in Ft. Pierce indicate that sustained winds were 33 mph, and peak wind gusts were up to 49 mph. The ARC opened 7 shelters in Indian River County and served 2,000 meals during the hurricane.

Hurricane Irene of October 1999. This Category 2 hurricane made landfall in the Keys and moved north, heading back out to sea at the Jupiter Inlet. Insured property losses in Dade, Broward, and Palm Beach counties exceeded $600 million. Total insured losses from the rest of the state totaled $200 million. Over 700,000 customers were left without power following the storm. Readings taken in Ft. Pierce indicate that sustained winds were 42 mph, and peak wind gusts were up to 51 mph. Peak wind gusts in Vero Beach measured 71 mph.

Tropical Storm Leslie of October 2000. This tropical storm mainly impacted Miami-Dade and Broward counties, causing $700 million in damage, $500 million of which were agricultural crop losses. During this storm, the City of Sebastian experienced significant flooding.

Hurricane Gabrielle of September 2001. This hurricane made landfall on the west coast of Florida and traveled northeast across the state. The storm spawned a total of 18 tornadoes. Insured losses associated with this storm totaled $115 million. Total damage is estimated to be nearly $230 million. Readings taken in Ft. Pierce indicate that sustained winds reached 27 mph, and peak wind gusts were up to 37 mph. Rain meters in Ft. Pierce indicated 1.97 inches of rainfall during this period.

Hurricane Frances of September 2004. This hurricane made landfall over the southern end of Hutchinson Island, Florida as a Category 2 hurricane. Frances gradually weakened as it moved slowly west-northwestward across the Florida Peninsula, and became a tropical storm just before emerging into the northeastern Gulf of Mexico near New Port Richey early on 6 September. The National Weather Service Melbourne Weather Forecast Office (WFO) estimated storm surge at 8 ft near Vero Beach and 6 ft around Cocoa Beach. Frances caused widespread heavy rains and associated freshwater flooding over much of the eastern United States. Storm-total rainfalls of 5-10 in were common elsewhere along Frances' track as a tropical cyclone. Frances caused an estimated $850 million in damage to insured property in Indian River County. The storm spawned a total of 101 tornadoes – 23 in Florida. Sustained winds reached 105 mph. There was one fatality recorded in Indian River County.

Hurricane Jeanne of September 2004. Jeanne made landfall as a Category 3 hurricane on the east coast of Florida early on September 26 with the center crossing the coast at the southern end of Hutchinson Island just east of Stuart. Maximum winds at landfall are estimated at 121 mph. Widespread rainfall of up to 8 inches accompanied Hurricane Jeanne as it moved across eastern, central and northern Florida. A narrower band of 11 to 13 inches was observed in the vicinity of the eyewall track over Osceola, Broward and Indian

River counties of east central Florida. Storm surge flooding of up to 6 ft above normal tides likely occurred along the Florida east coast from the vicinity of Melbourne southward to Ft. Pierce. Jeanne caused an estimated $2 billion in damage to insured property Indian River County.

Hurricane Wilma of October 2005. Wilma made landfall in southwestern Florida near Cape Romano as a Category 3 hurricane on October 24 with sustained winds estimated to be around 120 mph. The hurricane crossed the southern Florida peninsula in 4.5 hours, with the center emerging into the Atlantic just southeast of Jupiter. Maximum winds had decreased to near 109 mph (Category 2) during the crossing of Florida. Because the hurricane moved quickly across the southern Florida peninsula, however, the rain amounts were not very large in Florida and storm totals ranged generally from 3 to 7 inches. Some locations in southeast Florida had totals of only 1 to 2 inches -- or less. Wilma produced 10 tornadoes over the Florida peninsula on 23-24 October: one each in Collier, Hardee, Highlands, Indian River, Okeechobee, and Polk Counties, and four in Brevard County.

Tropical Storm Ernesto of August 2006. Ernesto made landfall at Plantation Key, Florida, in the upper Florida Keys, as a tropical storm with winds of 46 mph. The storm moved northward along the center of the Florida peninsula and within a weakness in the mid-level ridge, and the cyclone passed over Lake Okeechobee gradually turning and emerging over the Atlantic Ocean near Cape Canaveral, Florida. The storm dropped 3–6 inches of rain in many areas near the path of the storm's center, from the Cape Canaveral area to Lake Okeechobee, in portions of southwestern Florida, and in isolated spots in the Upper Florida Keys.

Tropical Storm Fay of September 2008. Fay was a long-lived tropical storm that made eight landfalls – including a record four landfalls in Florida (Key West, Cape Romano, Flagler Beach and Carrabelle) – and produced torrential rainfall that caused extensive floods across the Dominican Republic, Haiti, Cuba, and Florida. Heavy rainfall was the most notable hazard caused by Tropical Storm Fay. Melbourne, Florida broke a 50-year old record for a rainfall event. There were numerous rainfall reports of more than 20 in reported across east-central Florida and amounts in excess of 10 in were common elsewhere across the central and northern Florida.

Tropical Storm Isaac (August 26-27, 2012). Persistent heavy rain bands from Tropical Storm Isaac produced widespread urban and lowland flooding across much of the county. Rainfall from the morning of August 26 until the evening of August 27 averaged 4 to 8 inches, with isolated totals of 14 to 17 inches, most of which fell during the morning and afternoon of August 27. The most significant impacts occurred near the coast from Winter Beach to Vero Beach and Florida Ridge. Twenty seven manufactured homes and two single family homes were damaged by water intrusion and 20 roads were temporarily closed due to standing water during the height of the flooding.

Hurricane Sandy (October 26, 2012). Hurricane Sandy moved slowly northwest, parallel to the Florida coast, 200-250 miles offshore. Due to the very expansive wind fields associated with the hurricane, sustained tropical **storm** winds reached the east-central Florida beaches and adjacent portions of the barrier islands. Gusts to tropical storm force occurred throughout the coastal counties, with some interior counties also experiencing tropical storm gusts, especially during passing squalls. Large and pounding surf affected the beaches for six or more high tide cycles, during a period of high astronomical tides. By the end of the even, many of the beaches had sustained moderate to major beach erosion. The erosion damaged several home foundations/patios/pools, and endangered many other

beach-front residences and two businesses. Numerous beach cross-overs and lifeguard towers were damaged and sand was washed onto coastal roadways and beach parking areas in several locations. Damage estimates for the east-central Florida beaches totaled 46 million dollars.

Hurricane Matthew (October 6-7, 2016). Matthew battered the Bahamas on October 5th and 6th and passed between Andros Island and New Providence at 10:00 a.m. EST on October 6 with maximum sustained winds of 132 mph, a Category 4 hurricane. Matthew approached the east coast of Florida late Thursday, October 6, 2016, and weakened into a Category 3 hurricane by 2:00 a.m. EST on October 7th. The center of the eye was measured at only 35 miles off our shore. A preliminary beach damage report prepared by the Indian River County Coastal Engineer defined damages as being consistent with what FDEP defines as major dune erosion. Indian River County was declared eligible for FEMAs Individual Assistance program and 634 requests for FEMA assistance were submitted and 99 applications were approved with a total award amount of $191,945.03. The Indian River County Building Department issued 60 building permits. Repairs included repairing/replacing: meter mains, meter cans, roof shingles, weather heads, drywall, docks, insulation, electrical, etc. Indian River County's preliminary Request for Public Assistance was $15,985,721.76.

Hurricane Irma (September 10-11, 2017). Category 3 Hurricane Irma made landfall near Naples during the late afternoon of September 10. Irma then moved northward across west-central Florida during the evening while weakening to a Category 2 hurricane approximately 95 miles west of Vero Beach. A long duration of damaging winds occurred across Indian River County, with a period of gusts to hurricane force. A preliminary report indicated 72 structures with minor damage and 6 with major damage. The total estimated damage cost was $1.5 million. Damage generally involved roof shingles/tiles, soffits, awnings, and pool enclosures. A few houses, condos and businesses lost portions of their roofs, primarily along the coast, with additional damage due to water intrusion. Numerous trees were uprooted or snapped. With torrential rains, water intrusion into structures also occurred.

For many years, the risk of significant loss of life and property due to hurricanes seemed small. Many, if not the majority of existing homes and business along the U.S. Atlantic and Gulf Coasts were located there during the 1970's and 1980's, a period of relatively inactive hurricane formation. Most of the people currently living and working in coastal areas have never experienced the impact of a major hurricane. Hurricanes that impacted Florida during the 1970's and 80's were infrequent and of relatively low intensity. Homeowners, business interest, and government officials grew to regard hurricane risk as manageable by private insurance supplemented occasionally by Federal disaster funding and subsidized flood insurance. The hurricane risk did not seem sufficient to warrant increased investment in mitigation. Two major hurricanes, Hugo in 1989 and Andrew in 1992, forced a re-evaluation of this risk assessment. While experts sometimes disagree on the annual cost, all sources agree that Hurricane Andrew was the most costly hurricane event ever to affect the U.S. Insured losses from Hurricane Andrew topped $17 billion, and most sources agree that the total cost of Hurricane Andrew exceeded $25 billion.

Florida is the most vulnerable state in the nation to the impacts of hurricanes and tropical storms. South Central Florida is particularly exposed to the dangers presented by hurricanes due to its topography. The region is largely a flat, low-lying plain. The potential for property damage and human casualties in Indian River County has been increased by the rapid growth of the County over the last few decades, particularly along the coastline.

Population risk also has been exacerbated by some complacency due to the recent period of reduced hurricane frequency.

Florida not only has the most people at risk from hurricanes, but it also has the most coastal property exposed to these storms. Over the 30-year period from 1980-2010, Florida's population increased by 93%. At the end of 2008, there were 6.389 million residential risks, including 4.5 million of those risks coming from single-family homes. The residential property exposure totaled $2.1 trillion, of which Single-family homes accounted for $1.777 trillion. (Florida Insurance Council 2013)

4.1.2.2 Vulnerability Assessment

Tropical storm/hurricane events can have the following potential impacts within Indian River County, more specifically on the coastal areas of Vero Beach, Indian River Shores, and Orchid:

- Excessive wind;
- Excessive water;
- Soil/beach erosion;
- Electric power outage;
- Surface and air transportation disruption;
- Navigable waterway impairment;
- Potable water system loss or disruption;
- Sewer system outage;
- Telecommunications system outage;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Agricultural/fisheries damage;
- Damage to critical environmental resources;
- Damage to identified historical resources;
- Fire;
- Toxic releases; and
- Stormwater drainage impairment.

Hazus estimates the amount of debris that will be generated by hurricanes. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris. The probabilistic model estimates that a total of 50,920 tons of debris will be generated. Of the total amount, 43,304 tons (83%) is Other Tree Debris. Of the remaining 8,616 tons, Brick/Wood comprises 42% of the total, Reinforced Concrete/Steel comprises 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 143 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of eligible tree debris truckloads will depend on how the 5,037 tons of eligible tree debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, un-compacted debris.

4.1.2.3 Risk Assessment

All communities within Indian River County are highly vulnerable to hurricanes, but they are not all vulnerable for the same reasons. The barrier island communities (Town of Orchid, Indian River Shores, and the beach side of the City of Vero Beach) are obviously highly vulnerable to both wind and storm surge damage from hurricanes. The communities fronting on Indian River County's estuaries and rivers are also highly vulnerable to flooding associated with hurricane winds and storm surge. Inland communities may have less hurricane vulnerability from flooding but more hurricane vulnerability from wind damage due to their older or less substantial type of construction.

The risk assessment data for hurricanes in Indian River County are the HAZUS Probabilistic Hurricane Report (provided by FDEM 2019).

HAZUS estimates 70,963 buildings in Indian River County have an aggregate total replacement value of $19,570,065.00 million (2017 dollars). It presents the relative distribution of the value with respect to the general occupancies.

Table 4.5. Building exposure, Indian River County, 2018.

Occupancy	Exposure ($1000)	Percent of Total
Residential	15,939,081	81%
Commercial	1,798,118	9%
Industrial	294,552	2%
Agricultural	144,625	1%
Religious	253,532	1%
Government	631,028	3%
Education	509,129	3%
TOTAL	19,570,065	100.0%

Source: Hazus, 2018 (FDEM).

4.1.3 Tornadoes

4.1.3.1 Hazard Identification

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. It is generated by a thunderstorm or hurricane when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The most common type of tornado, the relatively weak and short-lived type, occurs in the warm season, with June being the peak month. The strongest, most deadly tornadoes occur in the cool season, from December through April (FDCA, 2004b). Occasional windstorms accompanied by tornadoes, such as the winter storm of 1993, also are widespread and destructive.

When a tornado threatens, only a short amount of time is available for life-or-death decisions. The NWS issues two types of alerts:

- **Tornado Watch** – means that conditions are favorable for tornadoes to develop.
- **Tornado Warning** – means that a tornado has actually been sighted.

Tornadoes are classified using the Enhanced Fujita-Pearson scale. On February 1, 2007, the Enhanced Fujita Scale replaced the original Fujita scale in all tornado damage surveys in the United States. (National Climatic Data Center, 2014) (**Table 4.5**).

Table 4.6. Fujita-Pearson/Enhanced Fujita Scale.

FUJITA SCALE				**OPERATIONAL EF-SCALE**		
F Number	Damage Scale	Fastest 1/4-mile (mph)	3 Second Gust (mph)	**EF Number**	**Damage Scale**	**3 Second Gust (mph)**
0	Little Damage	40-72	45-78	0	Light Damage	65-85
1	Minor Damage	73-112	79-117	1	Moderate Damage	86-110
2	Roof Gone	113-157	118-161	2	Considerable Damage	111-135
3	Walls Collapse	158-207	162-209	3	Severe Damage	136-165
4	Blown Down	208-260	210-261	4	Devastating Damage	166-200
5	Blown Away	261-318	262-317	5	Incredible Damage	Over 200

***Historic Events*.** Florida ranks third in the United States in the number of tornado strikes, and the first in the number of tornadoes per square mile. The odds of a tornado striking any specific point in southeastern Florida are 0.04, or once per 250 years.

The damage from a tornado is a result of the high wind velocity and wind-blown debris. Florida's average is 50 tornadoes annually since 1950, causing an average of 3 fatalities and 52 injuries each year. According to the National Climatic Data Center Storm Events Database (http://www.ncdc.noaa.gov/stormevents), there have been 25 tornado events reported in Indian River County between 1950 and 2019. Eleven were F0, five were EF0, one was F1, six were EF1, and two were F2 magnitude events.

NCDC data indicates that there has been one tornado-related injury, no deaths, and $2.3 million in property damage associated with tornado events in the County. **Table 4.7** describes some of the more significant tornado events that have occurred within the County.

Table 4.7. Tornado incidents, Indian River County, 1950 – 2017.

Date	Magnitude	Path Length (miles)	Path Width (yards)	Description
10 November 1963	F2	2	33	None Available
3 February 1970	F2	0	33	None Available
8 April 1973	F0	.2	20	None Available
4 October 1978	F0	0	20	None available
3 September 1979	F1	0	30	None available
20 August 1981	F0	.1	30	Tornado touched down in a wooded area two miles west of Vero Beach during a severe thunderstorm. Several trees were blown down, but no other damage or injuries were reported.
24 May 1984	F0	1	30	A roof was destroyed and a wall of the building was damaged and several power lines were downed.
25 May 1985	F1	2	30	None available
12 July 1987	F0	1	30	None available
27 June 1992	F0	0	10	None available
31 March 1996	F0	.1	30	A small F0 tornado touched down briefly blowing down a few trees along State Road 60 about eight miles west of Vero Beach.
25 September 1998	F1	2	40	Downed trees and damaged roofs in Sebastian
24 June 2001	F1	2	1	Downed trees and damaged roofs and shed in Sebastian
14 September 2001	F0	.2	30	A rain band associated with Tropical Storm Gabrielle moving north along the Florida coastline produced a small F0 tornado just south of Sebastian Inlet. The tornado was on the ground briefly, blowing down a few trees, damaging a camp trailer and a picnic shelter.
13 December 2002	F1	1	60	Destroyed 2 homes, damaged 7 homes and 3 vehicles in Wabasso (¼ mile south of SR 570 and ½ mile west of U.S. Highway 1)
25 September 2004	F1	1	30	As the main eye wall of Hurricane Jeanne crossed the coast, a tornado-like event moved through the NE corner of the intersection of I- 95 and Hwy 60, west of Vero Beach. There was a path of blown down trees surrounded by trees with little damage.

Date	Magnitude	Path Length (miles)	Path Width (yards)	Description
12 July 2009	EF0	.44	20	A brief tornado developed over the rural area of Indian River County associated with a rapidly developing cell on the south end of a line of storms, resulting from a collision of sea breezes.
18 June 2010	EF0	.02	10	A thunderstorm briefly became severe and produced damaging winds, affecting a small area in St. Cloud. Another strong storm west of Vero Beach produced an outflow boundary which intersected a newly developing cell, resulting in funnel cloud and brief tornado (landspout) touchdown.
18 October 2011	EF0	.14	75	Radar-detected rotation within a northeastward moving thunderstorm cell spawned a short-track EF0 tornado in Vero Beach Highlands. A NWS damage survey estimated maximum winds of 65-70 mph. An unoccupied home on 22nd Place SE sustained major damage, with part of the roof removed. A metal storage shed on a nearby property became airborne and landed in a neighbor's front yard. Small branches broke from trees and shrubs were knocked down and light damage (mainly to soffits and due to impact from debris) occurred to other homes within the area. There were no injuries. Light damage extending one block north and south of 22nd place southeast with small trees damaged and metal storage shed blown off its foundation.
27 August 2012	EF0	1.61	180	An EF0 tornado touched down just southeast of Indian River County Fire Station number 7 on 12th Street in Vero Beach. A discontinuous path of damage stretched 1.6 miles through the Vero Beach Estates and Countryside Village Mobile Home Parks, crossed State Road 60, and lifted just north of the Paradise Park residential area. A total of 95 structures (mostly mobile homes) were damaged, with 62 receiving minor damage and 33 sustaining major damage due to wind and rain.
17 May 2016	EF1	0.13	100	The tornado produced a short damage path impacting homes along a track encompassing about three blocks. The tornado traveled in a southward direction. Two homes sustained major damage with a significant portion of their roofs damaged.

Date	Magnitude	Path Length (miles)	Path Width (yards)	Description
				Sixteen other homes experienced minor damage to roofs, soffits and pool screen enclosures. Several trees were snapped and at least two trees were uprooted. The tornado was rated EF1, with estimated maximum winds of 80-90 mph. Estimated loss $395,000.
18 Aug 2017	EF0	0.18	20	A sheriff's deputy spotted a tornado (landspout) over an agricultural area west of Fellsmere, about midway between Blue Cypress Lake and County Road 512. A citizen driving several miles away observed and videotaped the tornado moving very slowly eastward, lasting three minutes. The tornado developed along an outflow boundary ahead of a cluster of thunderstorms and was also seen from Blue Cypress Lake and far to the south-southwest from central Okeechobee County. Sheriff Deputies invested the area of the tornado and cloud not find any evidence of damage. The tornado was rated EF-0 with maximum winds estimated below 55 mph.

Source: National Climatic Data Center, 2019.

The NCDC has recorded tornado events in unincorporated Indian River County, the City of Vero Beach, the City of Sebastian, Town of Fellsmere, and Wabasso (located in unincorporated County). No events have been recorded in the Town of Indian River Shores or Orchid.

During the tornado in December of 2002, the ARC provided services to three families hit by the tornado and opened a shelter for 38 families who were ordered to evacuate because their homes were deemed unsafe.

EXTENT: The National Climate Data Center (NCDC) indicates that there have been a total of 25 tornado incidents in Indian River County in the last 65 years, therefore there is a 3% chance of a tornado affecting our county in any given year. The majority of the events have been EF0 and EF1 as defined on the Enhanced Fujita Scale.

4.1.3.2 Vulnerability Assessment

Tornado events can have the following potential impacts within Indian River County:

- Excessive wind;
- Electric power outage;
- Surface and air transportation disruption;
- Telecommunications system outage;
- Human health and safety;
- Psychological hardship; and
- Economic disruption.

Indian River County's vulnerability to tornadoes is compounded by the high concentration of mobile home residents in large mobile home communities. According to the 2010 U.S. Census, there are 6,786 mobile homes in Indian River County, representing 11.7% of the total housing units in the County. Three municipalities within Indian River County have significant concentrations of mobile homes. Sebastian has a total of 564 mobile homes, representing 7.6% of the total housing units. Wabasso has a total of 166 mobile homes, representing 31.9% of the total housing units. Fellsmere has a total of 397 mobile homes, representing 42.4% of the total housing units.

4.1.3.3 Risk Assessment

Historical data indicate the overall vulnerability of Indian River County to tornadoes is low, but some specific communities have a moderate to high vulnerability to this hazard due to the type of construction or numbers of mobile homes (manufactured housing units) within their boundaries. These communities include Sebastian, Wabasso, and Fellsmere.

Tornado risk is defined as the annual probability of significant structural damage and is divided into four probabilities of occurrence: <1 in 500, 1 in 500, 1 in 200, and 1 in 100.

Table 4.8 Tornado exposure, Indian River County, 2014.

Probability of Occurrence	Number of Structures	Value of Structures	Population at Risk
1 in 500	54,217	$16,308,608	141,994

Source: HAZUS (FDEM)

4.1.4 Severe Thunderstorms/Lightning

4.1.4.1 Hazard Identification

A severe thunderstorm is defined as a thunderstorm containing one or more of the following phenomena: hail of at least 1 inch, surface wind speeds of 58 miles per hour or greater, or any combination of those two criteria (NOAA, NWS, 2014). Severe weather can include lightning, tornadoes, damaging straight-line winds, and large hail. Most individual thunderstorms only last several minutes; however, some can last several hours.

Long-lived thunderstorms are called super cell thunderstorms. A super cell is a thunderstorm that has a persistent rotating updraft. This rotation maintains the energy release of the thunderstorm over a much longer time than typical, pulse-type thunderstorms, which occur in the summer months. Super cell thunderstorms are responsible for producing the majority of severe weather, such as large hail and tornadoes (NOAA, NWS, 2003). Downbursts also are occasionally associated with severe thunderstorms. A downburst is a strong downdraft resulting in an outward burst of damaging winds on or near the ground. Downburst winds can produce damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder (NOAA, NWS, 2003). Strong squall lines also can produce widespread severe weather, primarily very strong winds and/or microbursts.

When a severe thunderstorm approaches, the NWS will issue an advisory. According to NOAA, NWS (1994) two possible advisories are as follows:

- **Severe Thunderstorm Watch**: Conditions are favorable for the development of severe thunderstorms.
- **Severe Thunderstorm Warning**: Severe weather is imminent or occurring in the area.

***Historic Events*.** According to the NCDC, there have been a total of 64 thunderstorm events in Indian River County since 1953, causing a total of $891 thousand in property damage. On 13 March 1993, a downburst in Vero Beach damaged eight homes and three commercial buildings. On 5 April 1995, a thunderstorm damaged several homes in the Windsor Subdivision in Wabasso. On 26 June 1995, a thunderstorm knocked down stadium lighting at Dodgertown in Vero Beach (now known as the Jackie Robinson Training Complex). In Sebastian, storms in May 1996 and August 2002 damaged a 20-passenger airplane and 3 moored vessels, respectively. In January of 1999, a thunderstorm in Vero Beach caused $5,000 worth of damage to doors at the Vero Beach Municipal Airport. In the past 10 years, the City of Vero Beach has recorded seven severe thunderstorm events; the Town of Indian River Shores has recorded four severe thunderstorm events, one of which reported moderate property damage; and the City of Sebastian has recorded three severe thunderstorm events (these were reports to NCDC through 6/2019).

NCDC has recorded 62 incidents of hail in Indian River County. The average accumulation for these events being 1.27 inches. The City of Vero Beach has recorded three incidents of hail since 2015, and Town of Fellsmere, one (these were reports to NCDC through 4/15/18).

Because thunderstorms are hazards that are not bounded by geographic or topographic characteristics, there are no definite means to determine whether or not the extent of this hazard differs from jurisdiction to jurisdiction within Indian River County.

Perhaps the most dangerous and costly effect of thunderstorms is lightning. As a thunderstorm grows, electrical charges build up within the cloud. Oppositely charged particles gather at the ground below. The attraction between positive and negative charges quickly grows strong enough to overcome the air's resistance to electrical flow. Racing toward each other, the charges connect and complete the electrical circuit. Charge then surges upward from the ground at nearly one-third the speed of light and produces a bright flash of lightning (Cappella, 1997).

On average, lightning kills more people than any other weather event. Florida leads in the nation in lightning related deaths and injuries. Most lightning strike fatalities occur in June, July, and August. Between 1959 and 2017, there have been 498 lightning-related deaths in Florida (https://www.weather.gov/media/safety/59-17_State_Ltg_Fatality_Maps_lists.pdf). Nationwide, lightning-related economic losses amount to over $6-7 billion dollars per year, and residential insured losses average $969 million per year (National Lightning Safety Institute, March 2014).

Between 1959 and 2019, Indian River County recorded one lightning-related death (Wabasso) and seven injuries (4 Wabasso, 2 Sebastian, 1 Indian River Shores). According to the NCDC, three major lightning incidents caused $1.212 million in property damage. The majority of the damage came on 30 June 2008 when a lightning-related fire destroyed a million dollar home in Vero Beach.

Extent/Probability: Indian River County averages more than 70 days with thunderstorms per year, with the most frequent occurrences being between the months of July and September. With thunderstorms come lightning and Florida leads the nation for the number of lightning strikes. Both Florida and Indian River County have about 12 strikes per square kilometer per year in some places (National Lightning Safety Institute).

4.1.4.2 Vulnerability Assessment

Thunderstorm/lightning events can have the following potential impacts within Indian River County:

- Excessive wind;
- Excessive water;
- Damaging hail;
- Electric power outage;
- Surface and air transportation disruption;
- Telecommunications system outage;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Fire; and
- Stormwater drainage impairment.

Thunderstorms typically cause damage in a community by knocking down trees and power lines. Downed trees can block key roadways within a community, making emergency response more difficult. Downed power lines block roadways, disrupt businesses when power is lost, and pose threats to people when lines are severed. Mobile homes also are more susceptible during severe thunderstorm activity. According to the Housing Element of the Indian River County 2030 Comprehensive Plan, there are 7,193 mobile homes utilized as year-round dwelling units in the county. This represents 9.75 percent of the countywide housing stock in that category. Three municipalities within Indian River County have significant concentrations of mobile homes. Sebastian has a total of 564 mobile homes, representing 7.6% of the total housing units. Wabasso has a total of 166 mobile homes, representing 31.9% of the total housing units. Fellsmere has a total of 397 mobile homes, representing 42.4% of the total housing units.

Extent: In the United States, there are an estimated 25 million lightning flashes each year. In an average year, Florida sees around 1.4 million of these lightning strikes. This makes Florida the "Lightning Capital of the United States." Lightning occurs with every thunderstorm and, on average, Florida sees around 70-100 days a year with at least one thunderstorm in the state. Because of Florida's vulnerability to thunderstorms and lightning, lightning is one of the most deadly weather hazards in the Sunshine State. This statistic makes Indian River County more vulnerable and having a higher probability to lightning having an impact on our community.

4.1.4.3 Risk Assessment

Vulnerability to severe thunderstorms and lightning is high in Indian River County, but many of the jurisdictions and population centers have only moderate vulnerabilities relative to these hazards. This variation in relative levels of vulnerability is again primarily due to construction practices and community characteristics. Working communities have a higher vulnerability to economic impacts by lightning than residential or retirement communities, all other factors being equal, while residential and retirement communities have a historically higher vulnerability in terms of lightning fatalities.

At the time of publication, a risk assessment model for severe thunderstorms was not available. The County can expect losses similar to what it experienced in the past, which is about an average of $17,500 per year in property damage. The most vulnerable areas in Indian River County would be open areas such as the shoreline, golf courses, open fields (i.e., Vero Beach Municipal Airport, Indian River Fairgrounds, sports arenas, etc.) This vulnerability is increased because these areas are where large populations congregate. There could also be a significant loss of life as well as economic impacts to transportation systems, tourism, etc.

Table 4.9 illustrates hail size estimates and descriptions. The potential damage and hailstorm intensity is described H0 to H10 according to the TORRO Hail Storm Intensity Scale. *Indian River County could reasonably expect hail of a size code 3 during a severe thunderstorm.

Table 4.9 TORRO Hailstorm Intensity Scale

Size Code	Maximum Diameter	Description	Typical Damage Impacts
0	5mm	Pea	No damage
1	5 to 15 mm	Mothball	Slight general damage to plants, crops
2	10 to 20 mm	Marble, grape	Significant damage to fruit, crops, vegetation
3	20 to 30 mm	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
4	25 to 40 mm	Pigeon's egg/squash ball	Widespread glass damage, vehicle bodywork damage
5	30 to 50 mm	Golf ball/pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
6	40 to 60 mm	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
7	50 to 75 mm	Tennis ball/cricket ball	Severe roof damage, risk of serious injuries
8	60 to 90 mm	Large orange/softball	Severe damage to aircraft bodywork
9	75 to 100 mm	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
10	Over 100 mm	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Table 4.10 is the Beaufort wind scale, which is used for estimating wind speed when there is no standard instrumentation available. Indian River County could expect to receive Force 11 winds during a severe thunderstorm.

Table 4.10 Beaufort Wind Scale

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

4.1.5 Wildfire

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 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.

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

4.1.5.1 Hazard Identification

Florida's population has nearly tripled in the last century, and much of the growth has occurred in the undeveloped areas. The trend has created a complex landscape known as the **Wildland/Urban Interface**, a set of conditions under which wildland fires move beyond trees and undergrowth to threaten neighborhoods. Ensuring a home is compatible with nature can help save it and the entire community when wildfire strikes.

Florida's wildfire season is twelve months long. Indian River County has wildfires throughout the year. The most active part the year is typically December through the beginning of June. Generally, Indian River County experiences the greatest number of wildfires during March, April, and May. On average, Indian River County has 21.1 wildfires a year depending on weather conditions. Refer to table 4.11 for details by cause.

South Florida has several areas of spot building where homes are built in neighborhoods with large, unmanaged properties nearby where little or no regular landscape maintenance is conducted. Local governments often require neighborhoods to maintain designated preserves or conservation areas where plants and wildlife must remain untouched. Work in the preserves is often restricted to minimize the impacts for wildlife and native vegetation. Yet these preserves must still be managed. Fire plays an important role because Florida plants and animals rely on it.

If the conservation areas are left unmanaged the accumulation of dead fuels and untreated new growth can create an undesirable effect, such as extreme fire behavior and habitat loss for the wildlife. Regular maintenance of preserves improves the chances for new growth. Otherwise, dead vegetation accumulates and causes fire danger to increase. These unmanaged areas force animals to forage outside their normal habitat. Regular food supplies

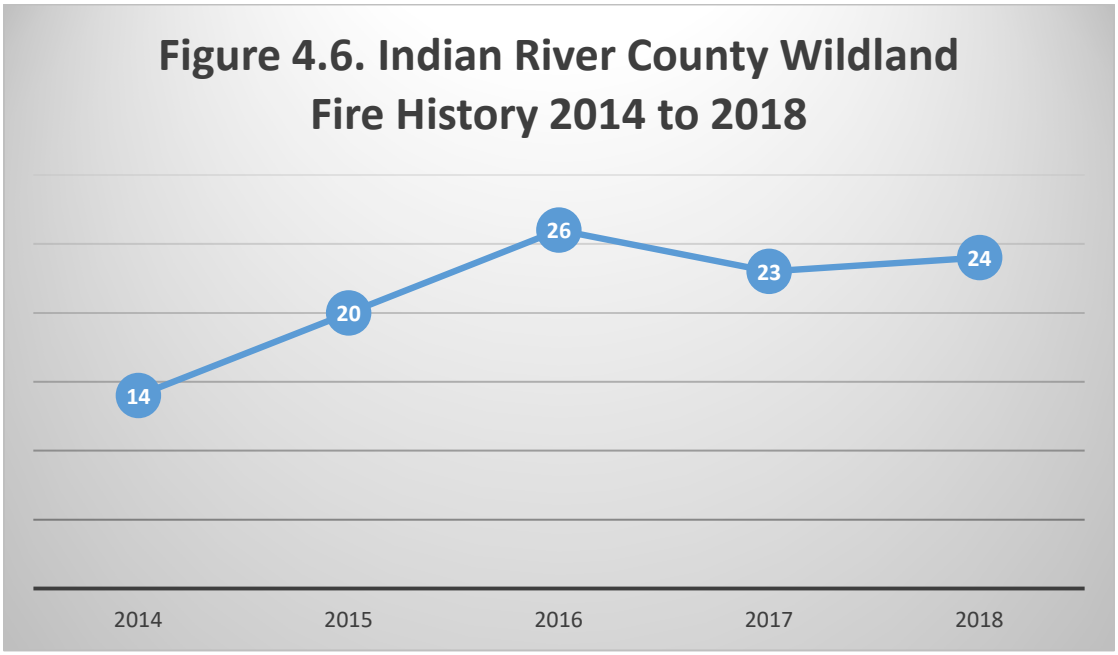
run low for gopher tortoises and other species that rely on periodic fire to burn off the excess vegetation often found in these preserves.

Large undeveloped properties owned by city, county, state or federal agencies might have set as these areas as preserves or natural areas. A management plan is needed to reduce the hazardous buildup of dead vegetation. The Florida Forest Service continues to work together with municipalities in Indian River County to educate and facilitate mitigation in identified high risk areas.

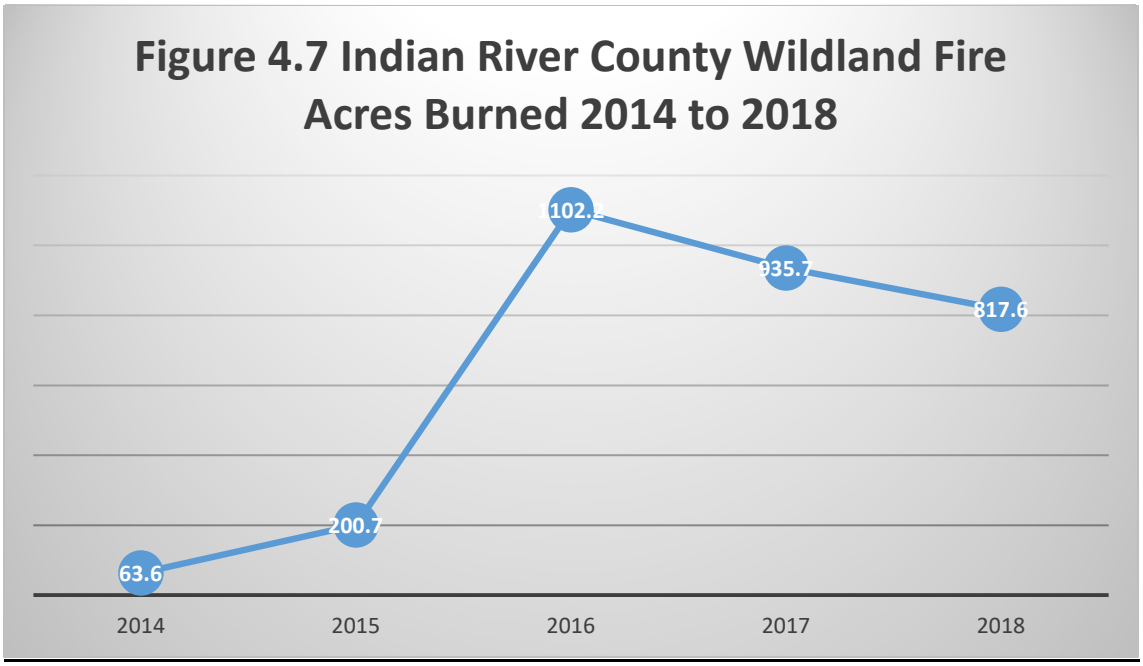
Table 4.11 Indian River County's Five Year Wildfire Causes by Ignition Type (2014-2018)

Cause	Number of Fires	Annual Average	Number of Acres (Note 1)	Annual Average
Campfire	5	4.67	28.1	0.9
Children	9	8.41	25	0.8
Debris burn	0	0	0	0
Debris burn--authorized--broadcast/acreage	2	1.87	209	6.7
Debris burn--authorized--piles	2	1.87	0.2	0.01
Debris burn--authorized--yard trash	1	0.93	1	0.03
Debris burn—non-authorized	0	0	0	0
Debris burn—non-authorized--piles	8	7.48	721.9	23.14
Debris burn—non-authorized--yard trash	4	3.74	49.1	1.57
Equipment use (Note 2)	0	0	0	0
Equipment--agriculture	1	0.93	22	0.71
Equipment--logging	0	0	0	0
Equipment--recreation	1	0.93	2	0.06
Equipment--transportation	1	0.93	0.1	0
Incendiary	10	9.35	936.1	30.01
Lightning	46	42.99	991.6	31.78
Miscellaneous--breakout	1	0.93	15	0.48
Miscellaneous--electric fence	0	0	0	0
Miscellaneous--fireworks	1	0.93	3	0.1
Miscellaneous--power lines	3	2.8	22.1	0.71
Miscellaneous--structure	1	0.93	20	0.64
Miscellaneous--other	1	0.93	10	0.32
Railroad	0	0	0	0
Smoking	0	0	0	0
Unknown	10	9.35	63.6	2.04
Total	107		3,119.8	
Note 1: Indian River County has 197,348 acres of undeveloped land				

Historical Wildfire Data

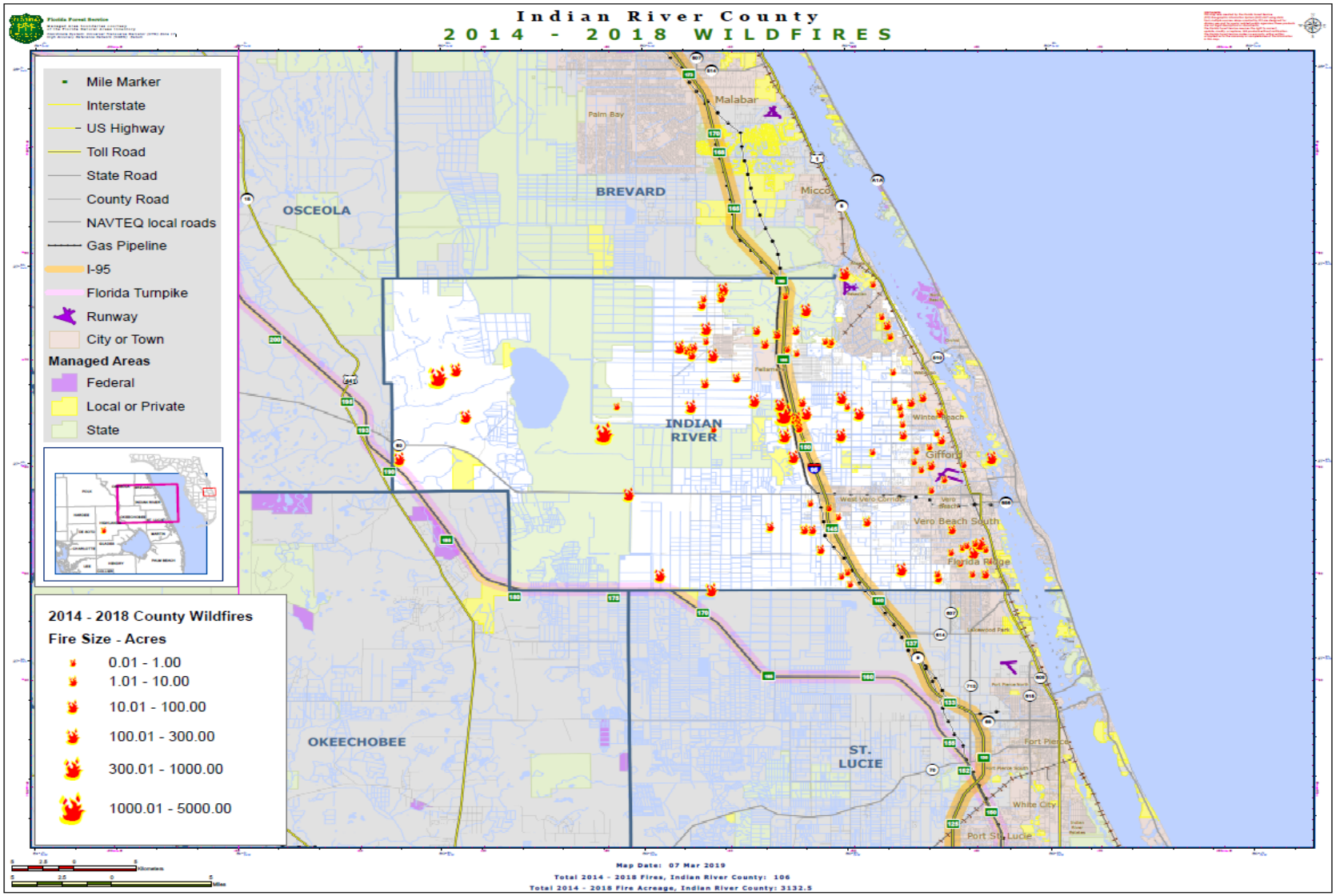


Source: Florida Forest Service, 2019.



Source: Florida Forest Service, 2019

Figure 4.8 Map of Indian River County Wildfires, 2014-2018.



Source: Florida Forest Service, 2019

A muck fire is a fire that consumes all the organic material of the forest floor and also burns into the underlying soil. It differs from a surface fire by being invulnerable to wind. If the fire gets deep into the ground, it could smolder for several years. In a surface fire, the flames are visible, and burning is accelerated by wind. Whereas in a muck fire, wind is not generally a serious factor (Canadian Soil Information System, 1996). Another extraordinary fact about muck fires has to do with their release of carbon dioxide. A peat bog that is on fire can release more carbon dioxide into the atmosphere than all the power stations and car engines emit in Western Europe in 1 year (Pearce, 1997). This type of fire could have a significant impact on global warming.

Historic Events. From 2014-2019, Indian River County has had 107 wildfires that have burned 3,119.8 acres. Lightning, non-authorized debris burning, children, or equipment were the most common ignition source for wildland fires in Indian River County (Florida Forest Service, 2019). Muck fires are not a frequent threat to Florida. However, during a drought in the 1980's, fires in the Everglades consumed the rich, dried out muck that had once been the bottom of the swamp. These fires burned deep into the ground and required alternative firefighting techniques. Muck fires occur very infrequently in Indian River County, and the only areas where this hazard might produce impacts are in the western portions of the County. At the present time, muck fires are not considered a significant hazard.

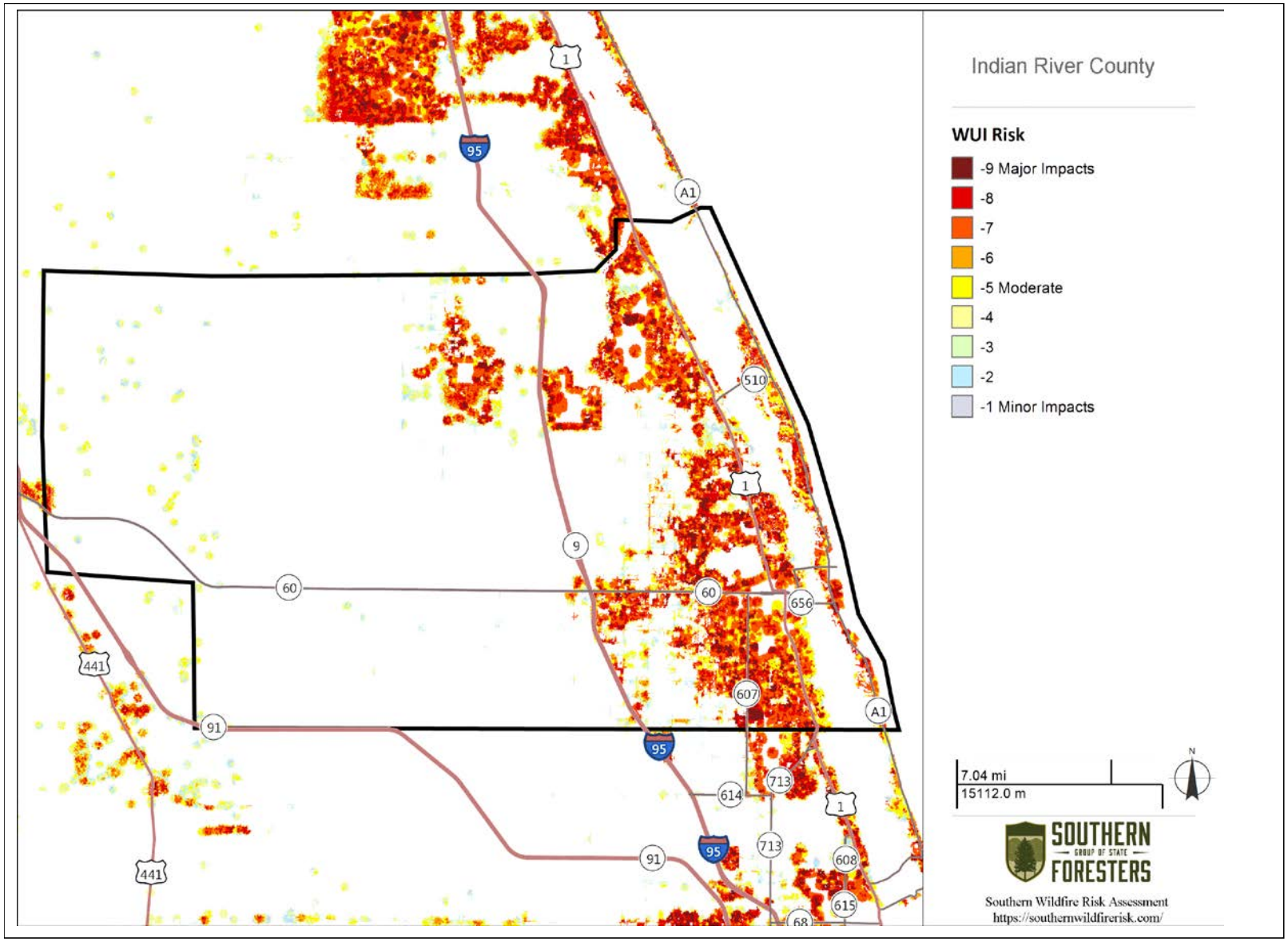
Sampling of Indian River County Wildfires (2018)				
Date	**Wildfire Name**	**Cause**	**Acreage**	**Location**
3/21/2018: 15:50	Sunny B	Lightning	392	West of I-95 between SR60 and CR512
3/20/18: 18:11	Willow	Lightning	20	I-95 and mile marker 151
3/29/18 14:40	Raven	Powerlines	12	W OF 82ND AVE TO 56TH ST
10/21/2018	Fellsmere	Campfire	1.5	12400 DR 570 IM MESA PARK AREA, FELLSMERE
11/29/18 13:05	Hibiscus Airport	Non-authorized Debris	0.1	98th Ave south of SR 60

4.1.5.2 Vulnerability Assessment

Wildland fires can have the following potential impacts within Indian River County; more specifically in the agricultural areas in the western parts of the county (Fellsmere, Sebastian, Vero Beach):

- Electric power outage
- Surface and air transportation disruption;
- Telecommunications system outage;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Agricultural/fisheries damage;
- Loss of livestock;
- Damage to critical environmental resources;
- Damage to identified historical resources

Figure 4.9 illustrates the Wildland Urban Interface (WUI) Risk Index layer



4.1.5.3 Risk Assessment

Low Wildfire Hazard -Homes are built with concrete and appropriate non-flammable roofing materials. Short grass, low shrubs and light duff are present. The forest and heavy vegetation are not continuous throughout the community. Wildfires that do occur in these areas are less intense and easier to suppress because of the lower volume of fuel to feed and sustain the fire. (Vero Beach)

Medium Wildfire Hazard - Wildland vegetation is continuous throughout the community. Tall grass, medium shrubs, thick duff and ladder fuels are prominent in the area. Vegetation is less than 30 feet from homes. Homes are built with vinyl, plastic or other types of less fire-resistant materials. Access is limited and the concentration of fuel to feed fires causes more intense fire behavior. Fire suppression becomes more difficult and costly. (Fellsmere, Florida Ridge, Gifford, Olso, Roseland, Vero Beach South, Vero Lake Estates, Wabasso, and Winter Beach)

High Wildfire Hazard -Dense, highly flammable vegetation surrounds the neighborhood and is within a few feet of homes. A thick layer of vegetation is present on the forest floor. Access to the neighborhood is limited to one entrance and/or on poorly maintained roads. Homes are rarely built with fire-resistant materials. Continuous, overgrown vegetation limits access and creates intense wildfire conditions. Fire suppression is challenging and requires more resources (engines, dozers, and aircraft) and firefighters than normal. (Sebastian)

Hazard Rating Factors – Although there are many factors that affect the survivability of homes during wildfires, the following have been shown to be important in Florida.

(1) Access –Roadway and shoulder widths, road maintenance standards, turnarounds and road surface materials affect how quickly emergency crews can respond, as well as how quickly and safely residents can evacuate.

(2) Vegetation –Wildland vegetation (fuel) in Florida is highly variable both in amount and type and burns differently at different times of the year. Generally speaking, native vegetation is more likely to burn during the winter months when grasses and weeds have been killed by frosts and freezing temperatures. In addition, many plants found in Florida eco-systems have a waxy leaf surfaces or resinous sap. *These plants can burn even though the leaves are still green*. Both dead and live fuels also tend to dry more rapidly in areas where extensive drainage systems have been constructed for development. The biggest concern for firefighters is how close the fuel (vegetation) is to the home. Firefighters recommend at least 30 feet of defensible space between home and woods.

(3) Building Construction –Construction materials such as vinyl soffits and siding and wood shake shingles have a greater potential for damage from wildfire than fire resistant building materials. Vinyl soffits will soften when exposed to heat or flames from a wildfire and fall away from the roof trusses. When this occurs, windblown embers (fire brands0 can enter the attic area and ignite the ceiling/ roof.

(4) Fire Protection – The key to successful controlling any wildfire is starting suppression action (attacking the wildfire) while it is still small. Firefighter access to a dedicated supply of water is an important factor. A reliable water source that will be unaffected by a sudden power loss is much better than relying on individual residential well systems and “trucked in” water to fight a wildfire and protect homes. Numerous structures may be threatened simultaneously, requiring large quantities of water.

(5) Utilities – Above ground utilities can be both a cause of wildfire and also a hindrance to effective suppression. Florida Forest Service’s firefighting dozers and fire plows can fall into unmarked septic tanks or sever buried lines. If firefighters cannot respond or are

delayed because of these hazards, there is a greater chance that threatened structures will be lost.

Table 4.12. Average annual loss due to wildland fire, Indian River County, 2014-2018.

Type	Threatened	Damaged	Lost
Businesses			
Outbuildings	18	5	1
Residences	5		

Source: Florida Forest Service, 2019

Table 4.13. - Wildfire Information Resources

Florida Forest Service	http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Wildland-Fire/Current-Fire-Conditions
When Nature is Your Neighbor, Landscaping to reduce your wildfire risk	http://freshfromflorida.s3.amazonaws.com/South_Florida_Firewise_Landscaping_Guide.pdf
Firewise Communities	http://www.firewise.org/wildfire-preparedness.aspx
Fire Adaptive Communities	http://www.fireadapted.org/
Good Fires	www.goodfires.org
University of Florida	http://fireinflorida.ifas.ufl.edu/landscaping.html
Florida Division of Emergency Management	http://floridadisaster.org/EMTOOLS/wildfire/wildfire.htm

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

Extent/Probability: The average occurrence in Indian River County is 21.1 wildfires per year depending on weather conditions, including precipitation. The extent of the vulnerability is based on 197,348 acres of undeveloped land (2019).

4.1.5.3 Wildfire Mitigation

Homeowner Mitigation - It is recommend by the Florida Forest Service that homeowners in Indian River County learn the importance of the Firewise Principals. National Firewise Principals stress the importance of defensible space and less flammable landscaping.

Defensible space is the area around a home where the vegetation has been modified to reduce the wildfire threat and to provide an opportunity for firefighters to effectively defend the house. *Lean, Clean and Green*. A good defensible space serves three purposes: (1) keeps low intensity ground fires from reaching structures, fences, decks, etc. (2) provides a relatively safe area for firefighters to protect the structure (3) keeps a house fire from spreading to nearby woodlands.

Less-flammable landscaping can be functional for wildfire protection and still provide food and cover for wildlife, shade for energy conservation, aesthetics and water conservation. Florida's native vegetation are highly flammable plants burn readily because they adapted to survive in fire dependent eco-systems and/ or they may contain flammable compounds that support fire. Less-flammable plants are desirable in the Firewise landscaping because they are less likely to burn.

Large Landowner Mitigation – When a natural area becomes overgrown, a purging fire is inevitable and natural. On large parcels of land, leaf blowers and hedge trimmers are not an effective or cost efficient way to treat hazardous fuels buildup. The process of reducing the wildfire risk will include reduction or elimination of hazardous accumulation of dead leaf litter through mechanical and prescribed fire treatments.

Wildfire Mitigation will target highly flammable vegetation types in Florida. Mechanical treatments, such as mulching, chopping or grinding up highly flammable shrubs or small trees, is effective at reducing future fire intensity and improving tree health. Although these treatments do leave behind woody debris, the debris will decompose to a more manageable height in the event of a wildfire.

Prescribed fire is more effective and cost efficient than mechanical treatments at reducing leaf litter/debris. With Florida's subtropical climate, the vegetation will grow back to extremely flammable levels within a few years unless a management plan is developed and implemented. Management plans might require a combination of mechanical and prescribed fire techniques.

Authorized Burns

Under Florida Statue 590 & 5I2, the Florida Forest Service administers Florida's outdoor burning and forest fire laws. The Florida Forest Service provides burn authorizations to land managers, ranchers and sugarcane farmers to burn for the following reasons:

- ✓ Ranchers/ dairy farmers use prescribed burning to increase the diversity and structure of vegetation to benefit wildlife and maintain livestock production. Rancher's burn during the cold months in order to prepare the land for grazing during the spring and summer months.
- ✓ Farmers burn between crops. Fire burns the stubble of the crop after it has been harvested. The fire also enriches the soil and helps combat disease, insects and weeds.

- ✓ The ability of farmers to burn sugarcane is significant, burning before harvesting allows more efficient sugarcane harvesting in the field and improves sugar quality and recovery in the factory.

- ✓ Land clearing companies pile the dead vegetation and burn it instead of hauling it off. Burning reduces the overall cost to the home builder.

- ✓ Land managers who manage large parcels of land for private landowners or federal, state and local government agencies use prescribe fire to manage their land. The fire cleans the forest floor of leaf litter allowing new growth to sprout. (for example: Water Management, State Parks, and private large parcel)

- ✓ Citrus growers pile burns for pruning and cleaning the orange groves. Burning, as opposed to hauling the debris to landfill, reduces the product cost to the consumer and helps prevent spread of diseases.

4.1.6 Extreme Temperatures

4.1.6.1 Freezing Temperatures

A freeze is defined by the National Weather Service (NWS) as when the surface air temperature is expected to be 32 degrees or below over a widespread area for a climatologically significant period of time. The NWS issues a freeze warning when surface temperatures are expected to drop below freezing over a large area for an extended period of time, regardless of whether or not frost develops.

Hazard Identification. According to the U.S. Department of Agriculture and Consumer Services, a moderate freeze (Defined as 25°F to 28°F) may be expected every 1 to 2 years. Severe freezes (Defined as 24°F and below) may be expected on an average of once every 15 to 20 years. Freezes pose a major hazard to the agriculture industry in Indian River County on a recurring basis, and are a significant threat to the economic vitality of the State's vital agriculture industry. Agricultural lands represent over 51% of the unincorporated area of Indian River County (Indian River County Future Land Use Element 2030).

According to the 2010 U.S. Census, 37,504 residents (27%) in Indian River County are over the age of 65. Freezing conditions primarily affect agriculture and homeless indigents. When conditions are predicted to be below freezing, cold weather shelters may be opened. According to Florida's Council on Homelessness, a point-in-time county for the period of 2015-2019 indicated that Indian River County had an average of 486 homeless individuals within the County (https://myflfamilies.com/service-programs/homelessness/docs/2019CouncilReport.pdf). Inland communities away from the moderating influence of the ocean or the estuary are more vulnerable to temperature extremes as are areas with significant agricultural assets. (Council on Homelessness - Florida Department of Children and Families, 2013).

***Historic Events*.** Indian River County has experienced four significant freezes between 1970 and the present. Florida has experienced a number of severe or disastrous freezes, when the majority of the winter crops are lost. The lowest temperature ever recorded in the state of Florida is -2°F (NCDC, 1999a) on February 13, 1899 in Tallahassee. Since December 1889, there have been at least 22 recorded severe freezes; the most recent being in 2010, when a Secretarial Disaster Declaration was issued for crop losses estimated to be in the hundreds of millions of dollars. During this event, everything from fruits and vegetables to nursery plants and shrubs to tropical fish felt the effects of the freeze. There were no data available to document previous occurrences of severe freeze by jurisdiction.

During the 2013 revision process, data indicated that the likelihood and probability of future occurrences of severe winter storms in Florida tended to result more in flooding and tornadoes than in snow and ice. Based on all the historical evidence, it is anticipated that a moderate freeze may be expected in Florida every one to two years. Severe freezes, where the greatest numbers of winter crops are lost, may be expected on average once every five years based on historic FEMA-declared disasters.

EXTENT: The minimum temperature recorded in the Vero Beach area was 25 degrees (19 degree wind chill) on 12/14/10. This could be considered the minimum likely temperature to be experienced in the Vero Beach area.

PROBABILITY: Severe winter weather includes extreme cold, snowfall, ice storms, and/or strong winds, and can affect every state in the United States in some fashion. Areas where this weather is uncommon, such as Florida, are typically more affected by winter weather than regions that experience this more frequently. Agriculture is the state's primary vulnerability to this hazard since freezing temperatures can kill or damage winter crops. Significant economic impacts in Florida led the NCDC to maintain freeze and frost data throughout the state. The probability of winter storms and freezes for Indian River County is low considering the entire state of Florida maintains a five percent probability or higher of a freeze or frost annually, all of which are located in the upper half of Florida.

4.1.6.2 Extreme Heat

Hazard Identification. Temperatures that remain 10° or more above the average high temperature for a region and last for several weeks are defined as extreme heat (FEMA, 1993). Humid conditions, which add to the discomfort of high temperatures, occur when an area of high atmospheric pressure traps hazy, damp air near the ground.

Human bodies dissipate heat in one of three ways: by varying the rate and depth of blood circulation; by losing water through the skin and sweat glands; and by panting. As the blood is heated to above 98.6°, the heart begins to pump more blood, blood vessels dilate to accommodate the increased flow, and the bundles of tiny capillaries penetrating through the upper layers of skin are put into operation. The body's blood is circulated closer to the surface, and excess heat is released into the cooler atmosphere. At the same time, water diffuses through the skin as perspiration. The skin handles about 90% of the body's heat dissipating function.

Heat disorders generally have to do with a reduction or collapse of the body's ability to cool itself by circulatory changes and sweating, or a chemical (salt) imbalance

caused by too much sweating. When the body cannot cool itself, or when it cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Studies indicate that, other things being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17-year old may be heat exhaustion in a 40-year old, and heat stroke in a person over 60.

When the temperature gets extremely high, the NWS has increased its efforts to alert the general public as well as the appropriate authorities by issuing special weather statements. Residents should heed these warnings to prevent heat-related medical complications. As a result of the latest research findings, the NWS has devised the "Heat Index" (HI). The HI, given in degrees Fahrenheit, is an accurate measure of how hot it really feels when relative humidity is added to the actual air temperature. The NWS will initiate alert procedures when the HI is expected to exceed 105°F for at least two consecutive days. Possible heat disorders related to the corresponding HI are listed below.

- Heat Index of 130°F or higher – Heatstroke/sunstroke with exposure for people in higher risk groups;
- Heat Index of 105°F-130°F – Sunstroke, heat cramps, and heat exhaustion likely and heatstroke possible with prolonged physical activity;
- Heat Index of 90°F-105°F – Sunstroke, heat cramps with prolonged exposure; and,
- Heat Index of 80°F-90°F – Fatigue possible with prolonged exposure and physical activity (NWS, 1999b).

Historic Events. The highest temperature ever recorded in the state was on June 29, 1931 at 109°F in Monticello at an elevation of 207 feet (NCDC, 2003b). From 1979-2003, excessive heat exposure caused 8,015 deaths in the United States. During this period, more people in this country died from extreme heat than from hurricanes, lightning, tornadoes, floods, and earthquakes combined. In 2001, 300 deaths were caused by excessive heat exposure." (CDC, 2009)There were no data available to document previous occurrences of extreme heat by jurisdiction.

Extent: The average annual high temperature for Indian River County is 81.4 degrees. The highest observed temperature recorded in Vero Beach was 100 degrees in June of 1950. The heat index, also known as the apparent temperature, is what the temperature feels like to the human body when relative humidity is combined with the air temperature. NOAA's National Weather Service Heat Index uses temperature and relative humidity to determine the apparent temperature. For example, if the air temperature is 100°F and the relative humidity is 55%, the heat index will be 124°F. The highest temperature in Indian River County would never be expected to exceed 124°F. Extreme heat is considered to have a low probability of occurrence, therefore this hazard will not be fully profiled.

4.1.6.3 Vulnerability Assessment

Extreme temperature events can have the following potential impacts within Indian River County:

- Electric power outage;
- Human health and safety;
- Psychological hardship;

- Economic disruption;
- Agricultural/fisheries damage; and
- Damage to critical environmental resources;

Temperature extremes, both freezes and periods of excessive heat, impact communities with a larger population of older people to a greater extent than those with younger populations. According to the 2010 U.S. Census, 41,178 residents (29%) in Indian River County are over the age of 65 (http://quickfacts.census.gov/qfd/states/12/12061.html). Freezing conditions primarily affect agriculture and homeless indigents. When conditions are predicted to be below freezing, shelters are opened. According to Florida's Council on Homelessness, a point-in-time county for the period of 2015-2019 indicated that Indian River County had an average of 486 homeless individuals within the County (https://myflfamilies.com/service-programs/homelessness/docs/2019CouncilReport.pdf). Inland communities away from the moderating influence of the ocean or the estuary are more vulnerable to temperature extremes as are areas with significant agricultural assets. During 2006–2010, about 2,000 U.S. residents died each year from weather-related causes of death. About 31% of these deaths were attributed to exposure to excessive natural heat, heat stroke, sun stroke, or all; 63% were attributed to exposure to excessive natural cold, hypothermia, or both; and the remaining 6% were attributed to floods, storms, or lightning. (http://www.cdc.gov/nchs/data/nhsr/nhsr076.pdf). This number is greater than the number of deaths caused by hurricanes and tornadoes combined.

Extreme temperatures, especially freezes, can have significant impacts on agricultural economics in a community. In 2012, Indian River County's value of agricultural products sold was $142 million (http://www.freshfromflorida.com/Divisions-Offices/Marketing-and-Development/Education/For-Researchers/Florida-Agriculture-Overview-and-Statistics). In 2008, 136,896 acres were designated for agricultural use. This represents over 51% of the unincorporated area of the county. More than 60,000 acres in Indian River County are devoted to citrus production. In 1997, the value of all farm lands and buildings in Indian River County was estimated to be $1,243,117 (University of Florida, 2001).

4.1.6.4 Risk Assessment

At the time of publication, a risk assessment model for extreme temperatures was not available. The County can expect losses similar to what it has experienced in the past.

4.1.7 Erosion

4.1.7.1 Soil Erosion

Hazard Identification. Soil erosion is the deterioration of soil by the physical movement of soil particles from a given site. Wind, water, animals, and the use of tools by man may all be reasons for erosion. The two most powerful erosion agents are wind and water, but in most cases, these are damaging only after man, animals, insects, diseases, or fire have removed or depleted natural vegetation. Accelerated erosion caused by human activity is the most serious form of soil erosion, and can occur so rapidly that surface soil may sometimes be blown or washed away down to the bedrock.

Undisturbed by man, soil is usually covered by shrubs and trees, dead and decaying leaves, or a thick mat of grass. Whatever the vegetation, it protects the soil when

rain falls or wind blows. Root systems of plants hold soil together. Even in drought, the roots of native grasses, which extend several feet into the ground, help tie down the soil and keep it from blowing away. With the vegetation cover stripped away, soil is vulnerable to damage. Whether through cultivation, grazing, deforestation, burning, or bulldozing, once the soil is bare to the erosive action of wind and water, the slow rate of natural erosion is greatly increased. Losses of soil take place much faster than new soil can be created. With the destruction of soil structure, eroded land is even more susceptible to erosion.

The occurrence of soil erosion has greatly increased. This is because of the activities of modern development and population growth, particularly agricultural intensification. It also is in the field of agriculture that most efforts have been made to conserve soils, with mixed success (Union of International Associations, 1999).

Particles scattered by erosion can also cause problems elsewhere. Stormwater drainage systems, both natural and mechanical, are frequently clogged by loose sediment. If drainage systems are not cleared of uncontrolled sediment on a regular basis, they lose function.

Extent: Sustained land zoning ordinances, regulated land development, wildfire mitigation efforts, agricultural extension information practices, and long matured agricultural conservation efforts are contributing to diminishing this hazard; however, it still has a low probability. Identifying specific soil erosion problems in the county is difficult in that the occurrence of barren soils from urban development or agricultural land clearing is temporary. Locations of potential erosion problems change regularly over time as planting and development activities occur.

4.1.7.2 Beach Erosion

Hazard Identification. Beach erosion is the wearing away of land and the removal of beach or dune sediments by wave action, tidal currents, wave currents, drainage or high winds. The wave climate impacting Indian River County's 22.4 miles of shoreline has contributed to the long term erosion of the County's barrier island. As a result, the Florida Department of Environmental Protection (FDEP) has concluded that 15.7 miles of shoreline is "critically eroded". A critically eroded area is defined by FDEP as a segment of the shoreline where natural processes or human activity has caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. To assist with its coastal management strategies and long term sustainability of its shoreline, the County has developed and adopted a Beach Preservation Plan (BPP), updated 2014. The BPP identifies the current shoreline conditions and provides cost effective strategies for future beach management along the County's shoreline in particular the FDEP classified critically eroded areas.

Wind, waves, and longshore currents are the driving forces behind coastal erosion. This removal and deposition of sand permanently changes beach shape and structure (Sea Grant Haznet, 1998). Most beaches, if left alone to natural processes, experience natural shoreline retreat. Historically, shoreline retreat is exacerbated by the effects of stabilized (jettied) coastal inlets, which interrupt the natural transport of sediment and promote erosion on the downdrift beaches. It has been estimated that on the east coast of Florida, as much as 80% of the observed erosion is directly attributable to the effects of stabilized inlets (Dean and Work 1993). As houses, highways, seawalls, and other structures

are constructed on or close to the beach, the natural shoreline retreat processes may be interrupted. Construction along a historically erosive shoreline increases the likelihood of a property becoming threatened by shoreline retreat. The wave climate impacting the County's 22.4 miles of coastline has contributed to the long term erosion of the County's barrier island. The need for shore protection often results in property owners "hardening" the coast with a structure such as a seawall or revetment.

A seawall is a large concrete or steel sheet pile wall designed to protect buildings or other man-made structures from beach erosion. A revetment is a cheaper option constructed with "rip rap" such as large boulders, concrete rubble, or even old tires. Although these structures may serve to protect beachfront property for a while, the resulting disruption of the natural coastal processes has serious consequences for all beaches in the area. Seawalls inhibit the natural ability of the beach to adjust its slope to the ever-changing ocean wave conditions. Large waves wash up against the seawall and rebound back out to sea, carrying large quantities of beach sand with them. With each storm, the beach narrows, sand is lost to deeper water, and the long shore current scours the base of the wall. Eventually, large waves impact the seawall with such force that a bigger structure becomes necessary to continue to resist the forces of the ocean (Pilkey and Dixon, 1996).

However, other shoreline protection strategies are commonly used to address shoreline retreat such as beach nourishment. Beach nourishment is the process of replenishing sand lost as a result of erosion. In Indian River County, the preferred shoreline protection strategy is beach nourishment.

To assist with its coastal management strategies and the long term sustainability of its shoreline, the county adopted its first Beach Preservation Plan in 1988, with updates in 1998 and 2008; and is currently updating the plan again for completion in 2015.

Historic Events. Hurricanes Floyd and Irene (1999) and Hurricanes Frances and Jeanne (2004) caused significant beach erosion along the Atlantic Ocean. Oceanfront property in the City of Vero Beach, Town of Indian River Shores, and Town of Orchid also experienced beach erosion during these two events.

The 2005 hurricane season was a record breaking season with 27 named storms. Florida was impacted by Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy. While the cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida, Indian River County was spared.

2008 was a relatively mild tropical storm season for Florida's beaches with Tropical Storm Fay affecting predominantly the Atlantic shoreline, and the gulf coast receiving the fringe impacts of Hurricanes Gustav and Ike.

Hurricane Sandy (October 26, 2012) caused an estimated $12 million in total countywide beach erosion damages. As a result, several emergency dune repair crossover repair projects occurred from 2012-2015.

Hurricane Matthew (October 7, 2016) caused an estimated $13 million in total countywide beach erosion damages. Emergency dune/berm repair was required at five locations totaling $210,000.

Hurricane Irma (September 10, 2017) caused an estimated $4.3 million in total countywide beach erosion damages.

Because of their location along the Atlantic Ocean and Intracoastal Waterway, the City of Vero Beach, Town of Indian River Shores, Town of Orchid, the City of Sebastian, and unincorporated County are more apt to experience beach erosion associated with wave or current action.

Extent: Indian River County's critically eroded areas, as identified by FDEP, can be found in Figure 4.10. The beaches of Florida will continue to shift and change over time, especially when faced with the current levels of development. This is especially a high probability hazard, especially in conjunction with hurricanes, winter storms, and coastal flooding.

Probability: Nearly 495 miles of Florida's beaches, approximately 60 percent, are currently experiencing erosion. Erosion can have significant economic impacts on the state due to property damages, loss of beachfront property, and effects to tourism. Florida's rivers also routinely experience erosion. This is a high probability hazard for Florida, including Indian River County, and is constantly being monitored by local, state, and federal entities.

4.1.7.3 Vulnerability Assessment

Erosion can have the following potential impacts within Indian River County's coastal areas (City of Vero Beach, Town of Orchid, Town of Indian River Shores and some unincorporated areas of the community:

- Soil/beach erosion;
- Navigable waterway impairment;
- Economic disruption;
- Damage to critical environmental resources; and
- Stormwater drainage impairment.

Indian River County's vulnerability to soil collapse and beach erosion is moderate to high along its beachfront coastline. The County has broken the beaches down into 8 management sectors based on their surrounding environmental conditions and erosion rates. Sectors 1, 2, 3, 5, and 7 have a significant beach erosion problem, as indicated by FDEP's deceleration of critically eroded shoreline. Hurricanes Matthew and Irma caused significant damages to the beaches resulting in FEMA damage reports and consequently FEMA funding assistance to restore those beach areas. The City of Vero Beach is located within Sector 5 and is one community that reported damaged property due to these storms. The Sector 4 area which includes the Town of Indian River Shores has low to moderate erosion rates, while Sectors 6 and 8 are accretional beaches. Shoreline erosion also is a potential vulnerability for the communities located along the Indian River Lagoon and Sebastian River. Vulnerability in the rest of the County is low to very low, with the exception of specific locations along some drainage canals.

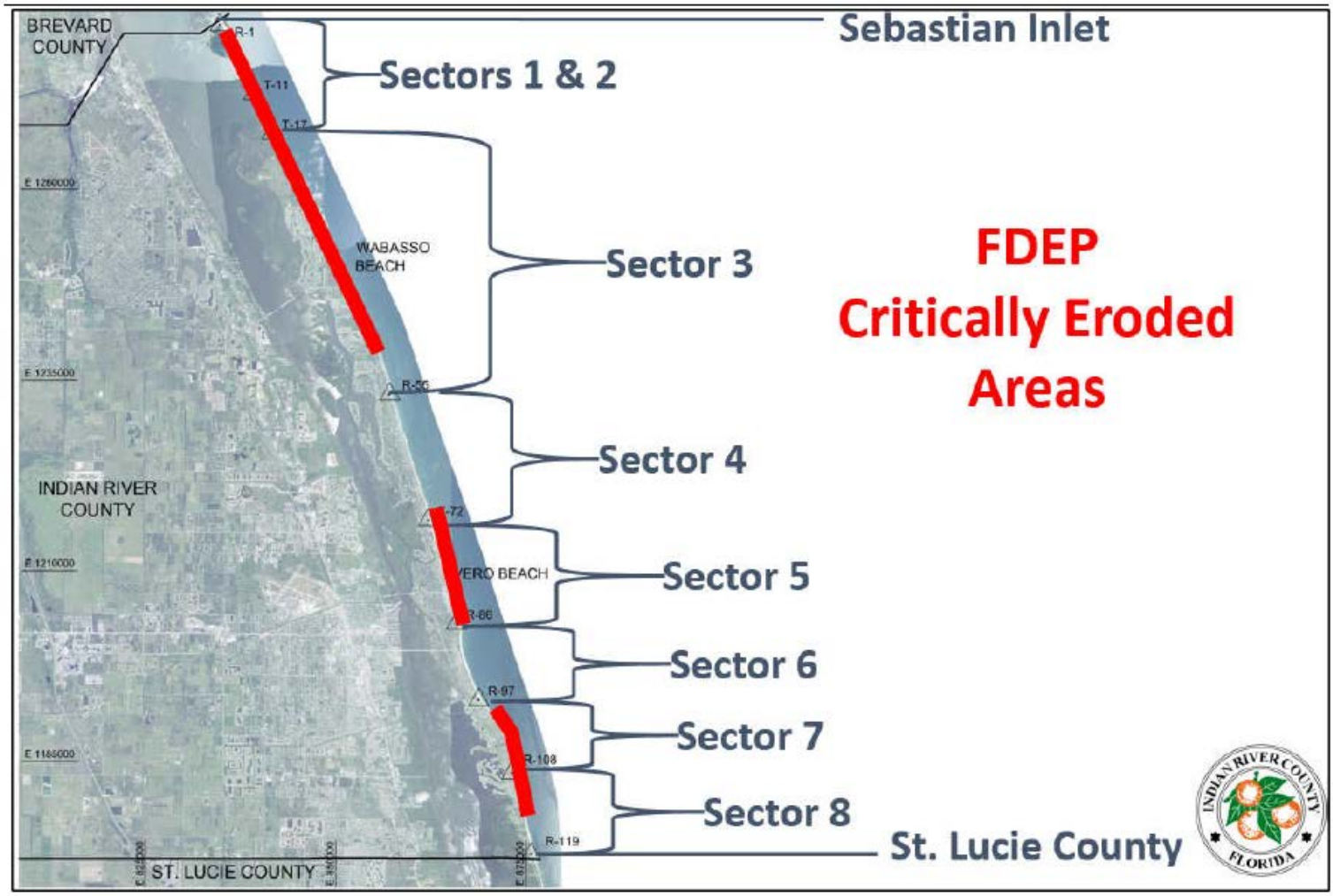


Figure 4.10 Critically eroded shoreline within Indian River County (FDOT June 2019)

The Department of Public Works has identified the following areas as being in need of beach nourishment projects:

Managed by the Sebastian Inlet District through Inlet Sand Bypassing Projects via the Inlet Management Plan:

- Sectors 1 & 2 – R-4 to R-17;

Managed by the County through the Beach Preservation Plan:

- Sector 3 – R-20 to R-55;
- Sector 5 – R-74 to R-86; and,
- Sector 7 – R-97 to R-107.

4.1.7.4 Risk Assessment

FDEP updated a statewide assessment of beach erosion in 2014. In that assessment, FDEP defined the "critical erosion area" as a segment of shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreation interests, wildlife habitat, or important cultural resources are threatened or lost.

The County has broken the beaches down into 8 management sectors based on their surrounding environmental conditions and erosion rates. Sectors 1, 2, 3, 5, and 7 (15.7 miles) have a significant beach erosion problem, as indicated by FDEP's deceleration of critically eroded shoreline. The northern 9.5 miles (R1-R51.3) south of Sebastian Inlet includes Sectors 1,2, and 3 and has been deemed critically eroded, threatening State Road AIA, Sebastian Inlet State Park facilities, the McLarty Treasure Museum, and private development along Ambersand Beach, Sanderling, Summerplace, and Wabasso Beach. The museum has a rock revetment to provide a barrier and safe net for storm vulnerability. The Sebastian Inlet District, as instructed in their inlet management plan, conducts regular sand bypassing projects by trapping sand within the inlet and placing it down drift of the inlet along Sectors 1 and 2 which includes Ambersands Beach Park. The most recent bypassing project was constructed in the winter of 2019. The County is currently undergoing the permitting process to restore Sector 3. The northern 3.1 miles of City of Vero Beach (R70-R86) is critically eroded with development and recreational interests being threatened. Historic management strategies for this area include adding seawalls, and constructing small dune restoration projects. The County has permitted its first large scale beach and dune nourishment project for Sector 5 which will commence fall 2019. Lastly, within southern Indian River County, Sector 7 a 2-mile segment (R99-R115.7) is critically eroded threatening homes and development interests. A beach restoration project was constructed in 2007 (FDEP 2010) which proved successful and now the County is undergoing the permitting process for a renourishment project.

4.1.8 Droughts

4.1.8.1 Hazard Identification

Drought is a normal, recurrent feature of climate, although many perceive it as a rare and random event. In fact, each year some part of the U.S. has severe or extreme drought. Although it has many definitions, drought originates from a deficiency of precipitation over an extended period of time, usually a season or more (National Drought

Mitigation Center, 2010). It produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area producing physical drought. This complexity exists because water is essential to our ability to produce goods and provide services (National Drought Mitigation Center, 2010).

In Indian River County, the primary sources of water are deep wells for utility systems and shallow wells for rural areas. Excess water from an interconnected series of lakes, rivers, canals, and marshes flows either north to the St. Johns River or east to the Indian River Lagoon (Indian River County Department of Emergency Services, 2002). When this cycle is disrupted by periods of drought, one of the most potentially damaging effects is substantial crop loss in the western agricultural areas of unincorporated Indian River County. In addition to obvious losses in yields in both crop and livestock production, drought in Indian River County is associated with increase in insect infestations, plant disease, and wind erosion. The incidence of forest fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

The St. Johns Water Management District and County staff manage the County's water resources. Complementing the District's water management efforts during periods of critical water shortage, a countywide, uniform, forceful, contingency plan is in place to effectively restrict the use of water.

Historic Events. Florida experienced one of the most severe droughts in 2007 dating back to when records started in the early 1900s. Lake Okeechobee, the region's primary reservoir, was down to less than half a foot above its record low. The $15 billion landscaping and nursery industries, which comprise Florida's largest agricultural sector, may have been the hardest hit. In November 2009 the lack of rainfall during rainy season led to Indian River County being named the driest county in the state and in danger of wildfires.

Extent: Indian River County's agricultural areas, which encompass 128,349 acres, are more vulnerable to the impacts of drought which increase the possibility of substantial crop loss.

4.1.8.2 Vulnerability Assessment

Drought can have the following potential impacts within Indian River County; more specifically in the agricultural areas in the western parts of the county (Fellsmere, Sebastian, Vero Beach):

- Economic disruption;
- Agricultural/fisheries damage;
- Damage to critical environmental resources; and
- Wildland fire.

While Indian River County is moderately vulnerable to impacts from drought due to the County's large agricultural land tax base (primarily located in the unincorporated area of Indian River County), some communities are less vulnerable due to their location and non-agricultural economic base.

A few examples of direct impacts of drought are reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and

wildlife mortality rates; and damage to wildlife and fish habitat. Social impacts include public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Income loss is another indicator used in assessing the impacts of drought; reduced income for farmers has a ripple effect throughout the region's economy (National Drought Mitigation Center, 2003).

The direct and indirect costs of drought total more than $9 billion per year in the United States. The worst drought (36% of U.S.) in recent history occurred in July 1988, and the NCDC reports the estimated cost as $40 billion (National Drought Mitigation Center, 2010).

According to a report by the National Oceanic Atmospheric Administration (NOAA), a full 33% of the contiguous United States spent 2012 in the grip of a severe to extreme drought – “severe” and “extreme” are NOAA’s most serious official classifications on the drought scale.

4.1.8.3 Risk Assessment

Indian River County overall, has a moderate vulnerability to the impacts from drought due to the County’s large agricultural land tax base. The western area of the County is most vulnerable to the impacts of drought because this area is extensively involved in farming and ranching. As of 2017, the average annual market value of agricultural products in Indian River County was $145 million (www.agcensus.usda.gov). The urbanized communities along the County’s coast are less vulnerable due to their location and non-agricultural economic base. Potential impacts to Indian River County’s potable water supply during drought conditions appear to be slight.

The Palmer Drought Index has become the semi-official drought index. It is most effective in determining long term drought—a matter of several months—and is not as good with short-term forecasts (a matter of weeks). It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. The Palmer Index can also reflect excess rain using a corresponding level reflected by plus figures; i.e., 0 is normal, plus 2 is moderate rainfall, etc.

Another reference tool is the Keetch-Byram drought index (KBDI), which is a continuous reference scale for estimating the dryness of the soil and duff layers. The index increases for each day without rain (the amount of increase depends on the daily high temperature) and decreases when it rains. The scale ranges from 0 (no moisture deficit) to 800 (prime drought condition). The range of the index is determined by assuming that there is 8 inches of moisture in a saturated soil that is readily available to the vegetation. In November, 2009, the lack of rainfall during rainy season led to Indian River County being named the driest county in the state of Florida and, according to the Florida Florida Forest Service, in danger of wildfires. According to the Keetch Bryam Drought Index, the county measured in at 649 when the normal range for that time of year is 271-420. Indian River County could reasonably expect to see a drought index of this magnitude.

4.1.9 Seismic Hazards

Seismic hazards, which include dam/levee failure, earthquakes, and sinkholes and subsidence, are considered to have a low probability of occurrence, therefore this hazard will not be fully profiled.

4.1.9.1 Dam/Levee Failure

Hazard Identification. Dam/levee failure poses a minor threat to population and property in Indian River County. All dams and levees are earthen structures and are State, regional, local, or privately controlled. The most significant risk related to dam/levee failure is flooding due to substantial rainfall and its eastward migration to final discharge in the Indian River Lagoon. Structural and non-structural techniques to slow and contain this runoff incorporate several drainage systems. Rainfall in excess of designed capacities could cause erosion of constructed drainage facilities and flooding of many areas including primary roadway evacuation routes (Indian River County Emergency Management, 2002). According to the National Inventory of Dams, there are five listed dams in Indian River County (South Relief Structure, Lateral C Structure, Main Canal Structure, North Relief Canal Structure, Lateral Structure #3 (United States Army Corps of Engineers, 1999).

Extent: Best available data do not indicate that there have been any dam or levee failures in Indian River County or the municipalities. The overall extent of seismic hazards in Indian River County is uniform throughout the individual jurisdictions in the County.

4.1.9.2 Earthquakes

Hazard Identification. Although Florida is not usually considered to be a state subject to earthquakes, several minor shocks have occurred over time, but only one caused any damage (USDOI, USGS, 2004).

Historic Events.

- In January 1879, a shock occurred near St. Augustine that is reported to have knocked plaster from walls and articles from shelves. Similar effects were reported in Daytona Beach. The shock was felt in Tampa, throughout central Florida, and in Savannah, Georgia as well (USDOI, USGS, 2004).
- In January 1880 another earthquake occurred, this time with Cuba as the focal point. Shock waves were sent as far north as the town of Key West (USDOI, USGS, 2004).
- In August 1886, Charleston, South Carolina was the center of a shock that was felt throughout northern Florida. It rang church bells in St. Augustine and severely jolted other towns along sections of Florida's east coast. Jacksonville residents felt many of the strong aftershocks that occurred in September, October, and November 1886 (USDOI, USGS, 2004).
- In June 1893, Jacksonville experienced a minor shock that lasted about 10 seconds. Another earthquake occurred in October 1893, which also did not cause any damage (USDOI, USGS, 2004).

- In November 1948, doors and windows rattled in Captiva Island, west of Ft. Myers. It was reportedly accompanied by sounds like distant heavy explosions (USDOI, USGS).
- In November 1952, a slight tremor was felt in Quincy, a town located 20 miles northwest of Tallahassee. Windows and doors rattled, but no damage was reported (USDOI, USGS).
- On July 16, 2016 an earthquake struck off the coast of Florida. The 3.7-magnitude quake had an epicenter that was 104 miles east-northeast of Daytona Beach. Some weak tremors were reported and picked up by scientific instruments on the mainland, but the quake was too weak to cause any damage.

Table 4.14 illustrates the Modified Mercalli Intensity Scale of 1931 is the basis for the U.S. evaluation of seismic intensity. Unlike earthquake magnitude, which indicates the energy a quake expends, Mercalli intensity denotes how strongly an earthquake affects a specific place. The scale has 12 divisions, identified in the table below, and given that the best available data do not indicate that there have ever been any earthquakes in Indian River County or the municipalities, we could reasonable expect to experience Level I on the intensity scale.

Table 4.14 The Modified Mercalli Intensity Scale

I. Not felt except by a very few under especially favorable circumstances.
II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III. Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing truck. Duration estimated.
IV. During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, and doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing motorcars rock noticeably.
V. Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI. Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures. Some chimneys broken. Noticed by persons driving motor cars.
VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed over banks.
XI. Few, if any (masonry), structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII. Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

4.1.9.3 Sinkholes and Subsidence

Hazard Identification. Sinkholes are a common feature of Florida's landscape. They are only one of many kinds of karst landforms, which include caves, disappearing streams, springs, and underground drainage systems, all of which occur in Florida. Karst is a generic term that refers to the characteristic terrain produced by erosional processes associated with the chemical weathering and dissolution of limestone or dolomite, the two most common carbonate rocks in Florida. Dissolution of carbonate rocks begins when they are exposed to acidic water. Most rainwater is slightly acidic and usually becomes more acidic as it moves through decaying plant debris. Limestones in Florida are porous, allowing the acidic water to percolate through them, dissolving some limestone and carrying it away in solution. Over time, this persistent erosion process has created extensive underground voids and drainage systems in much of the carbonate rocks throughout the state. Collapse of overlying sediments into the underground cavities produces sinkholes (Florida Geological Survey, 1998).

Historic Events. The Florida Center for Instructional Technology (2008) has recorded six sinkholes in Indian River County. The first three sinkholes developed in 1981; two were located in Fellsmere and the other in Vero Beach. All three sinkholes are less than 10 feet in width. The forth and largest developed in 1985, in Fellsmere and ranges from 31-80 feet in width. The fifth and sixth developed in 2002 and 2005, in Vero Beach and both are less than 10 feet in width. The Florida Center for Instructional Technology database does not document any sinkholes in Indian River Shores, Orchid, or Sebastian. (Maps, Etc., 2014)

4.1.9.4 Vulnerability Assessment

There are areas in western Indian River County where canal bank failures could cause or exacerbate flooding during heavy rain events or storms. This problem is, however, more related to soil erosion than to actual levee failure. There has never been any seismic activity, soil failures, and few sinkholes in Indian River County. While these hazards may exist, County vulnerability to them at this time is considered very low.

Seismic events can have the following potential impacts within Indian River County:

- Electric power outage;
- Surface and air transportation disruption;
- Potable water system loss or disruption;
- Sewer system outage;
- Telecommunications system outage;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Damage to identified historical resources;
- Fire;
- Toxic releases; and
- Stormwater drainage impairment.

The USDOI, USGS and the Florida Department of Natural Resources Bureau of Geology have created a map illustrating sinkhole type, development, and distribution for the state of Florida. Sinkhole risk is categorized using four categories. According to this map, Indian River County lies in Area II, which is classified as having coverage between 30 and 200 feet thick, consisting of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter, and develop gradually. Cover-subsidence sinkholes dominate in this area.

4.1.9.5 Risk Assessment

Extent: There is no risk assessment data available for seismic hazards (sinkhole only) in Indian River County.

4.1.10 Agricultural Pests and Diseases

Florida is among the top three agriculture-producing states in the nation. Agriculture generates farm cash receipts of nearly $6 billion annually, of which citrus and vegetable crops contribute more than 40%. The industry is susceptible to many hazards including freezes, droughts, and exotic pests or diseases. Agricultural crops are grown throughout the state, and every region is vulnerable to the effects of an exotic pests or disease infestation. As a result, Florida uses the second highest volume of pesticides in the nation.

Agriculture and citrus production play a key role in the Indian River County economy; 52% of the County is farmland. The main threats to the Indian River County agriculture industry are 1) Citrus canker, 2) Mediterranean fruit fly (Medfly), 3) Sugarcane pests, and 4) Tomato Yellow Leaf Curl Virus (TYLCV).

Extent: Best available data do not indicate that there have been incidents of agricultural pests and diseases in Indian River County or the municipalities.

4.1.10.1 Citrus Canker and Greening Disease

Citrus canker was found in Dade County in 2005 in 2006 the United States Secretary of Agriculture determined that eradication of citrus canker from Florida was no longer feasible. Because of its rapid spread, high potential for damage, and impact on export sales and domestic trade, citrus canker is a significant threat to all citrus-growing regions. Citrus canker is a bacterial disease of citrus that causes premature leaf and fruit drop. It affects all types of citrus, including oranges, sour oranges, grapefruit, tangerines, lemons, and limes. Symptoms found on leaves and fruit are brown, raised lesions surrounded by an oily, water-soaked area and a yellow ring or halo (Indian River County Agriculture Forum, 2009).

There is no known chemical compound that will destroy the citrus canker bacteria. In order to eradicate the disease, infected trees must be cut down and disposed of properly. It is a highly contagious disease that can be spread rapidly by windborne rain, lawnmowers and other landscaping equipment, animals and birds, people carrying the infection on their hands or clothing, and moving infected or exposed plants or plant parts.

Citrus greening, also known as huanglongbing (HLB) or yellow dragon disease is one of the most serious citrus diseases in the world. It is a bacterial disease that greatly reduces production, destroys the economic value of fruit, and can kill trees. It has significantly reduced citrus production in Asia, Africa, the Arabian Peninsula, and Brazil. Once infected, there is no cure for a tree with citrus greening disease. In areas of the world where citrus greening is endemic, citrus trees decline and die within a few years. The disease specifically attacks citrus plants and presents no threat to humans or animals.

4.1.10.2 Mediterranean fruit fly (Medfly)

Another threat to Indian River County's agriculture industry is the Medfly. It is one of the world's most destructive pests and infests more than 250 different plants that are important for U.S. food producers, homeowners, and wildlife. It is considered the greatest pest threat to Florida's $1.5 billion citrus crop, as well as endangering many other economically significant crops (Florida Department of Agriculture and Consumer Services, 1998a). For example, a Medfly outbreak in 1997 cost an estimated $32 million to eradicate in Manatee, Marion, Orange, Polk, and Sarasota counties (United States Department of Agriculture, 1999). If a long-term or widespread Medfly infestation were to occur, Florida growers would not be permitted to ship numerous fruit and vegetable crops to many foreign and domestic markets. The movement of fruits and vegetables, even within the state, would be disrupted, which could lead to higher prices in the supermarket. Costly post-harvest treatment of fruits and vegetables to meet quarantine restrictions of domestic and foreign markets would also be required. If the Medfly is not eradicated in Florida, ongoing pesticide treatments by homeowners and commercial growers will be necessary.

Adult Med flies are up to ¼ inch long, black with yellow abdomens, and have yellow marks on their thoraxes. Their wings are banded with yellow. The female Medfly damages produce by laying eggs in the host fruit or vegetable. The resulting larvae feed on the pulp, rendering the produce unfit for human consumption. In addition to citrus, med flies will feed on hundreds of other commercial and backyard fruit and vegetable crops.

Because med flies are not strong fliers, the pest is spread by the transport of larval-infested fruit. The major threats come from travelers, the U.S. mail, and commercial fruit smugglers. Several steps have been taken to prevent new infestations. State and Federal officials are working with postal authorities to develop ways to inspect packages suspected of carrying infested fruit. In addition, public education efforts carrying the message, "Don't Spread Med" are being expanded (Florida Department of Agriculture and Consumer Services, 1998b).

4.1.10.3 Sugarcane Pests

Changes in sugarcane agriculture, including new disease and insect pests, have seriously impacted the quality of cane and juice delivered to the mill for processing. These changing developments affect the level of sucrose, purity, fiber, and color of cane, resulting in a loss of sugar and decrease in the quantity and quality of sugar produced (Legendre et al., 1998).

4.1.10.4 TYLCV

The TYLCV is believed to have entered the state in Dade County sometime in early 1997 (Florida Department of Agriculture and Consumer Services, 1999). Symptoms vary among tomato types, but in general, leaves produced shortly after infection are reduced in size, distorted, cupped inward or downward, and have a yellow mottle. Fewer than 1 in 10 flowers will produce fruit after TYLCV infection, severely reducing yields.

The virus is transmitted by adult silverleaf whiteflies. Although frequent applications of pesticides help to decrease whitefly populations and suppress the spread of TYLCV, virus management through whitefly control is not possible in years where whitefly populations are high. Fortunately, the virus is not transmitted through seed or casual contact with infected plants.

4.1.10.5 Vulnerability Assessment

Agricultural pests and diseases can have the following potential impacts within Indian River County; more specifically in the agricultural areas in the western parts of the county (Fellsmere, Sebastian, Vero Beach):

- Human health and safety;
- Psychological hardship
- Economic disruption;
- Agricultural/fisheries damage; and
- Damage to critical environmental resources.

Agricultural pests and diseases are a more significant hazard in those areas of the County where agriculture is a more significant element in the economic base. The western portion of Indian River County is a major ranching area, and there are numerous nurseries and smaller agricultural-related businesses located throughout the County.

4.1.10.6 Risk Assessment

Because agricultural pests and diseases can have a significant impact on agricultural-related businesses, it is important to look at agricultural-related income to determine potential loss. Approximately 1.7 million cartons of “Indian River” fruit were exported during the 2017-2018 season. The State of Florida is the nation’s largest producer of fresh tomatoes and the crop value for the 2017 season exceeds $262 million (freshfromflorida.com). The Fellsmere and Wabasso areas are major agribusiness centers.

4.1.11 Epidemics

Infectious diseases emerging throughout history have included some of the most feared plagues of the past. New infections continue to emerge today, while many of the old plagues are still with us. As demonstrated by influenza epidemics, under suitable circumstances, a new infection first appearing anywhere in the world could travel across entire continents within days or weeks (Morse, 1995). Due to the potential of complex health and medical conditions that can threaten the general population, Florida’s vulnerability to an epidemic is continually being monitored. With millions of tourists arriving and departing the state annually, disease and disease exposure (airborne, vector, and ingestion) are constantly evaluated and analyzed.

Primarily as a result of the entrance of undocumented aliens into south Florida, and the large number of small wildlife, previously controlled or eradicated diseases have surfaced. Health officials closely monitor this potential threat to the public health. The emphasis upon preventive medical measures such as school inoculation, pet licensing, rodent/insect eradication, water purification, sanitary waste disposal, health inspections, and public health education mitigate this potential disaster.

Another potential threat to south Florida's population is food contamination. Frequent news stories document that *E. coli* and botulism breakouts throughout the country are not that uncommon. Most recently, millions of pounds of possibly contaminated beef from the Hudson packing plant were seized by the Department of Agriculture and destroyed.

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

Because epidemics are hazards that are not bounded by geographic or topographic characteristics, there are no definite means to determine whether or not the extent of this hazard differs from jurisdiction to jurisdiction within Indian River County.

4.1.11.1 Vulnerability Assessment

Florida is more vulnerable than many other states to possible outbreaks of infectious diseases due to the large number of international and U.S. tourists it attracts. The number of illegal aliens reaching U.S. shores also increases vulnerability to disease hazards. Indian River County’s vulnerability to epidemic outbreaks is considered relatively low when assessed against other Florida counties, primarily because its population is lower and it is not a key destination for illegal immigration. Medical facilities are adequate for current need, but would be stressed if forced to deal with a major disease outbreak.

4.1.12 Tsunamis

Hazard Identification. A tsunami is a series of waves created when a body of water, such as in an ocean, is rapidly displaced. A tsunami has a much smaller amplitude (wave height) offshore, and a very long wavelength (often hundreds of kilometers long), which is why they generally pass unnoticed at sea, forming only a passing "hump" in the ocean. Tsunamis have been historically referred to as tidal waves because as they approach land, they take on the characteristics of a violent onrushing tide rather than the sort of cresting waves that are formed by wind action upon the ocean. Since they are not actually related to tides, the term is considered misleading and its usage is discouraged by oceanographers.

There is another phenomenon often confused with tsunamis called rogue waves. There remains debate as to whether these waves are related to tsunamis. They are included in this section as the mitigation plans address the threat in the same relative manner. The characteristics are:

- Unpredictable nature
- Little is known about the formation
- May be caused by regularly-spaced ocean swells that are magnified by currents or the atmosphere

Historic Events. The history of big waves hitting Florida is short:

- A powerful earthquake in Portugal in 1755 killed thousands there and launched a tsunami that hit much of the U.S. coast. Scientists don't know if that caused many deaths in Florida, which was sparsely populated at the time;

- An earthquake in Charleston, S.C., in 1886 triggered a wave that surged up the St. Johns River to Jacksonville, causing few if any deaths;

- An 18-foot rogue wave flooded the parked cars of sunbathers on Daytona Beach without warning in 1992. This event, called a meteorological tsunami (or meteotsunami), was a tsunami-like wave phenomenon of meteorological origin. Tsunamis and meteotsunamis propagate in the water in the same way and have the same coastal dynamics. For an observer on the coast where it strikes, the two types would look the same and have the same impacts. Research is currently underway to better understand these events, with the goal of developing a protocol for issuing meteotsunami warnings along the U.S. coast.

- Scientists believe that is was a meteotsunami that hit Southwest Florida around 1:30 p.m. on Thursday, December 20, 2018. The temperatures dropped nearly 10 degrees and the barometric pressure momentarily rose by 1.6 millibars. The wave heights, which were projected to be around 1.7 feet at 1:30 p.m., reached 5.04 feet before decreasing rapidly over the next hour and sent the surf rushing up beach access walkways. Wind gusts measured by the National Weather Service spiked at 54 mph as a storm brought heavy rains and tornado warnings to the Naples area. This meteotsunami, fortunately, did not cause any significant flooding.

Extent: National Weather Service guidelines indicate that the (Florida Atlantic Coast) Tsunami Hazard Zone extends 300 feet inland beyond the high tide location.

In order to verbally describe the Tsunami Hazard Zone more comprehensively, while also allowing for a greater safety zone for the protection of life and property, Indian River County Emergency Management has defined the Tsunami Hazard Zone as the region from east of Highway A1A to the Atlantic.

4.1.12.1 Vulnerability Assessment

Tsunami events occur most often in the Pacific Ocean, but they are a global phenomenon and all are potentially dangerous, though they may not damage every coastline they strike. Analyzing the past 150 years of tsunami records shows that the most frequent and destructive tsunamis to affect the U.S. have occurred along the coasts of California, Oregon, Washington, Alaska, and Hawaii.

However, the State of Florida is located within the Caribbean area, and over the past 156 years, the Caribbean has experienced more total tsunami events, which have ultimately resulted in over 2,500 deaths. Overall, Florida has experienced few destructive tsunami or rogue wave events, but there were several small events. The potential impacts to Indian River County would be to the coastal areas of Vero Beach, Indian River Shores, and Orchid.

In 2012, The National Weather Service designated Indian River County as the first county in the state of Florida to be named TsunamiReady. The TsunamiReady program encourages communities to take a proactive approach to developing and implementing local tsunami plans and expanding public awareness in partnership with their local National Weather Service office. Although the chances of a tsunami impacting the east coast of Florida are extremely remote, computer modeling for a large tsunami originating from the Puerto Rico trench could inundate Indian River County beaches. The most significant impact of a tsunami would be strong waves in a 300-foot danger zone, which is the area east of A1A. Beaches would be evacuated and residents living along the coastline would be urged to move at least 15 feet up to the highest floor of a well-constructed building. Modeling results from a tsunami triggered by a large Portugal earthquake suggest more significant tsunami impacts locally.

4.1.12.2 Risk Assessment

At the time of publication, no specific data were available to determine the local potential loss associated with a tsunami incident in Indian River County. However, state facility losses due to a tsunami impact to Indian River County are estimated to be $22,422,125. The Tsunami Hazard Zone for Indian River County is identified as the area east of Highway A1A. There are no critical facilities (schools, fire rescue stations, government buildings, health care facilities, etc.) located within this area.

Probability: Florida has directly experienced few destructive tsunami and rogue wave events since 1900, with only four small recorded occurrences. The probability of future tsunami and rogue wave events in Indian River County is low.

4.2 TECHNOLOGICAL HAZARDS

This subsection will now identify those hazards in Indian River County identified as being technological hazards.

4.2.1 Radiological Accidents

Hazard Identification. While an actual release of radioactive material is extremely unlikely and the immediate threat to life extremely low, vulnerability to a nuclear plant disaster could consist of long-range health effects with temporary and permanent displacement of population from affected areas. The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloudlike) formation. The area the radioactive release may affect is determined by the amount released from the plant, wind direction and speed and weather conditions (e.g., rain), which would quickly drive the radioactive material into the ground, hence causing increased deposition of radionuclides.

Thirty of the 67 counties in the State of Florida are involved in preparedness planning for a commercial nuclear power plant emergency. Emergency Planning Zones (EPZs) have been designated for each power plant to enhance planning efforts for an emergency. An EPZ is comprised of two zones, the 10-mile plume exposure zone and the 50-mile ingestion exposure zone (Nuclear Energy Institute, 2004). Specific coordinating procedures for response to a general emergency at a nuclear power plant have been prepared in the form of standard operating procedures. These include emergency classification levels, which assist in notifying the public if a problem occurs at a plant. They are defined by four categories (FEMA, 2004):

- **Notification of Unusual Event** – The event poses no threat to plant employees, but emergency officials are notified. No action by the public is necessary.
- **Alert** – An event has occurred that could reduce the plant's level of safety, but back-up systems still work. Emergency agencies are notified and kept informed, but no action by the public is necessary.
- **Site Area Emergency** – The event involves major problems with the plant's safety and has progressed to the point that a release of some radioactivity into the air or water is possible, but is not expected to exceed EPA Protective Action Guidelines (PAGs). Thus, no action by the public is necessary.
- **General Emergency** – The event has caused a loss of safety systems. If such an event occurs, radiation could be released that would penetrate the site boundary. State and local authorities will take action to protect the residents living near the plant. The alert and notification system will be sounded. People in the affected areas could be advised to evacuate, or in some situations, to shelter in place. When the sirens are sounded, radio and television alerts will have site-specific information and instructions.

The St. Lucie nuclear power generation plant is located 12 miles southeast of the City of Ft. Pierce on Hutchinson Island in St. Lucie County. The facility contains two reactors and is owned and operated by the Florida Power & Light Company. Counties within the

50-mile EPZ include all or portions of St. Lucie, Indian River, Glades, Osceola, Okeechobee, Brevard, Highlands, Palm Beach, and Indian River.

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.1.1 Vulnerability Assessment

Radiological accidents can have the following potential impacts on Indian River County:

- Electric power outage;
- Surface and air transportation disruption;
- Telecommunications system outage;
- Human and health safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Damage to critical environmental resources; and
- Toxic releases.

Because of its location relative to the St. Lucie nuclear power plant, parts of Indian River County have a high vulnerability to a nuclear power plant accident or nuclear materials release. While the County's level of vulnerability is high, the frequency with which nuclear power plant accidents occur is very low, and the overall risk to the citizens of Indian River County is therefore considered low. Nuclear emergency in Indian River County has received massive emergency management attention at all levels of government. Emergency management planning and regulation relative to nuclear power plant accidents exists at the Federal, State, local, and corporate levels.

4.2.1.2 Risk Assessment

Although extensive safeguards are required, accidents can occur. These could affect large populations through the accidental release of radiation. Other sources of radiological accidents can occur through transportation of radioactive materials and the launching of spacecraft from Kennedy Space Center. In addition, the King‘s Bay Nuclear Submarine Base is located in St. Mary‘s, Georgia, just across the state boundary of Northeast Florida. Although the facility has the potential to use and store nuclear materials, as a military facility it is not required to conduct the same radiological emergency preparedness programs as nuclear power plants, nor do they identify evacuation zones or ingestion pathways. Release of radiological materials due to a facility or transportation-related accident has the potential for affecting a number of Northeast Florida counties.

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.2 Power Failure

Hazard Identification. Power failure can result from a variety of related causes, including sagging lines due to hot weather, flashovers from transmission lines to nearby trees, and incorrect relay settings. According to the electric utility industry's trade

association, the potential for such disturbances is expected to increase with the profound changes now sweeping the electric utility industry.

To address times when generating capacity is tight, or falls below consumer demand due to State or local emergencies, the Florida Electrical Emergency Contingency Plan was developed. Alerts have been created to give early warning of potential electricity shortfalls and bring utilities, emergency management officials, and the general public to a state of preparedness. The Contingency Plan consists of four separate phases and procedures for each phase. (Florida Reliability Coordinating Council, 2011). The four phases are:

- **Generating Capacity Advisory** – A Generating Capacity Advisory is primarily for information purposes. It starts utility tracking activities, and it initiates inter-utility and inter-agency communication. No action by the public is required. General information may be distributed to consumers to forewarn them of conditions if necessary.
- **Generating Capacity Alert** – A Generating Capacity Alert starts actions to increase reserves. Available emergency supply options will be explored. When reserves fall below the size of the largest generating unit in the state, loss of that size unit to an unexpected mechanical failure could lead to blackouts somewhere since insufficient backup is available.
- **Generating Capacity Emergency** – A Generating Capacity Emergency occurs when blackouts are inevitable somewhere in Florida. Every available means of balancing supply and demand will be exhausted. Rolling blackouts, manually activated by utilities, are a last resort to avoid system overload and possible equipment damage. Frequent status reports are provided to agencies and the media. The Division of Emergency Management will consider using the Emergency Broadcast System to inform citizens of events and to direct them to available shelters if conditions warranted. Recognizing the consequences of a loss of electricity, individual utility emergency plans include provisions for special facilities critical to the safety and welfare of citizens.
- **System Load Restoration** – System Load Restoration is instituted when rolling blackouts have been terminated and power supply is adequate. It is the recovery stage, and efforts are made to provide frequent system status reports.

Historic Events. In the U.S., from 2 July to 10 August 1996, the Western States Utility Power Grid reported widespread power outages that affected millions of customers in several western states and adjacent areas of Canada and Mexico.

A massive power outage struck the northeast on Thursday, 14 August 2003. Areas affected by the outage included New York City and Albany, New York; Cleveland and Toledo, Ohio; Detroit and Lansing, Michigan; parts of New Jersey and Connecticut; as well as Toronto and Ontario, Canada. The most extensive power failure in history, it shut down 10 major airports, 9 power plants, affected 50 million people, and led to a declared State of Emergency in New York City. The Ford Motor Company lost production capability at 21 of its facilities. Two deaths and 71 fires were attributed to the outage in New York City alone (Gellman and Milbank, 2003). The preliminary economic impacts of this event are large. It is

estimated that the power failure cost approximately $1 billion, including $800 million in unsold goods and services and $250 million in spoiled food.

Starting Aug 31, 2005, Hurricane Katrina caused widespread power outages throughout Louisiana, Mississippi, Alabama, Florida, Kentucky and Tennessee. Exact totals are hard to even define especially in Louisiana parishes which became unoccupied for months. Power was also knocked out to 1.3 million customers when Katrina passed over Florida several days earlier. In total 2.6 million people were left without power as a result of the storm across the United States.

On February 26, 2008 a failed switch and fire at an electrical substation outside Miami triggered widespread blackouts in parts of Florida affecting four million people. The nuclear reactors at Turkey Point power plant were shut down on the 84° F day. The failure knocked out power to customers in 35 southern Florida counties and spread into the northern Florida peninsula. The affected region ultimately ranged from Miami to Tampa on the state's west coast and Brevard County, home to Cape Canaveral and the Kennedy Space Center, on the east.

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.2.1 Vulnerability Assessment

Power failure can have the following potential impacts on Indian River County:

- Electrical power outage;
- Surface and air transportation disruption;
- Potable water system loss or disruption;
- Sewer system outage;
- Telecommunication system outage;
- Human and health safety;
- Psychological hardship;
- Economic disruption; and
- Disruption of community services

4.2.2.2 Risk Assessment

Power failures have the same potential impacts in all Indian River County communities. The vulnerabilities of all communities to power failures is considered moderate. The power grid throughout Indian River County is diversified, and there are no single choke points or distribution nodes whose failure would disrupt power distribution to the entire community.

4.2.3 Hazardous Materials Accidents

Hazardous materials accidents can occur anywhere there is a road, rail line, pipeline, or fixed facility storing hazardous materials. Virtually the entire state is at risk to an unpredictable accident of some type. Most accidents are small spills and leaks, but some result in injuries, property damage, environmental contamination, and other consequences. These materials can be poisonous, corrosive, flammable, radioactive, or pose other hazards and are regulated by the Department of Transportation. However, out of approximately 1,945

hazardous materials incidents reported statewide in 2018, six fatalities were reported, 37 were injured, and 123 were evacuated.

Emergencies involving hazardous materials can be expected to range from a minor accident with no off-site effects to a major accident, which may result in an off-site release of hazardous or toxic materials. The overall objective of chemical emergency response planning and preparedness is to minimize exposure for a wide range of accidents that could produce off-site levels of contamination in excess of Levels of Concern established by the EPA. Minimizing this exposure will reduce the consequences of an emergency to people in the area near to facilities that manufacture, store, or process hazardous materials (Treasure Coast Regional Planning Council, 2014).

A large volume of hazardous materials is transported to and through the County by railroad and highway, air, water, and pipeline daily. Within Indian River County, there are a number of both public and private fixed facilities that produce or use hazardous materials. Coordinating procedures for hazardous material response are found within the County's Emergency Plan for Hazardous Materials.

Mishandling and improper disposal or storage of medical wastes and low-level radioactive products from medical use are also a hazard to Indian River County. For example, several years ago an incident occurred in New Jersey when improper disposal of medical wastes resulted in some of the used products ending up on Atlantic Ocean beaches.

4.2.3.1 Vulnerability Assessment

Hazardous materials events can have the following potential impacts within Indian River County:

- Surface and air transportation disruption;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Fire; and
- Toxic releases.

A community's vulnerability to hazardous materials accidents depends on three factors. These are

1) The major transportation routes that pass through the community;
2) The hazardous material generators located in or near the community; and
3) The resources in terms of people and property are in an area of possible impact from a hazardous materials release.

Overall, Indian River County has a moderate vulnerability to impacts from hazardous materials releases. There are relatively few major generators within the County, and those that do exist are generally away from major population centers. An area of high vulnerability for hazardous materials accidents is the City of Vero Beach, due to the transportation network (both highway and rail) that passes through the area.

4.2.3.2 Risk Assessment

Historic Events. Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.4 Transportation System Accidents

Florida has a large transportation network consisting of major highways, airports, marine ports, and passenger railroads. The heavily populated areas of Indian River County are particularly vulnerable to serious accidents, which are capable of producing mass casualties. With the linear configuration of several major highways in Indian River County, such as interstate highways and the Florida Turnpike, major transportation accidents could occur in a relatively rural area, severely stressing the capabilities of local resources to respond effectively. Installing cameras on interstate highways and major transportation routes can assist in monitoring movement throughout the County, as well as provide for quicker response to traffic system accidents as well. A notorious example is the crash in the Everglades of ValuJet Flight 597 on 11 May 1996, which resulted in 109 fatalities and cost millions of dollars, severely taxing the financial and public safety resources of Dade County (FDCA, 2001). Similarly, a major transportation accident could involve a large number of tourists and visitors from other countries, given Florida's popularity as a vacation destination, further complicating the emergency response to such an event. In the past, wildland fires in Florida have forced the closing of interstate highways, creating tremendous impacts on the transportation systems.

As a major industrial nation, the U.S. produces, distributes, and consumes large quantities of oil. Petroleum-based oil is used as a major power source to fuel factories and various modes of transportation, and in many everyday products, such as plastics, nylon, paints, tires, cosmetics, and detergents (EPA, 1998). At every point in the production, distribution, and consumption process, oil is stored in tanks. With billions of gallons of oil being stored throughout the country, the potential for an oil spill is significant, and the effects of spilled oil can pose serious threats to the environment.

In addition to petroleum-based oil, the U.S. consumes millions of gallons of non-petroleum oils, such as silicone and mineral-based oils and animal and vegetable oils. Like petroleum products, these non-petroleum oils are often stored in tanks that have the potential to spill, causing environmental damages that are just as serious as those caused by petroleum-based oils. To address the potential environmental threat posed by petroleum and non-petroleum oils, the EPA has established a program designed to prevent oil spills. The program has reduced the number of spills to less than 1% of the total volume handled each year (EPA, 1998).

Indian River County has about 18 miles of Atlantic Ocean coastline that is subject to contamination caused by an oil spill. By Executive Order, the responsibility for preparing response plans for coastal oil spills is designated to the Florida Department of Environmental Protection, Division of Florida Marine Patrol (Indian River County Emergency Management Division, 2000). The Florida Coastal Pollutant Spill Plan has been prepared to coordinate response procedures and recovery efforts after a spill. There are two active oil field regions in Florida: in Escambia and Santa Rosa counties in the Panhandle, and Collier, Dade, Hendry, and Lee counties in southwest Florida.

4.2.4.1 Vulnerability Assessment

Transportation system accidents can have the following potential impacts within Indian River County:

- Surface and air transportation disruption;
- Navigable waterway impairment;
- Human health and safety;
- Economic disruption;
- Disruption of community services;
- Fire; and
- Toxic releases.

Vero Beach Regional Airport began limited commercial air service in the later part of 2015. The airport is also home to a major general aviation facility (Piper Aircraft) with two large flight schools, and considerable private and charter air traffic. Aviation is an important element of the economy in Indian River County, and this activity raises the County's vulnerability to aviation-associated accidents. Vulnerability to transportation system accidents also is associated with the highway and rail systems that run through the County. Individual community and population center vulnerabilities to this hazard are entirely dependent upon location. The cities of Vero Beach and Sebastian have higher vulnerabilities to rail system accidents. The western unincorporated portion of the County has a higher vulnerability to major highway accidents due to the presence of I-95. The Towns of Orchid and Indian River Shores have a low vulnerability in this area. The Florida East Coast Railroad blocks traffic to the hospital when trains pass through town; grade separated overpasses are necessary at 41st Street, Aviation Boulevard and 33rd Street, and 4th Street.

4.2.4.2 Risk Assessment

Historic Events. Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.5 Wellfield Contamination

Hazard Identification. The development of wellfield protection programs is a major preventative approach for the protection of community drinking water supplies. Wellfield protection is a means of safeguarding public water supply wells by preventing contaminants from entering the area that contributes water to the well or wellfield over a period of time. Management plans are developed for the wellfield protection area that include inventorying potential sources of ground water contamination, monitoring for the presence of specific contaminants, and managing existing and proposed land and water uses that pose a threat to ground water quality.

Ground water is an essential natural resource. It is a source of drinking water for more than half of the U.S. population and more than 95% of the rural population (Browning, 1998). In addition, ground water is a support system for sensitive ecosystems, such as wetlands or wildlife habitats.

Between 1971 and 1985, there were 245 ground water-related outbreaks of disease, resulting in more than 52,000 individuals being affected by associated illnesses

(Browning, 1998). While most of these diseases were short-term digestive disorders caused by bacteria and viruses, hazardous chemicals found in wells nationwide also pose risks to public health.

The 1986 Amendments to the Federal Safe Drinking Water Act require states to implement wellfield protection programs for public water wells. Prevention strategies include maintaining isolation distances from potential contamination sources, reporting to the state violations of isolation distance, and asking a local governmental unit to regulate these sources.

Cleaning up contaminated ground water can be technically difficult, extremely expensive, and sometimes simply cannot be done. Contaminated ground water also affects the community by discouraging new businesses or residents from locating in that community.

4.2.5.1 Vulnerability Assessment

Wellfield contamination can have the following potential impacts within Indian River County:

- Potable water system loss or disruption;
- Sewer system outage;
- Human health and safety;
- Psychological hardship;
- Economic disruption; and
- Disruption of community services.

Wellfield contamination has not been a major problem for most of Indian River County. There is some potential exposure to this hazard in the eastern portion of the County, but overall, the County vulnerability to this hazard is considered low. The County addresses the issue of wellfield contamination in the Comprehensive Growth Management Plan – Future Land Use Element.

4.2.5.2 Risk Assessment

Historic Events. Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.6 Communications Failure

Hazard Identification. As society emerges from industrial production into the age of information, we are seeing new kinds of technological accidents/disasters. The Galaxy 4 satellite outage in 1998 deactivated 40 million pagers in North America for several hours. Pagers at that time were heavily used by doctors and patients for emergency surgeries. Radio and other forms of news broadcasts also were affected. The pager failure not only affected personal and business communications, but emergency managers and medical personnel as well.

Although telephone calls by land lines are among the safest communication technology, and the most resistant to space weather effects, they have also been in rapid decline thanks to the wide spread adoption of cellular and mobile phones, especially among the under-30 population. According to the Pew Research Center

(https://www.pewinternet.org/fact-sheet/mobile/) the vast majority of Americans – 96% - now own a cellphone of some king. The share of Americans that own smartphones is now 81%, up from just 35% in Pew Research Center's first survey of smartphone ownership conducted in 2011. In terms of space weather vulnerability, there is one important caveat. Without an electrical power grid, conventional land-lines fail, and cell phones may not be recharged even though the cell towers may have emergency backup power capability. An example of this vulnerability occurs whenever natural disasters strike and cell towers are unavailable, or the crushing load of cell traffic renders the local tower network unusable. Moreover, one does not have to wait for power grid failure to have an impact on cell phone access during episodes of solar activity (Space Weather – Impacts, Mitigation and Forecasting – (https://www.vsp.ucar.edu/Heliophysics/pdf/Odenwald_SpaceWeather-Final.pdf).

4.2.6.1 Vulnerability Assessment

Communication failure can have the following potential impacts within Indian River County:

- Telecommunications system outage;
- Economic disruption; and
- Disruption of community services.

Communications failures have a greater potential to produce adverse economic impacts in business-based rather than retirement or residential communities. On the other hand, communications system failures in residential and retirement communities may put more human lives at risk. Indian River County's vulnerability to communications systems failures is generally considered moderate. The City of Vero Beach has a higher vulnerability to this hazard because it is the center of government and business within the County, and Fellsmere has a low vulnerability due to its location and small population size. Basically, Indian River County's vulnerability to this hazard is no greater or less than most other Florida coastal counties.

4.2.6.2 Risk Assessment

Historic Events. Due to the low probability of occurrence, this hazard will not be fully profiled.

4.2.7 Unexploded Military Ordnance

Hazard Identification. Unexploded military ordnance is a hazard unique to Indian River County. The military used the Fort Pierce Naval Amphibious Training Base, an area of about 19,000 acres between Vero Beach and Jensen Beach, during World War II for amphibious training and to develop and test procedures for breaching and removing beach fortifications expected to be encountered in Europe and Japan. A variety of ordnance was tested against these fortifications. Training at the base included testing of bombs, rockets, and mines. Several explosive devices left over from these training missions have been found along the shores of Vero Beach and Ft. Pierce. Public exposure to unexploded ordnance could occur primarily as a result of three types of activities: earth moving (building construction, pool construction, and major landscaping), recreational diving, and use of beach areas. Unexploded ordnance also may wash ashore or be exposed after storms (Indian River County Department of Emergency Services, 2002). The U.S. Army Corps of Engineers (Jacksonville office) with the full cooperation of Indian River County Department of

Emergency Services, is responsible for coordinating the disposal of any found items with the U.S. Navy, the U.S. Coast Guard, Florida Fish and Wildlife Conservation Commission and Indian River County.

The most recent finding, in January, 2014, was during an offshore removal action conducted by the U.S. Army Corps of Engineers (Corps) in Indian River County, south of Vero Beach, to address debris associated with past military activities in the area. Contractors discovered two suspected bombs in approximately 11 feet of water. An explosives and ordnance disposal unit from the Mayport Naval Station excavated the items and towed them approximately one mile offshore for assessment and possible underwater detonation.

4.2.7.1 Vulnerability Assessment

Unexploded military ordnance can have the following potential impacts within the coastal communities of Indian River County, specifically the coastal areas of the City of Vero Beach and unincorporated coastal areas of Vero Beach:

- Health and human safety;
- Psychological hardship;
- Damage to critical environmental resources; and
- Toxic release.

There is some exposure to risk from unexploded military ordnance in Indian River County, but the overall vulnerability of County residents to this hazard is very low. The communities most vulnerable to this hazard are the City of Vero Beach and the unincorporated areas along the eastern side of Hutchinson Island south of Vero Beach to the St. Lucie County line. While old military ordnance does occasionally surface along these beaches, there has never been a case where this ordnance was still live.

4.2.7.2 Risk Assessment

Historic Events. Due to the low probability of occurrence, this hazard will not be fully profiled.

4.3 SOCIETAL HAZARDS

This subsection will now identify those hazards in Indian River County identified as being societal hazards.

4.3.1 Terrorism and Sabotage

4.3.1.1 Terrorism

Hazard Identification. Terrorist attacks may take the form of induced dam or levee failures, the use of hazardous materials to injure or kill, or the use of biological weapons to create an epidemic. While there have not been any successful acts of terrorism committed in Florida in recent years, it is recognized that the state has many critical and high-profile facilities, high population concentrations, and other potentially attractive venues for terrorist activity that are inherently vulnerable to a variety of terrorist methods. Governmental/political, transportation, commercial, infrastructure, cultural, academic, research, military, athletic, and other activities and facilities constitute ideal targets for

terrorist attacks, which may cause catastrophic levels of property and environmental damage, injury, and loss of life. Furthermore, a variety of extremist groups are known to operate within Florida, and potential terrorist attacks have been investigated and averted in recent years (Indian River County Department of Emergency Services, 2002).

Acts of terrorism also are capable of creating disasters that threaten the safety of a large number of citizens. The U.S. has been relatively untouched by the storm of terrorist activities experienced in other parts of the world; however, in recent years, an increasing incidence of terrorism has been recorded in this nation.

The Federal government has recognized that the U.S. has entered the post-Cold War era. As a result, Federal planning guidelines regarding military threats are in transition. However, nuclear weapons continue to be a serious planning concern especially in areas surrounding military installations (Indian River County Department of Emergency Services, 2002). Those involved with the emergency management of government monitor the influx of undocumented aliens into south Florida from areas unfriendly to the interests of the U.S.

***Historical Events*.** On 11 September 2001, terrorists attacked the World Trade Center in New York City and the Pentagon in Washington, DC, crashing hijacked commercial airplanes into the structures. All told, approximately 3,000 civilians and emergency response personnel perished in the attack. The long-term economic and psychological impacts of this event are astounding. New York City alone experienced capital losses totaling 34 million dollars. The attack on the World Trade Center resulted in a loss of 12.5 million square feet of office space and damaged 7.7 million more. The insured losses associated with the event totaled 52 million dollars. The City estimates that 125,300 jobs were lost because of the attack (National Conference of State Legislatures, 2003). The September 11th attacks also had local connections to Indian River County as some of the New York City terrorists received flight training at the Vero Beach Municipal Airport.

An American-born man who’d pledged allegiance to ISIS gunned down 49 people at the Pulse Nightclub in Orlando. This was considered the deadliest mass shooting in the United States and the nation’s worst terror attack since 9/11.

A teen gunman has been accused of opening fire with a semi-automatic rifle at his former high school in Parkland, Florida. Seventeen people were killed and another 14 were wounded. This incident was in the top 5 worst school massacres in United States history.

4.3.1.2 Computer Accidents and Sabotage

Hazard Identification. The President's Commission on Critical Infrastructure Protection (PCCIP) recently reported that there is increasing threat that the U.S. could suffer something similar to an "Electronic Pearl Harbor" (Rubin, 1998). Networked information systems present new security challenges in addition to the benefits they offer. Long-term power outages could cause massive computer outages, with severe economic impacts such as loss of sales, credit checking, banking transactions, and ability to communicate and exchange information and data. "Today, the right command sent over a network to a power generating station's control computer could be just as effective as a backpack full of explosives, and the perpetrator would be harder to identify and apprehend," states the PCCIP report.

With the growth of a computer-literate population, increasing numbers of people possess the skills necessary to attempt such an attack. The resources to conduct a cyber-attack are now easily accessible everywhere. A personal computer and an Internet service provider anywhere in the world are enough to cause a great deal of harm. Threats include (Rubin, 1998)

- Human error;
- Insider use of authorized access for unauthorized disruptive purposes;
- Recreational hackers - with or without hostile intent;
- Criminal activity - for financial gain, to steal information or services, or organized crime;
- Industrial espionage;
- Terrorism - including various disruptive operations; and
- National intelligence - information warfare, intended disruption of military operations.

The effects of such activities may take the form of disruption of air traffic controls, train switches, banking transfers, police investigations, commercial transactions, defense plans, power line controls, and other essential functions. As the Internet becomes more and more important, the loss of its services, whether by accident or intent, becomes a greater hardship for those relying on this new form of communication. Computer failures could affect emergency communications as well as routine civilian applications, such as telephone service, brokerage transactions, credit card payments, Social Security payments, pharmacy transactions, airline schedules, etc.

4.3.1.3 Vulnerability Assessment

Terrorism and sabotage events can have the following potential impacts within Indian River County:

- Electric power outage;
- Surface and air transportation disruption;
- Potable water system loss or disruption;
- Sewer system outage;
- Telecommunications system outage;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Damage to critical environmental resources;
- Damage to identified historical resources;
- Fire; and
- Toxic releases.

The possibilities for terrorism and sabotage in Indian River County are extremely limited, and the County's vulnerability to this hazard is very low. The City of Vero Beach has a slightly higher vulnerability to terrorism as the center of government, but this vulnerability is still considered low.

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

4.3.2 Civil Disturbance

Hazard Identification. As in any other area, Indian River County is subject to civil disturbances in the form of riots, mob violence, and a breakdown of law and order in a focalized area. Communities with racial mixtures, gang violence, and drug trafficking are increasingly aware of the need to plan for civil disturbance emergencies (Indian River County Department of Emergency Services, 2002). Although they can occur at any time, civil disturbances are often preceded by periods of increased tension caused by questionable social and/or political events such as controversial jury trials or law enforcement actions (Indian River County Department of Emergency Services, 2002). Police services are responsible for the restoration of law and order in any area of the County.

4.3.2.1 Vulnerability Assessment

Civil disturbance can have the following potential impacts within Indian River County:

- Surface and air transportation disruption;
- Human health and safety;
- Psychological hardship;
- Economic disruption;
- Disruption of community services;
- Damage to identified historical resources; and
- Fire.

The potential for civil disturbances in Indian River County is considered very low. The City of Vero Beach has a moderate vulnerability in this area, but in general, civil disturbance is not a significant hazard faced by Indian River County.

4.3.2.2 Risk Assessment

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

4.3.3 Immigration Crisis

Hazard Identification. Florida's location as the nearest U.S. landmass bordering the Caribbean basin makes it a chosen point of entry for many migrants attempting to enter the country illegally. A major consequence of a mass arrival of illegal immigrants could be disruption to the routine functioning of the impacted community, resulting in significant expenditures related to the situation. An example of this threat occurred in 1994, when the State responded to two mass migration incidents. In May 1994, there was an unexpected migration of approximately 100 Haitian refugees; while in August 1994, there was an influx of 700 Cubans (Indian River County Department of Emergency Services, 2002). These events are typically preceded by periods of increasing tension abroad, which can be detected and monitored. Enforcement of immigration laws is a Federal government responsibility. However, it is anticipated that joint jurisdictional support of any operation will be required from the State and local governments.

The Atlantic shore of Indian River County is the frequent scene of the arrival of undocumented aliens, usually Haitian or Cuban (Indian River County Department of Emergency Services, 2002). The County has both the history and the potential for the unannounced arrival of a large number of aliens. Until relieved of the responsibility by the State and Federal governments, Indian River County must be capable of providing mass refugee care to include shelter, food, water, transportation, medical, police protection, and other social services.

4.3.3.1 Vulnerability Assessment

Immigration crises can have the following potential impacts within the coastal areas of Indian River County; more specifically Vero Beach, Indian River Shores, and Orchid:

- Human health and safety;
- Psychological hardship;
- Economic disruption; and
- Disruption of community services.

Reviewing the data on past illegal immigration and mass population movements such as the Haitian influx and Cuban raft incidents of the 1980's indicates that illegal immigration has never reached a crisis state for the local authorities in Indian River County. Overall, the County vulnerability to this hazard is very low. Due to demographic features, the City of Vero Beach has a slightly higher, but still low vulnerability to illegal immigration impacts.

4.3.3.2 Risk Assessment

Extent: Due to the low probability of occurrence, this hazard will not be fully profiled.

4.4 LIFE SAFETY AND PROCEDURES FOR WARNING AND EVACUTION

Indian River County Emergency Management is committed to helping our citizens prepare for and recover from any disaster that may impact our community. Our emergency plans subscribe to an all-hazards approach to emergency management, not just specific types of hazards but increasing preparedness for any type of hazard. A Public Outreach/Communication Strategy was developed and was made an annex of Indian River County's Comprehensive Emergency Management Plan (CEMP). The goals of the Public Outreach Strategy are to:

a. Identify a strategy to inform county residents and business owners about hazards that may impact our community (including flood hazards).
b. Identify the numerous ways Indian River County relays preparedness, protective action, and recovery activities to our residents.
c. Familiarize residents with appropriate property protection measures.
d. Provide guidance to the Indian River County Community Rating System (CRS) Coordinator for submittal for credit under the National Flood Insurance Program's Community Rating System.

4.5 SUMMARY

Indian River County's proximity to water and large population concentrations contribute to the heightened potential for property and content damage, loss of life, community and emergency service disruption, and economic losses due to flooding associated with both flooding and storm surge. While flooding is the most probable and frequent hazard in Indian River County, wind damage associated with tornadoes and severe thunderstorms can be significant hazards due to construction materials and methods. Because agriculture plays such a large role in the Indian River County economy, agricultural pests and diseases, droughts, and temperature extremes are important hazards against which to mitigate.

The **City of Vero Beach's** location adjacent to the Atlantic Ocean and Intracoastal Waterway make it especially vulnerable to water and wind-related hazards as well as coastal erosion. The City has low to moderate risk from wildland fires due to its location and development patterns.

The **Town of Indian River Shores**, located on the barrier island, is particularly vulnerable to flooding, coastal erosion, and both water and wind associated with tropical storms and hurricanes. The Town has a low risk from wildland fires due to its location and development patterns.

The **Town of Orchid**, located on the barrier island, is particularly vulnerable to flooding, coastal erosion, and both water and wind associated with tropical storms and hurricanes. The Town has a low risk from wildland fires due to its location and development patterns.

The **City of Sebastian**, located adjacent to both the Intracoastal Waterway and Sebastian Creek is vulnerable to flooding and storm surge. The majority of the City has been

assessed as having a moderate wildland fire risk due to its location and development patterns.

The **Town of Fellsmere** is less vulnerable to the impacts of tropical storms and hurricanes due to its location west of I-95; however, its rural nature, makes it more susceptible to the impacts of wildland fires.

Indian River County is a large and diversified County, and while all County residents are exposed to some degree to the hazards identified in **Table 4.15**, geographic location as well as other factors greatly affects individual vulnerabilities to specific hazards. While there are only five incorporated jurisdictions in Indian River County, there are several geographically distinct urbanized population centers, and their relative vulnerabilities have also been indicated in **Table 4.15**.

Because mitigation dollars tend to be scarce, it is important for communities to use the dollars on projects or activities that are cost effective. FEMA has made cost effectiveness a requirement of funding for most of their programs. Cost-effective projects are those that aim to reduce, if possible, the frequency, vulnerability, and exposure of hazards in the community. **Table 4.16** summarizes Indian River County's risk or potential for loss relative to each of the hazards identified.

Those hazards identified in our plan as having low or very low hazard vulnerability will not be required to have project representation due to the reduced likelihood of a jurisdiction experiencing damage from that hazard.

Table 4.15. Indian River County hazard vulnerability by incorporated jurisdiction and population centers.

Hazard Category	Jurisdictions					Population Centers						County
	Town of Fellsmere	Town of Indian River Shores	Town of Orchid	City of Sebastian	City of Vero Beach	Unincorporated Orchid Island	South County Area	Route 60 Area	Wabasso Area	Vero Lake Estates	Western County	Overall Vulnerability
Natural Hazards												
Flood	●	●	●	●	_	●	●	●	●	●	_	●
Hurricane/tropical storm	●	●	●	●	●	●	●	●	●	●	_	●
Tornado	_	□	□	_	_	□	_	_	_	_	_	_
Severe thunderstorm/lightning	_	_	_	_	●	_	_	_	_	_	_	_
Drought	_	□	□	_	_	□	_	□	_	□	□	_
Temperature extremes	□	_	_	□	□	□	_	□	_	□	_	_
Agricultural pests and diseases	□	_	_	□	_	□	_	_	●	□	●	_
Wildfire	_	□	□	□	□	□	_	_	●	_	●	_
Muck fires	○	○	○	○	○	○	□	○	○	○	□	○
Soil/beach erosion	○	_	_	□	●	_	□	□	□	□	○	_
Epidemic	_	□	□	_	_	□	_	_	_	_	□	_
Seismic hazards (sink holes/soils failure)	□	□	□	□	□	□	□	□	□	□	□	□
Tsunami	○	□	□	□	□	□	□	□	□	□	□	□

● = High, _ = Moderate, □ = Low, and ○ = Very Low.

Table 4.15. (Continued).

Hazard Category	Jurisdictions					Population Centers						County
	Town of Fellsmere	Town of Indian River Shores	Town of Orchid	City of Sebastian	City of Vero Beach	Unincorporated Orchid Island	South County Area	Route 60 Area	Wabasso Area	Vero Lake Estates	Western County	Overall Vulnerability
Technological Hazards												
Hazardous materials accident	_	○	○	_	_	○	_	_	□	□	_	_
Radiological accidents including nuclear power plant accidents	_	_	_	_	●	●	●	●	_	_	_	_
Communications failure	□	□	□	□	_	□	□	_	□	□	○	□
Transportation system accidents	□	○	○	_	●	□	_	_	_	□	□	□
Wellfield contamination	_	□	□	_	_	□	_	_	_	□	□	_
Power failure (outages)	_	_	_	●	●	_	_	●	_	_	□	_
Unexploded military ordnance	○	□	□	○	□	□	○	○	○	○	○	○
Societal Hazards												
Civil disturbance	□	○	○	□	□	○	□	□	□	○	○	□
Terrorism and sabotage	○	□	□	○	□	○	○	○	○	○	○	○
Immigration crisis	□	○	○	□	□	○	□	□	□	○	○	□

Unincorporated Hutchinson Island = Areas of the barrier not within city jurisdictions.
South County Area = The area south of the City of Vero Beach and west of the Indian River (Both sides of U.S. Highway 1).
Route 60 Area = Area west of the City of Vero Beach along Route 60 between the City and I-95.
Wabasso Area = The area to the south of the City of Sebastian.
Vero Lake Estates = The large development area west and south of the City of Sebastian.
Western County = Area west of I-95.

● = High, _ = Moderate, □ = Low, and ○ = Very Low.

Table 4.16. Risk assessment and hazard evaluation for Indian River County.

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
Natural Hazards							
Floods	X			Flooding significant enough to damage property occurs regularly in Indian River County. This is particularly true in unincorporated areas and in the Town of Fellsmere.	Countywide vulnerability is high but area specific.	Property damage along the coast of Indian River County occurs most often in the late winter or early spring and is associated with winter storms and northeasters. Flooding in the inland portions of the County occurs most often in the fall and is often associated with tropical depressions and tropical storms. Incidences of flooding in specific areas on Indian River County seem to be on the increase.	Frequency = High Vulnerability = High Exposure = High Risk = High
Hurricanes/Tropical Storms							
Tropical Storms	X			Pass within 100 nautical miles of Indian River County once or twice every year.	High from rain-associated flooding damages; relatively low from wind damage.	The major causes of damage associated with tropical storms are heavy rain and flooding. Many communities within Indian River County have particularly high vulnerabilities to flooding associated with these storms.	Frequency = High Vulnerability = High Exposure = Moderate Risk = High
Category 1 Hurricanes		X		Pass within 100 nautical miles of Indian River County once every 3.1 years.	High from rain-associated flooding; moderate from wind damage.	The continental shelf off Indian River County is beginning to widen. Consequently, Indian River County's vulnerability to storm surges from the Atlantic is relatively high when compared to counties to the south. According to Hazus, the 2014 building exposure estimate for a probabilistic hurricane event in Indian River County is $16,308,608.	Frequency = High Vulnerability = High Exposure = High Risk = High
Category 2 Hurricanes		X		Pass within 100 nautical miles of Indian River County once every 5.3 years.	High from rain-associated flooding; significant from wind damage.	Winds in Category 2 storms range from 96 to 110 mph. Significant damage is possible in older wood frame residential construction. According to Hazus, the 2014 building exposure estimate for a probabilistic	Frequency = High Vulnerability = High Exposure = High Risk = High

*As defined on Page 4-1

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
						hurricane event in Indian River County is $16,308,608.	
Category 3 Hurricanes		X		Pass within 100 nautical miles of Indian River County once every 11.5 years	Very high from rain-associated flooding coupled with storm surge; major from wind damage.	Winds in Category 3 storms range from 111 to 130 mph. These winds can do major damage to most residential construction. According to Hazus, the 2014 building exposure estimate for a probabilistic hurricane event in Indian River County is $16,308,608.	Frequency = Moderate Vulnerability = High Exposure = High Risk = High
Category 4 Hurricanes			X	Pass within 100 nautical miles of Indian River County once every 202 years.	Very high from rain-associated flooding coupled with storm surge; massive from wind damage.	Sustained winds in a Category 4 hurricane range from 131 to 155 mph. There are very few commercial structures in Indian River County engineered to withstand such winds. According to Hazus, the 2014 building exposure estimate for a probabilistic hurricane event in Indian River County is $16,308,608.	Frequency = Low Vulnerability = High Exposure = High Risk = Moderate
Category 5 Hurricanes			X	Pass within 100 nautical miles of Indian River County once every 1,500 years	High from rain-associated flooding; catastrophic in terms of wind damage.	Sustained winds in a Category 5 hurricane range upward from 155 mph. Very few structures can withstand these winds. Massive flooding may occur in the western part of the County resulting from the storm surge in Lake Okeechobee. According to Hazus, the 2014 building exposure estimate for a probabilistic hurricane event in Indian River County is $16,308,608.	Frequency = Very Low Vulnerability = High Exposure = High Risk = Low
Tsunami/Rogue Wave Occurance	X			Only one Atlantic-wide tsunami was documents (the 1755 Lisbon earthquake); however the eastern U.S. has had 40 tsunamis/rogue waves in the last 400 years, or an average of	Florida's greatest risk of a tsunami would originate from the Puerto Rico Trench.	Approximately 33% of the total state population lives within 20 miles of the coast. The designated Tsunami Hazard Zone is the region from east of Highway A1A to the Atlantic.	Frequency = Very Low Vulnerability = Very Low Exposure = Very Low Risk = Very Low

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
				one event every 10 years.			
Tornadoes		X		Between 1950 and 2014 there were 20 tornado events reported from Indian River County. In tornado prone southeast Florida, the odds of a tornado striking any specific location are once every 250 years.	Between 1950 and 2014, tornadoes caused one injury and $1.94 million in property damage in the County. In the County, tornadoes cause an average of $30,312 in property damage per year.	Tornadoes are rated from 0 to 5 based on their path length and mean width (Enhanced Fujita Scale). EF0 tornadoes cause light damage, and EF5 tornadoes cause incredible or catastrophic damage. Of the 20 tornadoes reported from Indian River County between 1950 and 2014, 8 were classified as F0 (40%), 4 were EF0 (20%), 6 were F1 (30%), and 2 were F2 (10%).	Frequency = Moderate Vulnerability = Moderate Exposure = Low Risk = Low
Severe Thunderstorms and Lightning	X			Between 1950 and 2014 67 severe thunder and lightning storms were reported in Indian River County. (1.05 per month).	These storms resulted in 2 fatalities (lightning) and 9 injuries (2/thunderstorms; 7/lightning), and a total of $2.06 million in reported property damage (also from lightning). This represents an average of $32,265 in damages per year. Wood structures are particularly vulnerable to lightning damage. We are a coastal community. Beaches are very open places, making beachgoers, swimmers, and boaters exceptionally vulnerable to lightning strikes.	Thunderstorms with strong wind, downbursts, hail, and lightning are very common on Florida's southeast coast. Lightning is responsible for more than $35 million in total insurance industry losses annually (January 2015). http://www.lightningsafety.com/nlsi_pls/perstemplate.html	Frequency = High Vulnerability = Moderate Exposure = Moderate Risk = Moderate

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
Drought	X			Every year, some portion of the U.S. endured drought conditions. Florida has recently experienced drought conditions annually in the spring and summer.	Indian River County's vulnerability to drought-related and economic loss can occur in many areas. Direct impacts include reduced crop yield, increased fire hazard, reduced water levels, increased livestock and wildlife mortality rates, and damage to wildlife and fishery's habitat. While drought causes little structural damage, the social impacts include public safety, health, conflicts between water users, and general reduction in the quality of life.	Indian River County's most direct exposure to drought is the economic loss endured by its agricultural community. The average annual market value of agricultural projects from Indian River County is approximately $145 million.	Frequency = High Vulnerability = Moderate Exposure = High Risk = Moderate
Temperature Extremes	X			Between 1950 and 2014, four frost/freeze events have been reported for Indian River County. Prolonged periods of extremely high temperatures are relatively rare in Indian River County; however, due to the consistently high humidity, the local "heat index" is often	Indian River County as a whole has a high economic vulnerability to freezing temperatures. The most significant area of impact is the commercial agricultural segment of the community, but countywide cold-sensitive ornamental landscaping also leaves many entities, public and private, open	While the loss of life from either extreme low or high temperatures in Indian River County is not great compared to national statistics, Indian River County does have a significant economic exposure to low temperatures in both the public and private sectors.	Frequency = Moderate Vulnerability = Moderate Exposure = Moderate Risk = Moderate

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
				significantly above the actual temperature during the summer months.	for significant economic loss. While the frequency of "heat waves" is low, the frequency of heat indexes within the range of causing health problems is moderate to high during the summer months. Elderly people, young children, and those who are sick or overweight are more likely to become victims of extreme heat.		
Agricultural Pests and Diseases	X			To date, infestations of agricultural plant diseases in Indian River County have been rare. Livestock diseases and wild animal vector diseases such as rabies continue to be a problem.	Indian River County is highly vulnerable to agricultural diseases and pests due to its location and the amount of traffic that passes through it.	Exposure to agricultural pests, particularly livestock diseases, is high in terms of the County's agricultural community. The average annual market value of agricultural products in Indian River County as of 2012 was about $145 million.	Frequency = Moderate Vulnerability = Moderate Exposure = High Risk = Moderate
Wildfire		X		Wildland fires have become a common annual occurrence in wooded areas during Florida's dry season.	Wildland fire is a significant and frequent hazard in specific areas of Indian River County. Vulnerability varies extensively with location.	Exposure to wildland fire varies greatly across Indian River County. While exposure is relatively low along the County's urbanized coastline, it is quite high in some of the landlocked interior communities. Mitigation projects addressing this issue need to be evaluated on a case by case basis.	Frequency = Moderate Vulnerability = Moderate Exposure = Moderate Risk = Moderate

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
Muck Fires	X			Muck fires are not a frequent threat to Indian River County. They occur during periods of extreme drought, when the swamp muck becomes dried out and is ignited. Once ignited, these fires burn deep within the muck and are extremely difficult to extinguish.	Areas with the highest vulnerability to this hazard are on the western side of the County.	There have been no significant muck fires in Indian River County in the last 30 years, and this hazard is considered to be a limited danger. There were significant muck fires in the Everglades in the 1980's. Because the fires are so difficult to extinguish, they become significant air quality problems. Specific mitigation projects must be evaluated based on location and potential danger.	Frequency = Low Vulnerability = Low Exposure = Low Risk = Low

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
Soil/Beach Erosion		X		Beach erosion constantly occurs along Indian River County's coastline. In some areas, specific structures are threatened. Other specific sites where erosion is a persistent problem are along stormwater drainage points into the Intracoastal Waterway and along canals.	All the coastal communities have high vulnerability relative to beach erosion. Beach erosion problems require public and private cooperation to address. Potential long-term mitigation will focus on overall sand budgets and sand transport rates. Mitigation projects in this area should be evaluated carefully by experienced coastal engineers. The erosion vulnerability is associated with stormwater outfalls and canals and is limited and site-specific in nature. Non-elevated structures along the coast are most vulnerable to coastal erosion.	Some specific locations have a higher "immediate exposure" than others. Overall, Indian River County's exposure to direct economic losses from erosion is moderate. Within the City of Vero Beach, this exposure is high. Stormwater drainage outfall and canal bank stabilization projects should be evaluated based on site specifics. Florida Department of Environmental Protection has identified 15.7 miles of critical erosion areas along the County's coast.	Frequency = High Vulnerability = Moderate Exposure = Moderate Risk = Moderate
Epidemic		X		There has never been an outbreak of a serious disease epidemic in Indian River County. Annual occurrences of flu and periodic outbreaks of so- called	Indian River County's vulnerability to disease outbreaks is higher than many areas of the nation simply because of the amount of tourist traffic	Due to the large number of retired and elderly people living in Indian River County, the countywide exposure to serious impacts from disease outbreaks must be considered moderate.	Frequency = Low Vulnerability = Moderate Exposure = Moderate Risk = Low

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
				children's diseases have not reached epidemic proportions.	that passes through the County.		
Seismic Hazards (sinkhole/soil failure)	X			Soil failure or collapse is rare in Indian River County and is generally related to some other natural hazard, such as canal bank or levee failure during a period of flooding. Sinkholes are not considered to be a significant hazard in Indian River County.	Countywide vulnerability to this type of hazard is low; however, areas that might be affected by dam or levee failure need to be evaluated carefully.	Overall, the community exposure to these types of hazards is low other than in specific locations and under specific circumstances.	Frequency = Low Vulnerability = Low Exposure = Low Risk = Low
Technological							
Hazardous Materials Accident	X			The frequency with which hazardous materials incidents occur in Indian River County is essentially the same as for other counties located along the major Florida east coast transportation corridor. Minor spills occur with a moderate frequency.	Countywide, Indian River County has a low vulnerability with respect to hazardous materials releases. Some areas such as the City of Vero Beach have moderate vulnerability to this hazard due to specific circumstances.	Countywide, the exposure relative to a site-specific hazardous materials release is low.	Frequency = Moderate Vulnerability = Low Exposure = Low Risk = Moderate
Radiological Accidents Including Nuclear Power Plant Accidents	X			To date, the frequency of radiological accidents and releases has been very low.	Indian River County is moderately vulnerable to radiological accidents due to its location with respect	Countywide, the exposure to a nuclear power plant accident must be considered high, while exposure to other types of radioactive materials releases is considered low.	Frequency = Very Low Vulnerability = Moderate Exposure = High Risk = Low

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
					to the St. Lucie Nuclear Power Plant.		
Communications Failure	X			Major communications failures have occurred infrequently in Indian River County to date.	Indian River County as a whole has a relatively low vulnerability to communication system breakdown. In some areas, such as the Town of Vero Beach, this vulnerability is higher.	Indian River County's exposure in the event of a major communication system failure is relatively low due to its agricultural economic base.	Frequency = Low Vulnerability = Low Exposure = Low Risk = Low
Hazardous Material Releases		X		Indian River County has some 38 reported (Section 302) hazardous material sites; some of which are located in urban areas. To date, the frequency of releases from these facilities have been low compared to the number of releases from transportation accidents.	Due to the number and location of hazardous material sites within the community, Indian River County must be considered to have a moderate vulnerability with respect to this hazard.	Countywide exposure in term of life and property from toxic material releases is considered moderate.	Frequency = Low Vulnerability = Moderate Exposure = Moderate Risk = Moderate
Transportation System Accidents		X		Indian River County has major rail lines, north-south highway corridors, and a significant airport. Ground transportation accidents occur relatively frequently. Major transportation accidents such as rail	Due to this concentration of transportation industries and activities in the eastern portion of the County, Indian River County, and particularly the City of Vero Beach has a high vulnerability to transportation system accidents.	Low countywide, but high in specific areas.	Frequency = Low Vulnerability = Low Exposure (Countywide) = Low Risk = Low

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
				and plane crashes to date have been rare.			
Wellfield Contamination	X			Indian River County maintains a program designed to monitor this risk. To date, instances of wellfield contamination in Indian River County have been rare.	The eastern part of the County along the coastline is particularly vulnerable to this hazard. This is the area with the greatest population and the most industrialization. During times of drought, this area is also vulnerable to wellfield contamination from salt water intrusion.	Exposure in terms of property value is moderate with regard to this hazard.	Frequency = Low Vulnerability = Moderate Exposure = Moderate Risk = Low
Power Failure (outages)	X			Business and industry in Indian River County are affected regularly by power fluctuation and short-term power outages. Major, long-term outages are rare.	All modern societies are highly vulnerable to prolonged power failures. Even power failures of 12 to 24 hours would have significant impacts on both the County's economy and on human health and safety.	Short-term power loss has a significant, but hard to quantify economic impact in terms of equipment damage and lost productivity. Prolonged power failures lasting days or weeks would be a major disaster for Indian River County both economically and in terms of human health and safety.	Frequency = Low for major power disruptions Vulnerability = Moderate Exposure = High Risk = Moderate
Societal							
Civil Disturbances	X			There have never been significant civil disturbances in Indian River County. Minor civil disturbances occur with moderate	Overall, vulnerability to civil disturbance in Indian River County is low; however, there are several specific areas and jurisdictions that are	Exposure in terms of dollars to the effects of civil disturbances must be considered low within the overall perspective of the County. Exposure in terms of human health and safety is moderate.	Frequency = Low Vulnerability (Countywide) = Low Exposure = Moderate Risk = Low

Hazard Category	Extent*			Hazard Evaluation			
	Minimum	Major	Catastrophic	Frequency	Vulnerability	Exposure	Risk (Potential for Loss)
				frequency in specific jurisdictions.	moderately if not highly vulnerable to this hazard.		
Terrorism and Sabotage		X		Other than random "hate crimes" there have never been any significant acts of terrorism or sabotage in Indian River County.	Indian River County has a low vulnerability for acts of terrorism and sabotage. It has a slightly higher than average potential for "celebrity terrorism."	Indian River County's exposure to this hazard may be greater than some other areas, but overall must be considered low. There are many other areas offering equally attractive targets in America, and there are several climatological, geographic, and infrastructural aspects to Indian River County that reduce its attractiveness to large scale acts of terrorism.	Frequency = Low Vulnerability = Low Exposure = Low Risk = Low
Immigration Crises		X		Illegal immigration has, and continues to impact Indian River County. While major immigration crises are rare, Indian River County has been affected by most of those that have occurred.	Because of its demographics and large agricultural industry, Indian River County has a moderate vulnerability to immigration crisis arising from anywhere in the Caribbean, Latin America, or South America.	Exposure in terms of dollars from an immigration crisis would result mainly from the stress on local police and health services. Exposure in terms of human health and safety would result from the possible introduction of diseases and stress on the existing healthcare network.	Frequency = Moderate over the last decade Vulnerability = Moderate Exposure = Moderate Risk = Moderate

5.0 MITIGATION OPTIONS

This section of the Indian River County LMS outlines a menu of mitigation options available to reduce the risks posed by natural disasters.

5.1 MITIGATION DEFINITION AND INTRODUCTION

Mitigation activities are those activities that aim to reduce the risks from natural and man-made hazards in a community. Mitigation is not a "one size fits all" process; a successful risk reduction activity in one community may not work in another. Several factors play a role in the decision on which mitigation activities to pursue including – frequency and severity of the hazard, the community's ability to address the problem, ease of implementation, costs and benefits, availability of funding, and a local champion to spearhead the activity, among others. There are several different types of mitigation activities that a community can undertake to reduce the risk posed by natural and man-made hazards. FEMA has identified six broad categories of mitigation actions including prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects.

5.2 MITIGATION CATEGORIES

The following definitions were included in the FEMA How to Guide 3: Developing the Mitigation Plan (FEMA, 2003).

- **Prevention** – Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses.
- **Property Protection** – Actions that involve the modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area.
- **Public Education and Awareness** – Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.
- **Natural Resource Protection** – Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency Services** – Actions that protect people and property during and immediately after a disaster or hazard event.
- **Structural Projects** – Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

5.3 MITIGATION OPTIONS BY CATEGORY

The following mitigation options are categorized using the categories identified above. While these lists are not comprehensive, they serve to provide examples of what can be done to reduce risk.

Prevention.

- Planning and zoning;
- Building codes;
- Capital improvement programs;
- Coastal zone management regulations;
- Density controls;
- Design review standards;
- Easements;
- Environmental review standards;
- Floodplain development regulations;
- Forest fire fuels reduction;
- Open space preservation;
- Performance standards;
- Shoreline setback regulations;
- Special use permits;
- Stormwater management regulations;
- Subdivision and development regulations; and
- Transfer of development rights.

Property Protection.

- Acquisition;
- Construction of barriers around structures;
- Elevation;
- Relocation;
- Structural retrofits;
- Storm shutters; and
- Shatter-resistant glass.

Public Education and Awareness.

- Outreach projects;
- Real estate disclosure;
- Hazard information centers; and
- School-age and adult education programs.

Natural Resource Protection.

- Best management practices;
- Dune and beach restoration;
- Forest and vegetation management;
- Sediment and erosion control;
- Stream corridor restoration;
- Stream dumping regulations;
- Watershed management;
- Forest and vegetation management; and
- Wetland restoration and preservation.

Emergency Services.

- Warning systems;
- Emergency response services; and
- Protection of critical facilities.

Structural Projects.

- Channel maintenance;
- Construction of dams/reservoirs;
- Construction of levees and floodwalls;
- Construction of seawalls/bulkheads; and
- Construction of safe rooms.

5.4 MITIGATION OPTIONS BY HAZARD

The following mitigation options broken down by specific hazard, were found mainly in North Carolina Emergency Management's Tools and Techniques: An Encyclopedia of Strategies to Mitigate the Impacts of Natural Hazards (North Carolina Division of Emergency Management, 2002) and FEMA's How to Guide: Integrating Human-Caused Hazards into Mitigation Planning (FEMA, 2002). They represent only a small fraction of the total possible mitigation options available to a community. For additional resources on mitigation options, see **Appendix B**.

***All Hazard*.**

- Acquisition and land banking;
- Citizen outreach programs;
- Community awareness programs;
- Development impact tax/improvement tax;
- Floating zones;
- Home inspection programs;
- Purchase of development rights;
- Smart growth principles;
- Structural retrofit;
- Subdivision ordinance; and
- Tax abatement, subsidies, low-interest loans, and other incentives.

***Drought*.**

- Contingency planning;
- Fire breaks;
- Housing code;
- New construction;
- Water conservation programs
- Monitoring and warning programs;
- Drought tolerant vegetation; and
- Wildland fire mitigation.

***Erosion*.**

- Beach nourishment;
- Dune protection and shoreline setbacks;
- Green infrastructure;
- Structural relocation;
- Open space preservation;
- Revetments for beach management; and
- Vegetation.

***Flooding*.**

- Acquisition;
- Elevation;
- Floodplain management plans
- Floodproofing;
- Flood insurance education;
- Stormwater management;
- Green infrastructure;
- Porous pavement;
- Retention ponds;
- Sewage treatment plant retrofit; and
- Tie downs.

***Hurricane*.**

- Acquisition;
- Floodplain management plans;
- Floodproofing;
- Shuttering;
- Enhanced building codes;
- Preparedness outreach;
- Tree and limb maintenance;

- Mobile home parks storm shelter;
- Safe rooms; and
- Stormwater drain maintenance.

Thunderstorm.

- Drainage system maintenance;
- Impervious surface limits;
- Tree and limb maintenance;
- Encourage flood insurance;
- Mobile home parks storm shelter;
- Stormwater drain maintenance; and
- Traffic light and other traffic controls.

Tornado.

- Mobile home parks storm shelter;
- Protecting natural environmental features;
- Warning systems;
- Enhanced building codes;
- Safe room;
- Tie downs;
- Traffic lights and other traffic controls;
- Utility lines; and
- Windproofing.

Tsunami.

- Maintain TsunamiReady designation;
- Preparedness outreach; and
- Coordinate student education with the School District of Indian River County.

***Wildland Fire*.**

- Fire breaks;
- Fuel loads;
- Housing code;
- New construction;
- Open space acquisition;
- BEHAVE Fire Behavior Prediction and Fuel Modeling System;
- Prescribed burns;
- Tree limb removal; and
- Wildland fire mitigation planning.

Terrorism.

- Site planning and landscape design;
- Architectural and interior space planning;
- Structural engineering;
- Mechanical engineering;
- Electrical engineering;
- Public education;
- Drills;
- Fire protection engineering;
- Security; and
- Parking.

Table 5.1 displays various mitigation activities by both mitigation category and hazard. Only select hazards are compared in the table.

5.5 MITIGATION OPTIONS ADDRESSING SPECIAL ISSUES

This section identifies several risk reduction strategies for three special issues of relevance in Indian River County – Repetitive Flood Loss Properties, Barrier Islands, and the CRS.

5.5.1 Repetitive Flood Loss Properties

FEMA has placed special emphasis on addressing repetitive flood loss properties through the mitigation planning process; therefore, it is important to identify strategies to lower the number of repetitive loss properties within the County. The following are examples of actions that can be taken to lower or eliminate both the number of repetitive loss claims and properties in the County.

Table 5.1. Mitigation options by category and hazard.

Category	Mitigation Alternatives	Hazard			
		Flood	Hurricane	Tornado	Wildland Fire
Prevention	building codes	X	X	X	
	coastal zone management regulation	X	X		
	density controls	X	X		X
	design review standards	X	X	X	X
	easements	X	X		X
	environmental review standards	X	X	X	X
	floodplain development regulations	X	X		
	floodplain zoning	X	X		
	forest fire fuel reduction				X
	hillside development regulation				X
	open space preservation	X	X		X
	performance standards	X	X	X	X
	shoreline setback regulation	X	X		
	special use permits	X	X		X
	stormwater management regulations	X			
	subdivision and development regulations	X	X	X	X
	transfer of development rights	X	X		X
Property Protection	acquisition of hazard-prone structures	X	X		X
	construction of barriers around structures	X	X		
	elevation of structures	X	X		
	relocation out of hazard areas	X	X		X
	structural retrofits	X	X	X	
Public Education and Awareness	hazard information center	X	X	X	X
	public educational and outreach programs	X	X	X	X
	real estate disclosure	X	X	X	X
Natural Resource Protection	best management practices	X	X		X
	dune and beach restoration		X		
	forest and vegetation management	X			X
	sediment and erosion control regulations	X	X		
	stream corridor restoration	X			
	stream dumping regulations	X			
	urban forestry and landscape management	X			X
	wetlands development regulations	X	X		X
Emergency Services	critical family protection	X	X	X	X
	emergency response services	X	X	X	X
	hazard threat recognition	X	X	X	X
	health and safety maintenance	X	X	X	X
	post-disaster mitigation	X	X	X	X
Structural Projects	channel maintenance	X	X		
	dams/reservoirs	X			
	levees and floodwalls	X	X		
	safe rooms/shelters		X	X	
	seawalls/bulkheads		X		

Source: Federal Emergency Management Agency's (FEMA's) How To Guide 3: Developing the Mitigation Plan (FEMA, 2003).

- Acquisition;
- Building codes;
- Detention basins;
- Drainage culverts;
- Drainage system maintenance;
- Dune protection and shoreline setbacks;
- Elevation;
- Firebreaks;
- Floating zones;
- Floodplain management plans;
- Floodproofing;
- Moratoria;
- Real estate disclosure requirements;
- Relocation;
- Sewage lift stations; and
- Stormwater drainage maintenance.

5.5.2 Barrier Islands

Geologic and meteorological processes associated with barrier islands create a number of potential hazards. The following actions are examples of mitigation activities that can be implemented to protect the people, buildings, and infrastructure on barrier islands before and during natural hazard events.

- Acquisition;
- Beach management plans;
- Beach nourishment;
- Carrying capacity;
- Dredging;
- Dune protection and shoreline setbacks;
- Floating zones;
- Groins;
- Jetties;

- Offshore breakwaters;
- Revetments;
- Roadway realignment;
- Sand dunes;
- Sand scraping;
- Seawalls and bulkheads; and
- Coastal sediment trapping and vegetation.

5.5.3 CRS Projects

Participation in the CRS program can help to lower flood insurance premiums for residents within Indian River County. The more flood mitigation actions that are initiated, the lower the premiums will be. The following subsection outlines examples of mitigation activities that qualify for potential premium-reducing CRS points.

- *310 Elevation Certificates* – elevation;
- *330 Outreach Projects* – audits of small business, community awareness programs, education and training, home inspection programs, and notification of location of hazards;
- *340 Hazard Disclosure* – real estate disclosure requirements;
- *400SH Special Hazard Areas* – beach management plans, dune protection and shoreline setbacks, sand dunes, sediment trapping vegetation, and wetland preservation and riparian habitat protection;
- *410 Additional Flood Data* – hazard identification, mapping hazards, risk assessment, and vulnerability assessment;
- *420 Open Space Preservation* – acquisition and comprehensive plans;
- *430 Higher Regulatory Standards* – building codes, government expenditure limitation in high hazard areas, moratoria, sewage lift station, and sewer manholes;
- *430 LZ Low Density Zoning* – development density;
- *450 Stormwater Management* – grassy swales, impervious surface limits, onsite sediment retention, performance or impact zoning, retention ponds, stormwater management, and vegetation;
- *510 Floodplain Management Planning* – floodplain management plans, hazard mitigation and post-disaster reconstruction, porous pavement, and stormwater basins;

- *520 Acquisition and Relocation* – acquisition, capital facilities plans, commercial parks, critical facilities, emergency shelters, parks, public housing, public records, relocation, safe site, and school facilities;
- *530 Retrofitting* – dikes, levees, floodwalls and berms, elevation, floodproofing, public housing, public records, public school buildings, retrofit of fire stations and police stations, and sewage treatment plan retrofit;
- *540 Drainage System Maintenance* – drainage culverts, drainage system maintenance, retention ponds, and stormwater drain maintenance;
- *610 Flood Warning Program* – capability analysis and disaster warning;
- *620 Levee Safety* – dikes, levees, floodwalls, and berms; and
- *630 Dam Safety* – dams and reservoirs.

5.6 MITIGATION IN DEPTH

As the Community Profile (**Section 2.0**) indicated, the Treasure Coast region has and will continue to experience increased population growth. Population growth has a major impact on how and where development takes place in the County. As new development moves outward from the urbanized core and corridors, the potential for natural hazards to impact life and property increases. Because growth issues are so prevalent in the County, select development related mitigation activities have been identified and are described below. These activities are provided as examples only, and they are not reflective of the broad spectrum of mitigation options available. The mitigation activities and the accompanying information were developed from North Carolina Division of Emergency Management in the Tools and Techniques document (North Carolina Division of Emergency Management, 2002).

5.6.1 Floating Zoning

5.6.1.1 Definition

Floating zones are written into the zoning code but "float" above the map until triggered by a set of conditions. Unlike overlay zones, floating zones replace the existing code for the places in which they are implemented. Once certain conditions (usually development-related) are met, the ordinance becomes affixed to a particular site. Floating zones are typically used when a community knows that it wants to apply a set of regulations to certain uses (such as a shopping center), but is waiting for events to decide the location for those uses.

5.6.1.2 Implementation

One of the best uses of floating zones is to reduce the density in areas that have been hit by a natural disaster. For example, areas where structures have suffered, on average, a certain degree of damage could anchor a floating zone that reduces the allowable density in that area. The damage zones where these regulations would be applied could be identified during the recovery phase.

5.6.1.3 Critique

Since one or several lots are subject to different regulations than their neighbors, floating zones are often attacked as being a form of spot zoning. While the location of floating zones can be subject to special interests and politics, they are usually based on facts, as opposed to speculated future needs.

5.6.2 Impact Fees/System Development Charges

5.6.2.1 Definition

Impact fees require new developments to share in the financial burden that their arrival imposes on a town. These assessments are typically one-time, up-front charges (although some jurisdictions allow payments over time) against new development to pay for off-site improvements. The fees also can be set up to allow new development to buy into existing services with excess capacity. Impact fees are typically based on ratios that show what services the average new resident will require.

5.6.2.2 Implementation

Every impact fee must meet a three part legal test. First, the need for improvements funded by the fee must be created by the new development. Second, the amount charged the new development must be proportionate to the cost of its use. Third, all revenues must be spent in proximity to the new development and within a reasonable period of time. If any of these are not met, the community may face legal action. Communities should have a comprehensive plan and capital improvements program in place to defend their use of impact fees or exactions.

Impact fees can be linked to environmental impact analyses in order to charge proportionate fees for projects that will have broader or lesser impacts. While there are several methods for analyzing impacts (checklists or spreadsheet models, for example), most look only at individual project impacts. An alternative is a cumulative impact assessment, which looks at the total effect of all development in a particular environment. This approach might allow planners to estimate the combined effects of several potential developments on reducing the flood storage capacity of a single watershed. The fee in this case would go toward mitigating increased flood heights, perhaps by creating flood storage elsewhere in the floodplain.

5.6.2.3 Critique

Impact fees can be applied to a wider variety of services than either exactions or special assessment districts. Unlike land dedications, these can be payments that cover the full costs of needed improvements. They are typically used in place of negotiated exactions because they take less time and are more predictable and equitable. Impact fees do not help with maintenance costs.

5.6.3 Porous Pavement

5.6.3.1 Definition

Substitute porous or open-grid pavement for impervious pavement to limit the amount of stormwater runoff that contributes to localized flooding.

5.6.3.2 Implementation

Pavement will ideally be pervious enough to absorb rainfall but with pores small enough not to clog with debris or cause problems for pedestrian traffic. Some brands of asphalt or concrete that lack the finer sediment of conventional cement hold promise. Several websites containing photographs and/or useful information regarding porous and open-grid pavement include

- http://www.gcpa.org/pervious_concrete_pavement.htm; and
- http://www.greenbuilder.com/sourcebook/PerviousMaterials.html.

5.6.3.3 Critique

Reservations apply to the use of open-grid, or open-cell, pavement: it is treacherous for those with mobility challenges (and those in high heels) and also is expensive to install. However, open-grid pavement is appropriate for limited-use access routes or overflow parking lots.

5.6.4 Transfer of Development Rights (TDR)

5.6.4.1 Definition

Like Purchase of Development Rights, TDR programs treat development as a commodity separate from the land itself. The local government first awards each property owner in a sending area a set of development rights based on the value or acreage of land. Sending areas contain land the local authority seeks to protect. The government then establishes a receiving area for these rights that is a preferred site for development. Landowners in the sending area are typically prohibited from developing their land; however, they can sell their rights to developers in the receiving areas. Developers who acquire these development rights can build to higher densities than would otherwise be permissible.

5.6.4.2 Implementation

TDR could be used for mitigation purposes by designating high hazard areas as sending zones. The development rights for parcels within this zone would be targeted at a receiving zone located outside the hazard area. The zone would need to have sufficient room to accommodate the sending rights. In jurisdictions with limited available space, the program could be aimed at redevelopment rather than new development. Alternatively, the community could completely downzone itself. Both options could help create a market for development rights.

One way to ensure that people participate in the program is to make it mandatory; although, the legality of mandatory TDR programs is currently under challenge. In a mandatory program, the marketability of the rights would have to be guaranteed. One way to do so would be to create a municipal land bank that would purchase the rights and resell them when demand was sufficient to generate value. Suitable receiving areas outside the hazard area must be available for TDR to be successful. TDR can be used to achieve a variety of associated community goals, including promoting compact development with less impervious surfaces and preserving agricultural, rural, or open spaces. Since TDR can be applied to areas of a community, rather than individual parcels, it can be more thoroughly effective than acquisition or cluster development techniques.

5.6.4.3 Critique

TDR is a complex system, which makes it difficult for planning staffs to implement and for landowners to understand and accept. It is frequently unpopular with residents in the receiving zone, who are subject to development that exceeds the apparent zoning limits. Perhaps most importantly, a region must have a significant amount of development pressure to make the rights marketable.

5.6.4.4 Example

Collier County, Florida, began a TDR program in the 1980's to protect 40,000 acres of coastal barrier islands, mangroves, salt marshes, and beaches. These areas were designated as sending zones. The receiving zones were already set for multi-family housing, but could be built to a higher density using the development rights. Parcels for which the development rights have been sold must be protected by a restrictive covenant or by donation to the County or a conservation organization. A moratorium was placed on the program when the transfer resulted in density concentrating in only one receiving site and overwhelming it.

6.0 IMPLEMENTATION STRATEGY

6.1 INTRODUCTION

Plan implementation is a vitally important aspect of the overall program. Without an implementation program, the Plan either "gathers dust on the shelf" or lags along, implementing projects incrementally based more on agencies' or individuals' interest than on a prioritized need basis. Discussed below are issues related to the organizational arrangement and administrative responsibility, the role of the Working Group, plan monitoring, plan funding, and plan update process.

6.2 INSTITUTIONAL ARRANGEMENT

The creation of a disaster-resistant community is achieved once the concept becomes part of the mindset and fabric of the private and public sectors of a community. Effective implementation requires the strong support of the locally elected body. In addition, it requires an advocate. Someone or a group who believes the issue to be essential to the long-term sustainability of the community. This individual or group of individuals continually is reassessing the vulnerabilities of the community, and identifying potential strategies and partners to address the vulnerabilities and means to affecting change whether it be a brick and mortar project or implementing a new programmatic initiative or modification to existing codes or plans.

This section describes the comprehensive organizational arrangement required to effectively implement the countywide LMS program. It also describes the administrative framework that defines the roles and responsibilities of those at the staff level who carry out activities on a daily basis.

6.2.1 Organizational Structure

The LMS organizational structure consists of several levels (see **Figure 6.1**, LMS organizational structure). Heading the effort is the LMS Working Group. This group must have broad representation to be effective. It should embrace all stakeholder groups in the County from both the public and private sectors. Therefore, when the Indian River County Working Group was created, representatives were chosen so that all affected groups would have representation in the planning process and in the ongoing implementation of the LMS. The Working Group interacts directly with the County Commission and the general public. The Indian River County DES staff provides direct support to the Working Group. In addition, the DES is the liaison to the Florida Division of Emergency Management within the FDCA, and the FEMA, Department of Homeland Security.

6.2.2 Administrative - Lead Responsibility

The Director of the DES shall be the individual responsible for implementing, **monitoring**, and updating this LMS. As depicted in **Figure 6.1**, the Director of DES must interact with the County Administrator on a frequent basis, reporting on the progress of the implementation program, obstacles or problems that have delayed the implementation

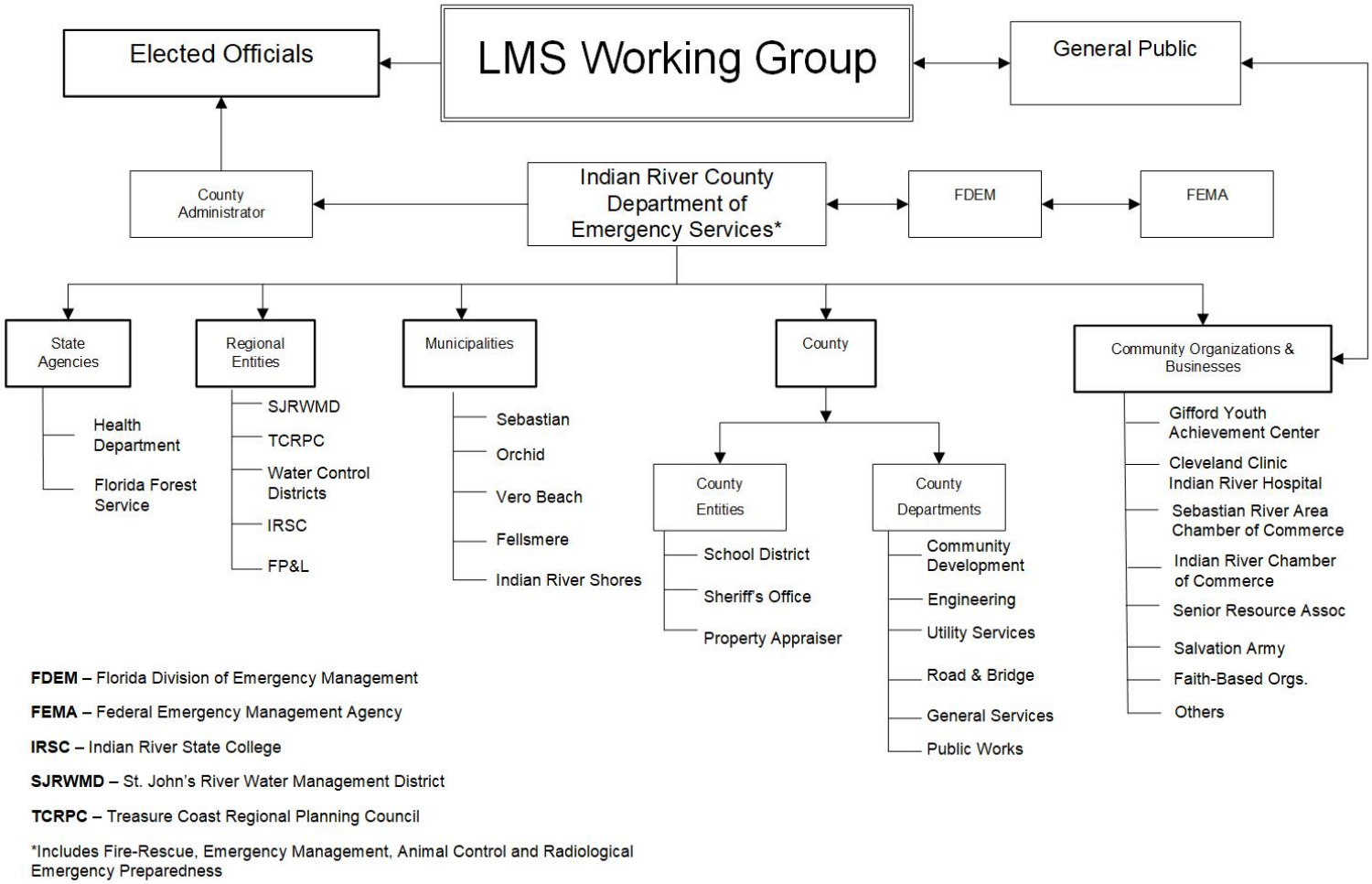


Figure 6.1. Local Mitigation Strategy (LMS) Organizational Chart

program, and ideas or alternative options to overcome the obstacles and/or problems being encountered. The intention is that all projects will be implemented as soon as funding becomes available.

Responsibilities of the Director of DES will be:

- To be the Hazard Mitigation Advocate at staff level;
- To keep current with all changes in LMS programs;
- To interact frequently with Florida Division of Emergency Management County Liaison;
- To work closely with the LMS Chairperson;
- To organize meetings of the Working Group;
- To coordinate and contact with all members of the Working Group on a regular basis;
- To maintain avenues of communication with the general public;
- To set-up and maintain files documenting progress of LMS program;
- To update the PPL as needed; and
- To coordinate 5-year LMS update.

6.2.3 Administrative - Support Responsibility

Successfully implementing the LMS is not the sole responsibility of DES; it is the responsibility of all participating organizations. Participating organizations from both the public and private sectors can fulfill administrative responsibility in a number of ways including

- Promote and educate others about the significance of local hazard mitigation;
- Interact and coordinate frequently with the LMS Coordinator;
- Manage mitigation projects or activities;
- Provide assistance to other organizations so that they can implement their mitigation projects or activities;
- Disseminate hazard mitigation-related information to constituents;
- Document the progress of one's organization's hazard mitigation activities; and
- Make available to LMS Coordinator new data and information relevant to the LMS process.

An example of providing support to other organizations could involve assisting in an all-hazard public awareness/education program. While it may be the responsibility of the LMS Coordinator to see that the project is implemented, other organizations such as the Indian River County Fire Rescue, American Red Cross, Indian River County School District, and even homeowner associations could serve in a support role designing such a program. Supporting organizations can assist in making sure that its members or member organization publicize and disseminate the program information generated as a result of the development of the public awareness/education program.

6.3 IMPLEMENTATION STRATEGY

The implementation strategy is based on information gathered from the Working Group as well as key community stakeholders and citizens. The hazards and community issues identified as well as the community's institutional analysis are used to determine the

best means to implement mitigation strategies in Indian River County. The implementation strategy includes the goals and objectives identified by the Working Group as well as a list of prioritized mitigation activities.

6.3.1 Goals and Objectives

In formulating the goals and objectives, appropriate plans, policy statements, laws, codes, and ordinances from each participating local government have been reviewed. With multiple local governmental entities involved in defining a community-wide vision, this becomes a complex process. To help clarify the process, a facilitated discussion with the Working Group was conducted, and a comprehensive list of the areas where disasters affect the community was developed. The list included the following:

- Loss of life;
- Loss of property;
- Community sustainability;
- Health/medical needs;
- Temporary sheltering;
- Food and water;
- Communication;
- Housing;
- Historical structures;
- Adverse impacts to natural resources (e.g., beaches, water quality);
- Economic disruption;
- Fiscal impact;
- Recurring damage;
- Damage to repair to public infrastructure (e.g., roads, water systems, sewer systems, stormwater systems, electrical power);
- Debris removal;
- Redevelopment/reconstruction;
- Development practices;
- Environmental damage;
- Intergovernmental coordination; and
- Mental health counseling.

Along with these general hazard impacts, specific issues related to preparing for, mitigating against, responding to, and recovering from disasters were identified by the Working Group. The issues identified are summarized below.

- Tradeoff between flood protection and water quality;
- Public infrastructure at risk from flooding;
- Connections between County and St. Johns River Water Management District's Stormwater Management Plans;
- Catastrophic events surpass what is planned for in current stormwater management plans;
- Bridges and transportation facilities are built to withstand a typical 100-year storm;
- The Town of Orchid is not a participant in the CRS program;

- Coordination between government entities and private developments and homeowner associations;
- The County, City of Vero Beach, and the City of Sebastian have pre-arranged contracts for debris removal following an event;
- Linkage between the County and municipal Emergency Management Plans;
- Law Enforcement needs an upgraded firing range;
- Including additional utility providers in place at the Emergency Operations Center;
- Need to revisit emergency plans and operations with various County and municipal entities;
- Public awareness about livestock relocation;
- Public awareness about including safe room construction into new developments;
- The following roadway has been identified as suffering from chronic flooding and needs additional outfall capacity or flood storage;
  - 27th Avenue between 4th Street and 5th Street
- Continue to follow the beach management strategies identified in the County Beach Preservation Plan. Several areas on the barrier island are identified by FDEP as critically eroded, including:
  - Sectors 1 & 2 – R-4 to R-17;
  - Sector 3 – R-20 to R-55;
  - Sector 5 – R-74 to R-86; and,
  - Sector 7 – R-97 to R-107.
- The FEC railroad blocks traffic to the hospital when the train passes. Grade separated overpasses located at 41st Street, Aviation Boulevard and 33rd Street, and 4th Street would help alleviate the problem.
- Funding for protracted incidents.
- Unexploded military ordnance disposal is time-consuming because assistance must be requested from nearby service providers. The County could benefit from having its own bomb disposal unit.

These concerns, along with information generated from the inventory of local planning documents and ordinances, resulted in the following goals and objectives for all hazard mitigation planning in Indian River County.

The Indian River County LMS Working Group identified the following goals and objectives. The goals and objectives were selected because of their ability to address community issues that were identified earlier in the mitigation planning process. Goals as defined by FEMA are general guidelines that explain what you want to achieve. They are usually broad policy statements and are long-term in nature. Objectives as defined by FEMA are strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable. The goals and objectives define the broad direction of the mitigation strategy and provide the focus for developing and adopting mitigation projects and activities. Projects implementing the stated goals and objectives are detailed further in **Appendix G**.

Goal 1. To minimize the loss of life and property and repetitive loss.

Objective 1.1 Create and maintain current an all-hazards database.

Project #4. Provide access to Blue Cypress Park by raising roadbed, replacing failing culvert, and implementing flood mitigation.

Project #7. Implement a historic Fellsmere flood study to mitigate against future floods by providing primarily structural improvements.

Project #9. Elkcam Canal dredging and seawalls to reduce the exposure of possible flooding and property damage to residential homes, businesses, and city owned facilities.

Project # 12. Dredging of Indian Lane storm water drainage canal to improve holding capacity and provide better flow from the storm water drainage system.

Project # 14. Dredging of George Street Canal in the City of Sebastian to improve holding capacity of canal system to retain water and provide better flood control.

Project #22. Culvert pipe for Stonecrop main ditch alignment to ensure circulation of storm water system and reduce possible flooding and property damage.

Project # 25. Construction of tilting Weir gates across two canals that connect Rockridge subdivision with the lagoon.

Project # 26. Study of sea level rise potential impacts to public facilities.

Project # 28. Culvert replacement for ditch/street crossings to promote better drainage in the City of Sebastian.

Project # 29. Establishment of a county GIS department to improve flood mapping for flood damage reduction.

Project #34. Mitigate against future floods by storing flood waters within historic Fellsmere regional lakes thereby reducing the flood level in the basins served by the detention lakes.

Project #35. Historic Fellsmere alleyway grading to mitigate against future floods by storing flood waters in the alleyways thereby reducing the flood level in the basins served by the alleyway flood storage system.

Project #36. Historic Fellsmere Stormwater Greenway to mitigate against future floods by storing flood waters in the stormwater greenway thereby reducing the flood level in the basins served by the stormwater greenway.

Objective 1.2 Restore or protect waterfront areas susceptible to erosion/drought.

Project # 24. Construction of seawall/revetment along Humiston Beach in the City of Vero Beach to prevent flooding/erosion.

Project # 27. Acquisition of land along the Indian River Lagoon within the Coastal High Hazard Area to reduce potential future losses.

Project # 30. Construction of seawall along Conn Beach in the City of Vero Beach to provide erosion and flood control.

Project # 33. Restoration of critically eroded areas along an 8.3-mile stretch of the Atlantic shoreline in an effort to provide needed storm protection.

Objective 1.3. Improve local roadways to ensure safe, efficient evacuation.

Project # 3. Replacement of all existing culverts along New York/97th Street with RCP at proper intervals to reduce head loss to Park Lateral.

Project #13. Barber Street bridge replacement to ensure traffic circulation, emergency response, and public transportation from the City of Sebastian to U.S. #1, C.R. 512 and I-95.

Project #16. Fleming Street bridge replacement to ensure traffic circulation, emergency response, and public transportation from the City of Sebastian to U.S. #1, C.R. 512, and I-95.

Project # 17. Replacement of County bridges constructed below the 100-year flood plain for improved access, evacuation and exposure to flooding.

Project # 21. Laconia Avenue improvements, including a new bridge over the St. Sebastian River, to provide an emergency evacuation route.

Objective 1.4 Reduce the potential threat of wildland fires.

Project # 6. Conduct prescribed burns in certain conservation areas vulnerable to wildland fire.

Objective 1.5 Increase primary shelter space and supplies to meet stated need.

Project # 2. Retrofits to the county's public schools that serve as public shelters.

Project #8. Generator project for the Sebastian Adult Day Canter to increase the shelter capacity to serve as a step-down shelter for Special Needs Shelter clients.

Project #19. Fortification of Hibiscus Children's Center, a group home for 40 at-risk teenagers to allow shelter-in-place (harden roofs and install generators).

Goal 2. To achieve safe and fiscally sound, sustainable communities.

Objective 2.1 Ensure that local planning and development matters address hazard mitigation.

Project # 18. Install flood control structures Vero Isles.

Project # 20. Protection of superficial aquifer groundwater quality and quantity as a secondary potable water source through acquisition of primary recharge areas and through the plugging of abandoned artesian wells.

Project #23. Relocation of City of Vero Beach wastewater treatment plant.

Objective 2.2 Retrofit critical facilities.

Project # 1. Replace and upgrade roof of the Vero Beach Police Department to reduce vulnerability to wind and flood damage.

Project # 5. Rebuild non-wind code compliant fire rescue stations.

Project # 10. Retrofits to the North County Library to reduce vulnerability to wind and flood damage.

Project #11. Retrofits to the County's main library to reduce vulnerability to wind and flood damage.

Project #15. Retrofits to the City of Vero Beach Public Works facility including roof replacement and hardening of building.

Project #23. Relocation of the City of Vero Beach Wastewater Treatment Plan to reduce vulnerability to hurricane and tropical storms.

Project # 31. Modifications to the outfall structure at Stonebridge Subdivision for flood damage reduction.

Project #32. Historic Jones Pier floodproofing/elevation to above base flood elevation, storm shutters, and drainage improvements.

6.4 INTEGRATION INTO LOCAL PLANS

Hazards are pervasive throughout our local communities. While it is understood that the issue of hazard mitigation is a central focus of the unified LMS, there are other planning mechanisms where this important issue should be addressed. Issues of land use, infrastructure, and environment have been addressed in local comprehensive plans; however, few plans properly address the impact disasters may have on existing and future development. Disasters have enormous physical and social impacts on the community. Other types of planning mechanisms where hazards should be addressed include county and city CEMPs, Continuity of Operations Plans, flood mitigation plans, State Housing Initiative Partnership Program (SHIP), and Land Development Regulations. Disaster planning is relevant to historic resources, waterfront development, community redevelopment, and low income neighborhoods where substandard housing is typically found has resulted due to use of poor construction methods and materials, and/or lack of adequate maintenance by the homeowner.

From a regulatory standpoint, the local government comprehensive plans administered under the provisions of Section 163.3161, F.S. are the cornerstone of growth management in Florida. Being supported by force of law, local comprehensive plans are extremely important vehicles to implement hazard mitigation. Local governments under Section 163.3161, F.S. are required to update their capital improvement lists annually. The projects included on the LMS PPL also should be incorporated into the local comprehensive plan CIEs. This should be accomplished annually in keeping with the annual update of the jurisdiction's CIE list of projects.

As described in **Section 6.7**, **Continuing Public Involvement**, the LMS Working Group will meet semi-annually. It is anticipated that one of the annual meetings will focus on integrating hazard mitigation into comprehensive plans. At that meeting, ideas will be shared about how successes were achieved and obstacles overcome.

6.4.1 The Integration Process

The following process will be followed to ensure widespread integration of hazard mitigation into local planning mechanisms in Indian River County.

1) A letter from the LMS Chair, along with a letter of support from the chair of the elected body, will be transmitted to local planning directors, inviting each to attend an LMS Working Group meeting to discuss ways in which hazard mitigation can be best integrated into planning matters.

2) A meeting of the LMS Working Group is held. This phase could be said to be the institutionalization of hazard mitigation into the local planning and development.

3) Each director will be asked to work with their planning staff to develop a strategy to integrate hazard mitigation into their planning programs and to evaluate whether their regulations address hazard mitigation, and if found to be lacking, identify several possible alternatives.

4) At the next meeting of the LMS, each director will report their situation to the LMS Working Group.

5) Identified changes will be made through the plan amendment process. Refer to Section 163.3187, F.S. and Chapter 9J-11, F.A.C. Local governments can seek plan amendments twice each year. Effective June 2, 2011, local governments have more discretion in determining whether they need to update their local comprehensive plan. As such, local governments no longer need to submit evaluation and appraisal reports to the department for a sufficiency determination. At least every seven years, pursuant to Rule Chapter 73C-49, Florida Administrative Code, local governments must determine whether the need exists to amend the comprehensive plan to reflect changes in state requirements since the last time the comprehensive plan was updated.

A similar process as described in Points 1-4 above will be taken by the LMS Working Group to study the feasibility and implementation mechanics relative to other planning processes active in the County such as the Metropolitan Planning Organization, important in addressing transportation matters, SHIP, which is active with low-income housing issues, and Gifford Front Porch Florida, a neighborhood improvement program. Historical resources also will be evaluated since there are a number of historical structures in risk areas in the County.

Indian River County
There has been no new development in the City of Vero Beach since the last plan update that would change the vulnerability and exposure of the county and its jurisdictions to its existing hazards.

City of Vero Beach
The City of Vero Beach periodically reviews the adopted LMS to prepare amendments to its Comprehensive Plan, Post Disaster Plan, and Comprehensive Emergency Management Plan. This review process is done through formal or ad hoc interdepartmental committees and advisory boards with final adoption going through the City Council. Many of the City of Vero Beach projects listed in the LMS are programmed for inclusion in the City's annual 5-Year Capital Plan and Capital Improvements Schedule. Along with these projects, the City incorporates the LMS in updating the City's activities and programs under the Community Rating System. All recommended LMS projects will decrease the vulnerability of the City to its known hazards. There has been no new development in the City of Vero Beach since the last plan update that would change the vulnerability and exposure of the county and its jurisdictions to its existing hazards.

City of Sebastian
The City of Sebastian has established programs and plans which integrates their LMS goals. These programs including the following:

- Storm Water Management Plan/NPDES
- Pavement Management System
- Emergency Management Plan

- Flood Ordinance
- Comprehensive Plan
- Building Codes
- Planning and Zoning design standard review

Any/all development with the City of Sebastian since the last plan update have been permitted within the requirements of the Florida Building Code and FEMA standards and will not change the vulnerability and exposure of the county and its jurisdictions to its existing hazards.

Indian River Shores
The Town of Indian River Shores has established programs and plans which integrates their LMS goals, which are:

- Flood reduction
- ALS evacuation
- Improvements to first responder access

All recommended LMS projects will decrease the vulnerability of the City to its known hazards. There has been no new development in the Town of Indian River Shores since the last plan update that would change the vulnerability and exposure of the county and its jurisdictions to its existing hazards.

City of Fellsmere
The City of Fellsmere periodically reviews the adopted LMS to prepare amendments to reflect amendments to their Comprehensive Plan, Land Development Code, and Capital Improvement Plan. This review process is done through formal or ad hoc interdepartmental committees and advisory boards with final adoption going through the City Council. Many of the City of Fellsmere projects listed in the LMS are programmed for inclusion in the City's annual 5-Year Capital Plan and Capital Improvements Schedule. Along with these projects, the City incorporates the LMS in updating the City's activities and programs under the Community Rating System. There has been no new development in the City of Fellsmere since the last plan update that would change the vulnerability and exposure of the county and its jurisdictions to its existing hazards.

Town of Orchid
The administration of the Town of Orchid reviews Indian River County's adopted LMS to determine any necessary amendments to the Towns Comprehensive Plan. Proposed amendments are reviewed by the Local Planning Agency, which provides its recommendations to the Town Council, which in turn has the responsibility of adopting necessary amendments. There has been no new development in the Town of Orchid since the last plan update that changes the vulnerability and exposure of the county and its jurisdictions to its existing hazards.

6.5 PLAN MONITORING

Once the LMS is adopted by participating local governments, monitoring the progress of plan implementation is extremely important. It is through the monitoring process that the Working Group can determine whether or not implementation is occurring as originally envisioned. Determining whether or not the implementation timeframes are being met is critical. The monitoring process may be more important in identifying why actions/initiatives are not occurring. The identification of obstacles to implementation is also important. Funding cutbacks, unsuccessful competitive grant applications, and staff

changes (e.g., key individual resigns or reassigned to new job, unexpected design problems, unexpected complexity in securing permits, lose commitment of partner agencies/organizations) can have significant impacts on implementing the LMS. Certain events or circumstances can alter the traditional means of operation, as was the case following September 11th. Changes such as this make plan monitoring important in keeping the LMS current.

6.5.1 Process

Step 1 Each quarter, the designated contact for all mitigation projects or initiatives identified on the PPL will report progress to the LMS Coordinator. For the first and third quarters, the point-of-contact will complete an Individual Project Progress Report – **Form #1** for each project and submit it to the LMS Coordinator. For the second and fourth quarters, an informal progress check-in will take place between the point of contact and the LMS Coordinator. The point-of-contact also will be responsible for submitting any supporting documentation such as newspaper articles or other relevant media.

Step 2 Based on the submitted progress report forms and progress check-ins, the LMS Coordinator will complete quarterly progress reports for the overall LMS program and present them to the elected boards of the County and municipalities. In past years, this has been done in lieu of formal meetings if the working group does not have changes. Formal meetings will now be held on a semi-annual basis.

Step 3 At the end of each year, the LMS Coordinator will prepare an Annual LMS Report – **Form #2**. The Annual Report will be presented to the elected boards of the County and municipalities. It is important that the Annual Report, not just be placed on the consent agenda of each local government, but a formal presentation be made where, not only is the status reported, but the elected officials have an opportunity to ask questions about the program. A separate project list will be maintained by the LMS Coordinator that identifies the completed, deleted or deferred mitigation actions as a benchmark for progress. This status list can be found in Appendix G.

Step 4 Besides reporting to local governments, LMS Coordinator and/or Chair of the LMS Working Group will be available to make similar presentations to private sector organizations, non-profit organizations (e.g., Senior Resource Association, chambers of commerce), and community organizations (e.g., Kiwanis, Rotary, Lions).

INDIAN RIVER COUNTY
UNIFIED LOCAL MITIGATION STRATEGY
INDIVIDUAL PROJECT PROGRESS REPORT

Date: _____

From: LMS Project Coordinator

To: Elected Officials

Project Title:
Applicant Name & Agency:
Status of Project:

FORM #1

ANNUAL LOCAL MITIGATION STRATEGY (LMS) REPORT

Date: _____

From: LMS Project Coordinator

To: Elected Officials

This report is prepared to inform locally elected officials in Indian River County of the progress being made to make our community more disaster-resistant. The following briefly summarizes the status of **Existing Projects** presently being developed and identifies **New Projects** expected to be undertaken in the upcoming year.

Period: _____

Rank on PPL	Project Title	Purpose of Project	Status of Completion	Obstacles/Problems/ Solutions

Annual Local Mitigation Strategy (LMS) Report
(Continued)

Period: _____

PPL Ranking	Project Title	Purpose of Project	Funding Source(s)	Anticipated Problems/ Solutions	Start/End Dates

FORM #2 (Continued).

6.5.2 Evaluation of Continued Project Priority

Part of the monitoring process will be for the group to evaluate the continued priority for each project. This determination will be made with consideration of the following factors:

- The proposed project's relationship to current or more recent hazard identification and risk assessment evaluations conducted by the LMS Working Group,
- Recent experience with hazard events in Indian River County and the relevance to the proposed project to mitigating the vulnerabilities to those hazards,
- The current probability of receiving funding for implementation from local, state or federal sources and its consistency with current local, state or federal program priorities.

On an annual basis, and for preparation for the next updated edition of the plan, jurisdictions will recommend that an initiative continue at its currently designated priority, or deferred for future action.

6.6 UPDATING THE PLAN

There are two updating processes connected to the LMS. One describes how the PPL is updated annually. A detailed description of the PPL updating procedure is provided below. The second updating process, involves the 5-year update of the entire LMS.

6.6.1 PPL

At the heart of the LMS is the PPL. The PPL is a rank order of priority projects that if implemented will result in a more disaster-resistant community. Because projects are completed, new needs surface, new funding opportunities arise, and dramatic events occur that affect priorities, it is important that the PPL be a dynamic document. For this reason, the window to submit projects to the PPL will always be open. The following sections identify the multi-step prioritization methodology.

6.6.1.1 Methodology

Potential LMS mitigation projects and activities will be evaluated based on the following criteria:

1) Suitability;
2) Risk Reduction; and
3) Cost

In order to evaluate the projects, the Working Group previously established the priority of goals and hazards using the following methodology. The process listed below will be followed during each update of the LMS.

6.6.1.2 Prioritization Process

We use a priority ranking system that has been found to deal with projects on an objective basis and all participants feel that the system is fair and equitable. Other counties have used the system with success as well.

There are three components on the Scoring Sheet used to obtain the total score, with a total of 15 variables resulting in a total of 1500 points that are then converted to a percent score. The applicant will assign a score to each of the variables. If the calculations are done by the spreadsheet, the score will be converted automatically and work as follows:

30% Suitability of the project
- 40% Addresses Goals
- 15% Addresses Hazards
- 10% Environmental Impact
- 10% Consistent with Existing Legislation and/or Policies
- 25% Consistent with Existing Plans and Priorities

45% Risk Reduction/Community Effect produced by the project
- 15% Scope of Benefits
- 35% Potential to Save Human Lies
- 15% Importance of Benefits
- 10% Level of Inconvenience or “Nuisance Factor”
- 10% Economic Effect or Loss
- 15% Number of People to Benefit

25% Cost of the project
- 20% Estimated Costs
- *75% Initial Cost*
- *25% Maintenance/Operating Costs*
- 25% Financing availability
- 25% Affordability
- 30% Repetitive Damages Corrected

Priority of Goals: The Working Group previously prioritized the following LMS goals according to the following priority ranking:

- Minimize the loss of life, property, and repetitive loss;
- Achieve safe and fiscally sound, sustainable communities; and
- Minimize economic disruption and ensure orderly, effective recovery and redevelopment.

Priority of Hazards: The Working Group previously prioritized the following LMS hazards according to the following priority ranking:

1) Hurricane/Tropical Storm
2) Wildland Fire
3) Flooding
4) Tornado
5) Hazardous Materials Accident
6) Transportation System Accident
7) Power Failure
8) Communication Failure

9) Terrorism/Sabotage
10) Thunderstorm/Lightning
11) Erosion
12) Immigration Crisis
13) Radiological Hazards
14) Wellfield Contamination
15) Agricultural Pest and Disease
16) Civil Disturbance
17) Drought

- Economic Collapse
- Epidemic
- Extreme Temperature
- Military Ordnance
- Seismic (Sinkholes, Earthquakes, Dam/Levee Failure)
- Societal Alienation
- Substance Abuse

Bulleted hazards indicate that no priority score was given; therefore, the hazard is a "non-immediate priority" hazard.

6.6.1.3 Prioritization Scoring

The rankings above were translated into scores so that priority could be determined. Consistent with the previously prioritized goals and hazards, staff converted the rankings into numerical scores to fit the new scoring criteria.

6.6.1.4 Project Evaluation

Any organization interested in submitting a project for the PPL must complete a project proposal form (Form #3). **Prior to submitting project applications, applicants are required to perform a self-evaluation and determine if their project: (1) is cost/beneficial, (2) is environmentally sound, (3) has been considered the best alternative, and (4) will actually solve a problem and be a permanent solution.** Applicants will be asked to identify parameters such as; which goal(s) the project addresses, which hazard(s) the project addresses, how high the potential to save human lives is, etc. DES staff will apply the criteria listed above to projects that are up for consideration for the LMS PPL. Each project will be scored according to the point system discussed above. Projects will be listed on the PPL ranked according to their total evaluation score. The project with the most points will be ranked first.

FORM #3

Indian River County Local Mitigation Strategy (LMS)
Sample Project Proposal Form – Page 1

Indian River County
Local Mitigation Strategy
Project Proposal Form - Step 1

Final Score	0

Instructions:

The total score is derived from the following three parameters: **Suitability, Risk Reduction/Community Effect** and **Cost**. Within these parameters are a total of 15 variables resulting in a possible total of 1,500 points. Applicants will assign a score to each of the variables appropriate for their proposed project. If you use the electronic version of the Prioritization Matrix (**http://www.ircgov.com/Boards/LMS/Index.htm)** in Step 2, the scores will be calculated (using a percentage) and converted to points automatically.

Without the benefit of the electronic version on the Prioritization Matrix, applicants are to print and complete all but the **"Points"** column of the Project Proposal Form. The final points and ranking will be tabulated for you once the entire proposal form is submitted for review.

The final score is what will be used to establish a priority of one project compared to another. The higher the score, the higher the priority. All scored projects will be added to the project list in prioritized order. Tied projects will be handled in accordance with the Tie-Break Methodology of the LMS Plan (6.6.1.5).

Each project must be accompanied by a Project Proposal form and submitted to:

Etta LoPresti, Emergency Management Planner
Indian River County Department of Emergency Services
Emergency Management Division
4225 43rd Avenue
Vero Beach, FL 32967
elopresti@ircgov.com

Step 1: Complete the following basic information before moving on to the Prioritization Matrix

Applicant Name:	
Agency Name:	
E-Mail:	
Phone:	
Project Name:	
Proposed Mitigation Measure:	
Estimated Project Cost:	
Estimated Time to Complete Project:	
Hazard(s) Mitigated:	
Jurisdictions Involved in Project:	
Possible Funding Sources:	Click here to go to website to find a list of possible funding sources

Continue to Step 2

FORM #3

Indian River County Local Mitigation Strategy (LMS)
Sample Project Proposal Form – Page 2

Indian River County
Local Mitigation Strategy Working Group
(LMS Project Proposal Form and Prioritization Matrix - Step 2)

Name of Applicant:	0
Date of Application:	
Project Cost:	$0

SUITABILITY	30%		0%	0
RISK REDUCTION/ COMMUNITY EFFECT	45%		0%	0
COST	25%		0%	0
TOTAL	**100%**			**0**

	Parameter	Weighting Factor	Scoring Criteria	Score	Points
Suitability		**30%**			
1	Addresses Goals	40%	**5 - High:** Minimizes the loss of life, property and repetitive loss (or project addresses multiple goals). **3 - Medium:** Minimizes economic disruption and ensures orderly, effective recovery and redevelopment. **1 - Low:** Achieves safe and fiscally sound sustainable communities.		0
2	Addresses Hazards	15%	**5 - High:** Hurricane/Tropical Storm, Wildland Fire, Flooding, Tornado (or multiple hazards). **3 - Medium:** Hazardous Materials Accident, Transportation System Accident, Power Failure. **1 - Low:** Communication Failure, Terrorism/Sabotage, Thunderstorm/Lightning, Erosion. **0 - Very Low:** All other hazards.		0
3	Environmental Impact	10%	**5 - Positive effect** on the environment. **3 - No effect** - environmentally neutral. **1 - Adverse effect** on the environment.		0
4	Consistent with Existing Legislation and/or Policies	10%	**5 - High:** Consistent with existing laws and policies. **3 - Medium:** New legislation or policy changes needed, but no conflicts identified. **1 - Low:** Conflicts with existing laws, regulations and/or policies.		0
5	Consistent with Existing Plans and Priorities	25%	**5 - High** - Supported in multiple plans or policies. **3 - Medium** - Supported in a plan or policy. **1 - Low** - Conflicts with existing plans and priorities, does not fit in with identified initiatives or is not supported in the Comprehensive Plan.		0
	Parameter Subtotal	100%	**sum of parameter scores; max =**	500	0
Suitability subtotal			(sum of parameter scores) / (maximum possible score)		0%

FORM #3

Indian River County Local Mitigation Strategy (LMS)
Sample Project Proposal Form – Page 3

Indian River County
Local Mitigation Strategy Working Group
(LMS Project Proposal Form and Prioritization Matrix - Step 2)

Name of Applicant:	0
Date of Application:	
Project Cost:	$0

SUITABILITY	30%		0%	0
RISK REDUCTION/ COMMUNITY EFFECT	45%		0%	0
COST	25%		0%	0
TOTAL	**100%**			**0**

	Parameter	Weighting Factor	Scoring Criteria	Score	Points
Risk Reduction/ Community Effect		**45%**			
1	Scope of Benefits	15%	**5 - High:** Benefits all municipalities and the unincorporated area, directly or indirectly. **3 - Medium:** Benefits more than half but not all of the municipalities and/or the unincorporated area. **1 - Low:** Benefits less than half of the municipalities and/or the unincorporated area.		0
2	Potential to Save Human Lives	35%	**5 - High:** More than 1,000 lives. **3 - Medium:** Up to 1,000 lives. **1 - Low:** No lifesaving potential.		0
3	Importance of Benefits	15%	**5 - High:** Needed for essential services. **3 - Medium:** Needed for other services. **1 - Low:** No significant implications.		0
4	Level of Inconveniece or "Nuisance Factor" (During project implementation)	10%	**5 - None:** Causes few problems. **3 - Moderate:** Most major problems avoided. **1 - Significant:** Causes much inconvenience (e.g., traffic jams, loss of power, delays).		0
5	Economic Effect or Loss (During project implementation)	10%	**5 - Minimal** economic loss (little effect during project). **3 - Moderate** economic loss (minimum disruption). **1 - Significant** economic loss (businesses closed, jobs affected, etc.).		0
6	Number of People to Benefit	15%	**5 - High:** More than 100,000 people. **3 - Medium:** 10,000 to 100,000 people. **1 - Low:** Fewer than 10,000 people.		0
	Parameter Subtotal	100%	**sum of parameter scores; max =**	500	0
Risk Reduction/ Community Effect Subtotal			(sum of parameter scores) / (maximum possible score)		0%

FORM #3

Indian River County Local Mitigation Strategy (LMS)
Sample Project Proposal Form – Page 4

Indian River County
Local Mitigation Strategy Working Group
(LMS Project Proposal Form and Prioritization Matrix - Step 2)

Name of Applicant:	0
Date of Application:	
Project Cost:	$0

SUITABILITY	30%		0%	0
RISK REDUCTION/ COMMUNITY EFFECT	45%		0%	0
COST	25%		0%	0
TOTAL	**100%**			**0**

	Parameter	Weighting Factor	Scoring Criteria	Score	Points
Cost		**25%**			
1	Estimated Costs*	20%			0
	i. Initial Cost	*75%*	**5 - Low:** $0 to $100,000. **3 - Moderate:** $100,001 to $1 million. **1 - High:** More than $1 million.		*0*
	ii. Maintenance & Operating Costs	*25%*	**5 - Low** costs **3 - Moderate** costs **1 - High** costs		*0*
2	Financing availability	25%	**5 - Good:** Readily available through grants or other funding sources. **3 - Moderate:** Limited grant or matching funds available. **1 - Poor:** No funding sources or matching funds are identified.		0
3	Affordability	25%	**5 - Good:** Project is easily affordable. **3 - Moderate:** Project is somewhat affordable. **1 - Poor:** Project is very costly for the jurisdiction.		0
4	Repetitive Damages Corrected	30%	**5 - High:** Alleviates repetitive loss. Property must have been damaged in the past by a disaster event. **3 - Medium:** Repetitive loss may have occurred but was not documented. **1 - Low:** No effect on repetitive loss.		0
	Parameter Subtotal	100%	**sum of parameter scores: max =** 500		0
Cost Subtotal			(sum of parameter scores) / (maximum possible score)		**0%**

* Estimated costs are comprised of two secondary parameters: initial and maintenance/operating costs

Page 4 Project Priority Ranking Matrix

Project Scoring.

The LMS Project Proposal Form and Prioritization Matrix scores the projects as follows:

Parameter	Possible Score	Calculated Points
Addresses Goals		
Minimizes the loss of life, property and loss	5	200
Minimizes economic disruption	3	120
Achieves safe and fiscally sound communities	1	40
Addresses Hazards		
Hurricane/T.Storm, Fire, Flooding, Tornado or Multiple	5	75
Hazards	3	45
HazMat Accident, Transportation Accident, Power Failure	1	15
Communication Failure, Terrorism/Sabotage, T.Storm, Erosion		
Environmental Impact		
Positive impact	5	50
No effect	3	30
Adverse effect	1	10
Consistent w/Existing Legislation and/or Policies	5	75
Supported in multiple plans or policies	3	45
Supported in a plan or policy	1	15
Conflicts w/existing laws, regs and/or policies		
Consistent with Existing Plans and Policies		
Supported in multiple plans or priorities	5	125
Supported in a plan or policy	3	75
Conflicts w/existing plans and/or policies	1	25
Scope of Benefits		
Benefits all municipalities and uninc. Areas	5	75
Benefits more than half but not all municipalities	3	45
Benefits less than half of municipalities	1	15
Potential to Save Human Lives		
More than 1,000 lives	5	175
Up to 1,000 lives	3	105
No lifesaving potential	1	35
Importance of Benefits		
Needed for Essential Services	5	75
Needed for Other Services	3	45
No Significant Implications	1	15
Level of Inconvenience or "Nuisance Factor"		
Causes Few Problems	5	50
Most Major Problems Avoided	3	30
Causes Much Inconvenience	1	10
Economic Effect or Loss		
Minimal Economic Loss	5	50
Moderate Economic Loss	3	30
Significant Economic Loss	1	10
Number of People to Benefit		
More than 100,000 people	5	75

Parameter	Possible Score	Calculated Points
10,000 to 100,000 people	3	45
Fewer than 10,000 people	1	30
Initial Cost		
Low: $0 to $100,000	5	375
Moderate: $100,001 to $1 million	3	225
High: More than $1 million	1	75
Maintenance and Operating Costs		
Low costs	5	175
Moderate costs	3	75
High costs	1	25
Financing Availability		
Readily available through grants or other	5	125
Limited funds available	3	75
No funding sources identified	1	25
Affordability		
Project is easily affordable	5	125
Project is somewhat affordable	3	75
Project is very costly	1	25
Repetitive Damaged Corrected		
Alleviates repetitive loss	5	150
Repetitive loss occurred but not documented	3	90
No effect on repetitive loss	1	30

Repetitive Damages Corrected:

The maximum score for a project is 1,500 points, which would be received by a project that addresses multiple goals and hazards, is supported by multiple plans and policies, addresses issues related to public health, safety, and welfare, and is cost-effective.

The scores for the three parameters will be added together. The total scores for each of the criteria will be the basis of the ranked list of projects. The projects with the highest score will be ranked first on the PPL.

After the total scores have been determined, a revised PPL will be developed by listing the projects in ranked order according to score.

The LMS PPL will set the priorities for mitigation projects within the County, but it is important to note that given funding availability, changes in political will, or the occurrence of a disaster, priorities may shift.

6.6.1.5 Tie-break Methodology

This project prioritization methodology will most likely result in tie scores for projects that address the same hazards. For instance, most stormwater management projects will address the same goals and hazards, resulting in tie ranking scores. Because of this, it is important to develop a tie-break methodology.

For projects with identical ranking scores that address different hazards, the project that addresses the highest priority hazard shall be ranked the higher. For instance, if a tornado project and a hazardous materials accident project received identical ranking scores, the tornado project would be ranked higher because its overall hazard priority is higher than hazardous materials accidents.

For projects with identical ranking scores that address the same hazards, the least expensive project will be placed higher in rank.

6.6.1.6 Benefit-Cost Analysis

Benefit-Cost Analysis (BCA) is the method by which the future benefits of a hazard mitigation project are determined and compared to its costs. The end result is a Benefit-Cost Ratio (BCR), which is calculated by a project's total benefits divided by its total costs. The BCR is a numerical expression of the "cost-effectiveness" of a project. A project is considered to be cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs. **FEMA requires a BCA to validate cost effectiveness of proposed hazard mitigation projects prior to funding.** Additional information can be found at https://www.fema.gov/benefit-cost-analysis.

6.6.2 Comprehensive Update

The LMS planning process is dynamic and results in the development of a set of prioritized projects and initiatives with the aim of mitigating hazard impacts. To ensure this Local Hazard Mitigation Strategy remains consistent with current community issues and characteristics, it is important that it be periodically reviewed and updated.

In developing this updating process, three key sources were consulted to shape the process and procedures developed herein: Section 163.3191, F.S.: the evaluation and appraisal process of local government comprehensive plans; the ARC, Ten-Step Informative Model; and the FEMA's DMA2K local mitigation planning requirements. A key objective in the development of the process was to keep it from being excessively bureaucratic and cumbersome.

The LMS update process will occur on a 5-year cycle as is recommended by FEMA's DMA2K. The Working Group indicated that there needed to be some abbreviated reassessment of the Strategy following a Disaster Declaration.

The LMS monitoring, evaluating and updating procedures will be initiated and carried out by the Director of the DES. Both the regular, 5-year Strategy update processes, as well as the abbreviated review process applicable following a Disaster Declaration, are depicted in **Figure 6.2**.

6.6.2.1 Regular LMS Update Procedures

The regular updating process will occur every 5 years. The administrative steps, as described below, constitute the procedures that will be followed.

Step 1 The Director of DES will activate the update process in January of the fourth year of the update cycle by notifying each member of the Working Group of an initial organizational meeting. At that time, the DES will evaluate and request information updates on those serving on the Working Group (name of person, address, telephone and fax number, and e-mail address, if available).

Step 2 The Director of DES prepares a meeting agenda in coordination with the Chairman of the Working Group to be distributed in advance of the meeting to members of the Working Group.

Step 3 A Working Group meeting is held. A brief review of the updating process is discussed. A discussion of whether the evaluation criteria are still appropriate or whether modifications or additions are needed due to changing conditions over the period since the last update process occurred. The data needs will be reviewed, data sources identified, and responsibility for collecting information assigned to members.

Step 4 A draft report is prepared. Evaluation criteria to be addressed include the following:

A. Changes in the community and government processes that are hazard-related and have occurred since the last Strategy review;

1. Community change
    a. Growth and development in vulnerable areas;
    b. Impact of actions resulting from growth that adversely affect natural resources in vulnerable areas, such as seawalling, beach erosion, heightening deposition in inlets;
    c. Demographic changes;
    d. New hazards identified;
    e. Changes in community economic structure; and
    f. Special needs population changes.

2. Government process changes
    a. New or changing laws, policies, and regulations;
    b. Changes in funding sources or requirements;
    c. Change in priorities for implementation;
    d. Changes in government structure; and
    e. Shifts in responsibility and mitigation committee resources.

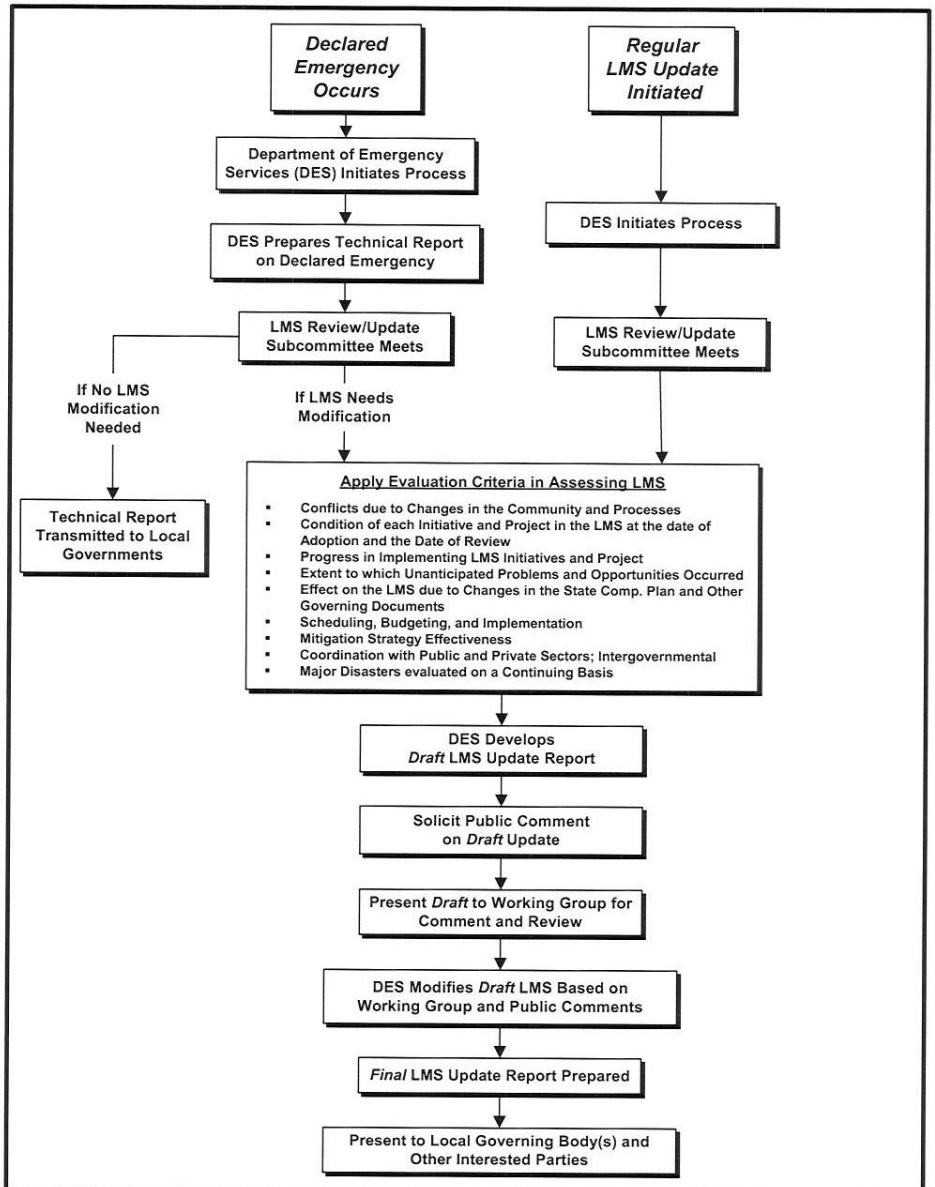


Figure 6.2. Review and revision procedures for updating the single, countywide Indian River County Local Mitigation Strategy (LMS).

B. Progress in implementing LMS initiatives and projects - the Strategy initiatives and projects as compared with actual results at the date of the report;

C. Effectiveness of the implemented initiatives and projects;

D. Evaluation of unanticipated problems and opportunities that have occurred between the date of adoption and date of report;

E. Evaluation of hazard-related public policies, initiatives, and projects;

F. Assess the effectiveness of public and private sector coordination and cooperation.

Step 5 The Director of DES determines the best method to solicit public input. The Director of DES is responsible for public noticing/advertising requirements. All Working Group members are informed and requested to attend the public meeting.

Step 6 A public meeting is held. The Director of DES or a representative of the Working Group presents findings, conclusions, and recommendations of the Strategy effort. Public comments are recorded.

Step 7 The Director of DES distills and synthesizes public comments in the memorandum.

Step 8 The Director of DES coordinates and organizes second meeting of the Working Group. The draft Strategy Update Report is distributed to each participant 7 days prior to the meeting. The Working Group meeting is held. Consensus is reached on changes to the draft. If agreement cannot be reached by certain local governments on certain issue(s) and/or project prioritization(s), the conflict resolution process (**Section 6.8**) may be triggered for those specific items parties cannot agree upon. A vote is taken securing approval of the draft Strategy Update Report, contingent upon integrating Working Group comments into the draft report.

Step 9 The Director of DES incorporates modifications/additions resulting from the Working Group meeting.

Step 10 The Director of DES finalizes the Strategy Update Report. Copies are distributed to Working Group members.

Step 11 Each jurisdictional representative presents the updated Strategy to their respective governing body and other interested parties. If there are new or modified recommendations that their local government could implement to further the countywide Strategy, member seeks direction from governing body to implement appropriate strategies.

Step 12 The final updated LMS is forwarded on to the State Hazard Mitigation Officer at the Florida Division of Emergency Management and then to FEMA Region IV for review.

Step 13 The final updated LMS is formally adopted by all of the participating jurisdictions.

6.6.2.2 Declared Emergency Assessment

Step 1 Within 6 months following a Disaster Declaration, the Director of the Department of Emergency Services will initiate a post disaster review and assessment for the purpose of preparing an After Action Review.

Step 2 The Director of the Department of Emergency Services will prepare an After Action Report (AAR). The purpose of the report is to document the facts of the event. The LMS Working Group will be responsible for a post-disaster review of the LMS plan and assess whether the LMS effectively addressed the hazard. The AAR should contain, at a minimum, the following:

A. Identification of whether the hazard creating the declared emergency has been addressed in the LMS;

B. The AAR will document: the magnitude of the event, extent of damages, and specific damages sustained (public infrastructure [e.g., potable water and wastewater treatment plants and collection systems] and private infrastructure [e.g., utilities, power]);

C. Evaluation of the accuracy of the hazard vulnerability and risk assessment in the LMS relative to the actual event;

D. Identification of the LMS and evaluation of initiatives/projects that had been implemented to mitigate impacts of the type of hazard creating the emergency event.

E. Discussion of unanticipated impacts and identification of potential mitigation measures; and

F. The Working Group will review the LMS and make appropriate recommendations for changes, if needed

G. Discussion of unanticipated impacts and identification of potential mitigation measures; and

H. Synthesis of information and prepare conclusions. Recommendation of whether the Strategy needs to be amended.

Step 3 If the declaration includes funding through the Hazard Mitigation Grant Program (HMGP) the Director of the Department of Emergency Services will schedule~~s~~ a meeting of the Working Group to discuss

the current prioritized project list and to solicit new projects from jurisdictions.

Step 4 A meeting of the Working Group will be held and members will discuss new and existing projects. HMGP eligible projects will be evaluated throughout the application process, preferably ones that vary in budget amount. The Working Group can also make recommendations to update the LMS at this time.

Step 5 Selected projects will be prioritized in the order that the group wants funded (they may be ordered differently than the LMS project list).

Step 6 If it is determined that the LMS is to be amended, the Working Group will submit recommendations for review by the chair/vice-chair person. The Amended LMS should do the following:

A. Utilize information from the After Action Review.
B. Provide justification of the need to amend the LMS; and,
C. Include a re-prioritization of initiatives/projects.

Step 7 A draft amended LMS will be provided to each Working Group member.

Step 8 A meeting of the Working Group will be held. The draft Amended Strategy will be ~~is~~ discussed and approved if all agree.

Step 9 The Director of the Department of Emergency Services is responsible for public noticing/advertising requirements. Working Group members are informed and requested to attend all meetings.

Step 10 If comments are extensive and/or controversial, another ~~a~~ meeting of the Working Group will be ~~is~~ scheduled and organized by the Director of the Department of Emergency Services. If another meeting of the Working Group is warranted, skip to Step 12.

Step 11 A meeting of the Working Group is held. All comments are discussed. A consensus should be reached as to how the comments are to be reflected in the Amended Strategy. If agreement cannot be reached by the Working Group on certain issue(s) and/or project prioritization(s), the conflict resolution process (**Section 6.8**) may be triggered for those specific items parties cannot agree upon. A vote is taken securing approval of the draft LMS contingent upon integrating Working Group comments into the draft report.

Step 12 The Director of the Department of Emergency Services will modify the LMS based on the outcome of the results of Working Group meetings (Steps 8 & 12).

Step 13 The Director of the Department of Emergency Services finalizes the Amended LMS. Copies of the Amended LMS are distributed to the Working Group for review.

Step 14 Each jurisdictional representative presents the Amended LMS to their local governing body and other interested parties. If there are new or modified recommendations that their local government could implement to further the countywide Strategy, the member seeks direction from the governing body to implement appropriate strategies.

Step 15 The final updated LMS is formally adopted by all participating jurisdictions.

Step 16 The final updated LMS is forwarded to the State Hazard Mitigation Officer at the Florida Division of Emergency Management and FEMA Region IV for review.

Declared Emergency Assessment (Post 90-days after declaration)

Step 1 Once the Notice of Funding Availability (NOFA) is published, the state will conduct an HMGP Applicant's Workshop for those interested in preparing an application for hazard mitigation grant funding.

Step 2 The Working Group will determine which projects from the LMS project list will be submitted (based on our allocation).

Step 3 Once the projects for submission are selected, the Working Group will prioritize the selected projects in the order that they want them funded. This list may be ordered differently than they are in the LMS project list and needs to be submitted to the state.

Step 4 Obtain an endorsement letter from the Chair/Vice-Chairperson of the LMS Working Group to accompany the project, if it is chosen. The letter must have the priority number and budget (Federal share), identify how the project meets LMS goals and objectives, signed by LMS Chair. **Applications without a LMS endorsement letter will NOT be processed.**

Step 5 Begin/complete the applications (plan on over submitting) for selected projects.

Step 6 Use the HMGP Application Checklist as a guide for completing the application.

Step 7 The state will conduct project reviews.

Step 8 The state will submit eligible projects to FEMA for final approval and potential funding consideration.

Step 9 Upon FEMA approval, the state begins the project/grant management process.

Step 10 FEMA's goal is to obligate all funds within 24 months of the disaster declaration.

6.7 CONTINUING PUBLIC INVOLVEMENT

The Indian River County LMS Working Group recognizes the importance of public involvement in the LMS planning process. The committee is committed to providing opportunities for the public to be involved in the LMS planning process and welcomes input from neighboring communities, agencies, businesses, academia, nonprofits and other interested parties. The Group will ensure continued public involvement through the following methods:

1) Advertising semi-annual meetings of the LMS Working Group in local newspapers and websites to invite the public to attend;
2) Posting updated LMS information and data on County and municipal websites when available;
3) Engaging in public hazard awareness programs to make residents more aware of the hazards that Indian River County faces; and
4) Providing copies of the final LMS at local library branches for the public to view.

The LMS Coordinator shall have the responsibility of ensuring that these activities are being implemented.

6.8 CONFLICT RESOLUTION

Background. With multiple local governments involved in the development of the Indian River County LMS, differences of opinions may arise over the course of the program with regard to goals, objectives, policies, and projects. Governments often have different interests, priorities, and needs as well as distinct constituents. In cases where an impasse occurs, there needs to be a procedure that can be activated to resolve such conflicts. This section describes the procedure that will be used to resolve conflicts arising among the participating entities in the development of the Indian River County LMS. The Conflict Resolution Process is depicted in **Figure 6.3**. The specific steps are described in detail below.

Prior to developing the process, other dispute resolution processes were investigated. They included the TCRPC Dispute Resolution Process, the Palm Beach County Multi-jurisdictional Issues Coordination Forum, the South Florida Growth Management Conflict Resolution Consortium, the Volusia County Coastal Management Element Conflict Resolution Program, and the Monroe County procedures for resolving disputes during the planning, design, construction, and operation of wastewater collection/treatment and effluent disposal facilities.

The two types of conflicts that may arise are issues and disputes. Issues are technical problems that are susceptible to informal solution by emergency management or planning office staff. Disputes are problems that escalate to levels requiring formal resolution by neutral third parties. In either case, resolution or settlement will not be binding, but a mutual, agreed to understanding among the disputing parties.

Developing an LMS is a cooperative, collaborative process, and local governments should be able to reach consensus on most issues and problems that arise during the development period. When occasions arise where local governments cannot

reach agreement on a particular issue or project, they will be able to petition a hearing of the issues before the Working Group.

The LMS Coordinator would provide staff support.

Conflict Resolution Process. The following provides a detailed, step by step procedure that would be followed should a dispute arise during the study.

Objective: To institute a fair, effective, and efficient process to resolve conflicts among local governments during the development of the single, Countywide LMS.

During the development of the LMS, local governments may reach an impasse on a particular issue or position. The local government has an opportunity to elect to exercise the following LMS Conflict Resolution Process.

Step 1 The local government would submit a letter of dispute (LOD) to the LMS Coordinator explaining in as much detail as possible their concern and position along with documentation to support their position. Also, they would outline potential alternative solutions.

Step 2 The LMS Coordinator would review the LOD making sure that it clearly outlined the position of the local government(s) and provided sufficient information supporting their position so the dispute at question could be easily understood by the members of the Working Group. If necessary, the LMS Coordinator would contact the disputing party and ask for additional information/data necessary to clarify the position.

Step 3 The LMS Coordinator will schedule a meeting of the full LMS Working Group. In an effort to continue to try to resolve the impasse expeditiously, the LMS Coordinator will make every attempt to schedule the meeting within two calendar weeks from the date that the LOD is determined sufficient. Each member of the Working Group will be sent a copy of the LOD and any supportive materials provided by the disputing party. The disputing party will be notified of the meeting date and time.

Step 4 A meeting of the Working Group will be held. The representative of the disputing party will present their positions to the Working Group. Based on the ensuing discussion, hopefully resolution will be achieved. At the end of the meeting, if no mutually acceptable compromise is achieved, the position of the Working Group will be final. Whatever the outcome of the meeting, a memorandum of understanding will be prepared by the LMS Coordinator. To be official, the memorandum must have the concurrence of the Working Group Chair and a representative of the disputing party.

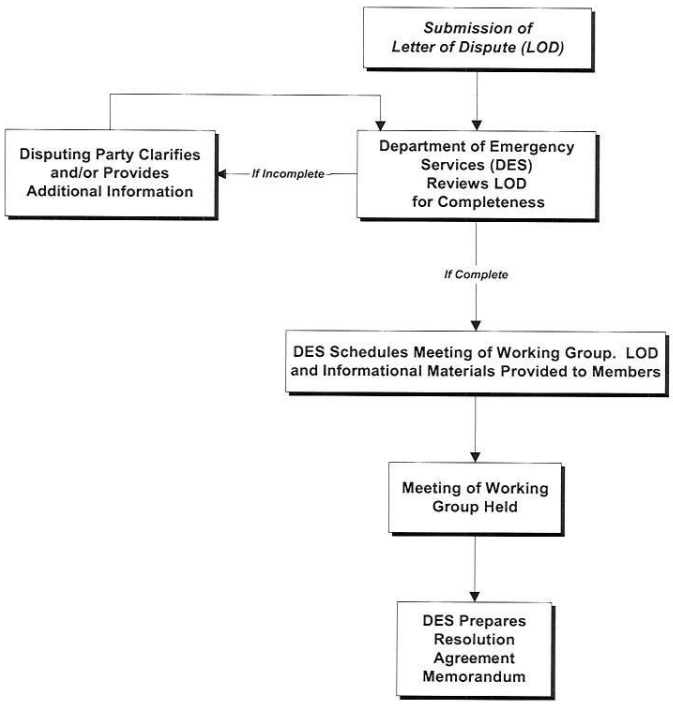


Figure 6.3. Indian River County Conflict Resolution Process.

6.9 FUNDING

Whether projects are implemented in many instances is dependent on whether or not funding is available or whether a grant application was awarded. Potential funding sources are listed in **Appendix C**. However, because funding programs are so fluid (funded some years and cutback other years, or completely eliminated), the County and its municipalities maintain contact with their FDEM liaison, who is familiar with available grants. Also, Region IV, FEMA – Pre-disaster Mitigation Senior Coordinator and the Hazard Mitigation Grant Program Coordinator for Florida are excellent resources, as well. Each participating agency and organization is responsible for implementation of the mitigation initiatives contained within their portion of the Indian River County LMS when the necessary resources, funding, authorities and/or authorizations to become available. The LMS Coordinator will attempt to notify all LMS Working Group members of any notices of funding availabilities and open application periods for mitigation grant programs administered by the Florida Division of Emergency Management or the Federal Emergency Management Agency. Notices of other potential hazard mitigation grant opportunities will be forwarded when they become available; however, it is the applicant's ultimate responsibility to monitor potential funding sources available for their project. Projects will be selected by order of priority ranking and availability of funding for implementation. The applicable agency is responsible for completing all necessary application forms, providing any matching funds, etc. If the agency or organization is unable or unwilling to undertake the application process, the LMS Working Group and/or program staff would notify the agency or organization with the next highest ranked proposed mitigation initiatives on the prioritized project list.

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APPENDIX A

POLICIES

Table A-1. Indian River County 2030 Comprehensive (Growth Management) Plan hazard mitigation inventory.

Policy/Objective/Project	Source	Notes
Indian River County shall provide the following services based on the following criteria: Fire and Emergency Services - Within the urban service area, (excluding Indian River Shores) level-of-service standard of .089 Stations per 1,000 permanent plus weighted peak seasonal population	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 3.8, pp. 154.	Fire, Natural and Technological Disaster Mitigation
Indian River County shall regulate development of areas, which are prone to flooding and areas within the 100-year floodplain in a manner that is consistent with the regulations established by the National Flood Insurance Program.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 7.1, pp. 163.	Flood Mitigation
Indian River County shall include within its land development regulations a mechanism to assess the impact of new development on emergency evacuation.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 12.3, pp. 169.	Hurricane Mitigation
During the 1995-2020 time period, the County will have no increase in land use designation density or intensity within the Coastal High Hazard Area (CHHA).	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Objective 17, pp. 172.	Erosion, Flood, and Hurricane Mitigation
The County shall not approve plan amendments that increase the residential density or land use intensity within the CHHA.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 17.1, pp. 172.	Erosion, Flood, and Hurricane Mitigation
The County shall support programs of land acquisition on the barrier island for natural resource preservation, recreation or both.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 17.2, pp. 172.	Erosion, Flood, and Hurricane Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
The County shall limit densities in the CHHA to ensure timely evacuation of the barrier island.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 17.3, pp. 172.	Erosion, Flood, and Hurricane Mitigation
The County shall prohibit new development of adult congregate living facilities, nursing homes, homes for the aged, total care facilities, and similar developments within the CHHA.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 17.4, pp. 172.	Erosion, Flood, and Hurricane Mitigation
Within one year the issuance of a Hazard Mitigation Report by Indian River County or the Treasure Coast Regional Planning Council, any recommendations that identify land use conflicts or inconsistencies will have been implemented.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Objective 19, pp. 175.	Natural and Technological Disaster Mitigation
Indian River County shall issue Hazard Mitigation Reports for following natural or manmade hazardous incidents. Such incidents may include, but not be limited to, hurricanes and tropical storms, tornadoes, flooding, hazardous material accidents, nuclear power plant accidents, armed violence (civil disturbance, terrorism, or military conflict), mass immigration, coastal oil spill, freezes, fires, and drought.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 19.1, pp. 175.	Natural and Technological Disaster Mitigation, Hurricane, Flood, Erosion, Hazardous Waste, Nuclear, Fire, and Drought Mitigation
Following the issuance of any Hazard Mitigation Reports, Indian River County shall review its comprehensive plan for consistency with that Hazard Mitigation Report. Appropriate Hazard Mitigation Report based plan amendments shall be processed at that time.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 19.2, pp. 175.	Natural and Technological Disaster Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Through the time horizon of the plan, the County will have no instances of sanitary sewer facilities contaminating surface water or groundwater resources.	Indian River County 2030 Comprehensive (Growth Management) Plan, Sanitary Sewer Sub-Element, Objective 3, pp. 38.	Wellfield Contamination Mitigation
The County shall continue to prohibit the locations of septic systems within two hundred feet of a public water supply well, unless otherwise approved by the FDEP or HRS.	Indian River County 2030 Comprehensive (Growth Management) Plan, Natural Groundwater Aquifer Recharge Sub-Element, Policy 1.3, pp. 29.	Wellfield Contamination Mitigation
The County shall continue to protect existing and future public water supply wells from contamination by continuing to implement Chapter 931 of the County's land development regulations and by prohibiting any non-residential land use which stores, handles, or produces a toxic degradation or petroleum-based product, from locating within 1,000 feet of a public water supply well.	Indian River County 2030 Comprehensive (Growth Management) Plan, Natural Groundwater Aquifer Recharge Sub-Element, Policy 1.5, pp. 12.	Wellfield Contamination Mitigation
The County shall prohibit new developments or changes of uses that produce hazardous materials from locating on the Atlantic Coastal Ridge or the Ten Mile Ridge areas of Indian River County.	Indian River County 2030 Comprehensive (Growth Management) Plan, Natural Groundwater Aquifer Recharge Sub-Element, Policy 1.6, pp. 13.	Hazardous Materials Disaster and Wellfield Contamination Mitigation
To protect the function of natural groundwater aquifer recharge areas, to prevent the contamination of groundwater and to extend the life span of the county’s aquifers through water conservation.	Indian River County 2030 Comprehensive (Growth Management) Plan, Natural Groundwater Aquifer Recharge Sub-Element, Goal, pp. 12.	Hazardous Materials Disaster Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
The solid waste disposal district shall provide convenient locations at which residents can drop off household hazardous materials free of charge.	Indian River County 2030 Comprehensive (Growth Management) Plan, Solid Waste Sub-Element, Policy 2.4 pp. 27.	Hazardous Materials Disaster Mitigation
The County shall encourage the County Environmental Health Department to continue to perform regular inspections of small quantity hazard waste generators.	Indian River County 2030 Comprehensive (Growth Management) Plan, Solid Waste Sub-Element, Policy 2.9, pp. 27.	Hazardous Materials Disaster Mitigation
The County shall encourage the Department of Environmental Protection to continue to perform regular inspections of large quantity hazardous waste generators and private licensed waste handlers to ensure that bio-hazardous waste, generated by medical establishments and handled by private firms, is properly managed.	Indian River County 2030 Comprehensive (Growth Management) Plan, Solid Waste Sub-Element, Policy 2.10, pp. 27.	When improper management of bio-hazardous waste is found during an inspection, the private waste handler (the violator) will be prosecuted and fined by the Environmental Control Board. The County shall continue to inspect the bio-hazardous waste which enters the landfill. Hazardous Materials Disaster Mitigation
Stormwater Management Facility Improvements Shall be included within the Indian River County Infrastructure CIP.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Policy 3.1, pp. 41.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Indian River County shall provide and maintain a drainage system which reduces the risk of property damage and inconvenience from long term flooding, promotes stormwater recharge of the shallow aquifer, reduces stormwater pollutant loading of the Indian River Lagoon and receiving waters and provides proper floodplain management.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Goal, pp. 38	Flood Mitigation
By 2030, all existing and new development in the unincorporated section of Indian River County will be protected from flooding from a 25 year/24 hour storm event.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 1, pp. 38.	Flood Mitigation
The County hereby adopts the following level-of-service standard for all new drainage systems within the unincorporated County: New development requiring major site plan approval or subdivision platting shall construct a drainage system capable of Conservation Service Type 2 modified rainfall curves.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Sub-Element, Policy 1.1, pp. 38.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
The finished floor elevation of any new buildings constructed within a flood zone, as designated in the 1989 Federal Emergency Management Agency (FEMA) Flood Insurance Study - Indian River County and Incorporated Areas. "AE" zone structures must be elevated a minimum of six (6) inches above the base flood level; "A" zone - structures must be elevated a minimum of 18 in. above the crown of the road or at the elevation required by the DHRS, whichever is higher; if no base flood data are available, the structure must be elevated at least three (3) feet above the highest natural elevation or the ground surface prior to construction next to the proposed walls of the structure; "VE" zone - structures must be elevated so that the bottom of the lowest horizontal structural member of the lowest floor is elevated on-half (1/2) foot or more above the base flood level.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Policy 1.2, pp. 38.	Flood Mitigation
The County shall ensure that adequate stormwater management facilities are constructed and maintained to prevent major flooding of the road network of Indian River County during storm events.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Sub-Element, Policy 1.3, pp. 39.	Flood Mitigation
All major bridges shall be designed to withstand a 100 year/3 day storm event.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Policy 1.5, pp. 39.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
By 2020, all drainage basins in Indian River County shall, at minimum, meet the Flood Protection Level of Service (FPLOS) for a 10 year/24 hour storm event.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, pp. 39.	Flood Mitigation
In existing developments, the County will reconstruct existing drainage systems and restore design capacity when road paving is programmed under the County's Petition Paving Program.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, Policy 2.1, pp. 39.	Flood Mitigation
By 2020, all existing roadways in the County shall be improved to meet the following level-of-service standard: Minimum road crown elevation for existing roads shall be raised during resurfacing/rebuilding to the flood elevation resulting from the 2 year/24 hour storm event on local streets. The center two lanes of rebuilt roads must be at or above flood levels resulting from a 10 year/24 hour storm event on Arterial and Collector roads.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, Policy 2.2, pp. 39.	Flood Mitigation
By 2012, all drainage basins within the county shall meet a 10 year/24 hour storm event level-of-service standard.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, Policy 2.3, pp. 40.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
By 2012, the County will adopt a Stormwater Master Plan. In developing the Stormwater Master Plan, the County will analyze each basin in the unincorporated County, identify existing conditions and problems in each basin, and identify projected growth in each basin. As a result of that analysis, the County will identify a design storm parameter, discharge rate, land use allowance, and structural improvement plan for each basin. The County will coordinate with the City of Sebastian, and will prioritize analysis of the areas within and adjacent to the St. Sebastian River basin.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, Policy 2.5, pp. 40.	Flood Mitigation
To ensure stormwater management facilities function properly, the County will establish defined levels of maintenance for public and private stormwater management facilities, and will conduct inspections on a routine basis.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, Policy 2.6, pp. 40.	Flood Mitigation
The County will continue its activities to retrofit the Vero Lakes Estates drainage system.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 2, Policy 2.8, pp. 40.	Flood Mitigation
By 2012, Indian River County will have an adopted Stormwater Master Plan, which will guide all improvements to stormwater management facilities in Indian River County over a 20 year time frame.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 3, pp. 40.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
In all major transportation improvement projects, the County shall include stormwater management facilities to serve the discharge needs of developments existing at the time of the improvement project within the upstream watershed area. Funding shall be included in the Transportation CIP.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 3, Policy 3.2, pp. 41.	Flood Mitigation
By 2012, the County shall consider establishing a stormwater utility to fund maintenance and improvements of existing stormwater management facilities.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 3, Policy 3.4, pp. 41.	Flood Mitigation
The County shall coordinate with the SJRWMD, and encourage the municipalities within the County to adopt stormwater master plans.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 4, Policy 4.5, pp. 42.	Flood Mitigation
The County shall maintain its Comprehensive Emergency Management Plan (CEMP) to serve as a comprehensive floodplain management plan approved by the Federal Emergency Management Agency (FEMA).	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 5, pp. 42.	Flood Mitigation
The County shall prohibit encroachments, including fill, new construction, substantial improvements, and other development, within a County adopted regulatory floodway, as identified in the data section of this sub-element, that would result in any increase in flood levels during the occurrence of a flood discharge, unless specifically approved by the Administrator of the Federal Insurance	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-element, Objective 5, Policy 5.1, pp. 42.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Administration under the provisions of 44 CFR 65.12, as amended.		
The County will allow only low density land uses in areas designated as flood prone (within the 100 year floodplain) as depicted on the Future Land Use Map. The only exception is where platted subdivisions were developed prior to existing regulations.	Indian River County 2030 Comprehensive (Growth Management) Plan, Stormwater Management Sub-Element, Objective 8, Policy 8.1, pp. 45.	Flood Mitigation
Indian River County shall maintain. periodically review, revise if necessary, and enforce land development regulations. Those regulations shall include, but not be limited to provisions for the use of areas subject to periodic flooding and the provision of adequate drainage and stormwater protection.	Indian River County 2030 Comprehensive (Growth Management) Plan, Future Land Use Element, Policy 1.3, pp. 131.	Flood Mitigation
The County shall not fund transportation improvements, which allow increased development in CHHAs.	Indian River County 2030 Comprehensive (Growth Management) Plan, Transportation Element, Policy 5.3, pp. 131.	Erosion, Flood, and Hurricane Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
The County shall evaluate and prioritize its capital improvement projects based on the following criteria. These criteria are ranked in order of importance. • Preservation of the health and safety of the public by eliminating public hazards; • Compliance with all mandates and prior commitments; • Elimination of existing deficiencies; • Maintenance of adopted level-of-service standards; • Provision of infrastructure concurrent with the impact of new development; • Protection of prior infrastructure investments; • Consistency with the county plan and plans of other agencies; • Accommodation of new development and redevelopment facility demands; • Consistency with plans of state agencies and water management districts that provide public facilities within the local government's jurisdiction; • Promotion of compact development by discouraging growth outside of urban service areas; • Demonstration of linkages between projected growth and facility location; • Utilization of the economics of scale and timing of other improvements; • Reduction of operating costs; • Adjustment for unseen opportunities, situations, and disasters.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 1.3, pp. 51.	Natural and Technological Disaster Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Through 2030, development in CHHAs will not increase beyond the density or intensity levels indicated on the current Future Land Use Map.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Objective 2, pp. 53	Erosion, Flood, and Hurricane Mitigation
The County shall not increase land use density and intensity, in the CHHA, beyond that reflected in the County's current Future Land Use Map.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 2.2, pp. 53.	Erosion, Flood, and Hurricane Mitigation
The County shall make appropriations for infrastructure in CHHAs only to maintain the adopted level-of-service standards.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 2.3, pp. 53.	Erosion, Flood, and Hurricane Mitigation
The County shall ensure that the replacement of infrastructure in the CHHA will be limited to maintaining the adopted level-of-service standards.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 2.4, pp. 53.	Erosion, Flood, and Hurricane Mitigation
The County shall require that all developments and all single family units in CHHAs fully pay the cost for required infrastructure improvements through impact fees, developer dedications, assessments, and contributions.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 2.5, pp. 53.	Post-Disaster Redevelopment; Erosion, Flood, and Hurricane Mitigation
The County shall not use public funds to subsidize increased density and intensity of urban development in CHHAs. However, public beach, shoreline access, resources restoration, or similar projects may be constructed.	Indian River County 2030 Comprehensive Growth Management Plan, Capital Improvements Element, Policy 2.6, pp. 53.	Erosion, Flood, and Hurricane Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
New development requiring major site plan approval or subdivision platting shall construct a complete drainage system to mitigate the impacts of a 25 year/24 hour design rainfall event using the soil conservation service type 2 modified rainfall curves.	Indian River County 2030 Comprehensive Growth Management Plan, Capital Improvements Element, Policy 3.5, pp. 54.	Flood Mitigation
Post development runoff for any drainage basin shall not exceed pre-development runoff unless a maximum discharge rate has been adopted and the discharge does not exceed that rate. If a maximum discharge rate has not been adopted for a basin, post development discharge may not exceed pre-development discharge.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 3.5, pp. 54.	Flood Mitigation
By 2015, all existing roadways in the county shall be improved to meet the following level-of-service standards: Minimum road crown elevation for existing roads shall be raised during resurfacing/rebuilding to the flood elevation resulting from the 2 year/24 hour storm event on local streets; the center two lanes of rebuilt roads must be at or above flood levels resulting from a 10 year/24 hour storm event on Arterial and Collector roads; and all drainage basins will meet the following level of service standards: By 2005 – 5-year/24 hour storm event, by 2010 – 10-Year/ 24 hour storm event.	Indian River County 2030 Comprehensive (Growth Management) Plan, Capital Improvements Element, Policy 3.5, pp. 54.	Flood Mitigation
In coordination with the Office of Radiation Control and the Indian River County Health Department, the County shall make available information on the detection and control of radon gas.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Policy 1.2, pp. 122.	Air Pollution Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Through 2020, there will be no reduction in flood storage capacity or the other natural functions and values of floodplains in Indian River County.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Objective 4, pp. 128.	Flood Mitigation
Consistent with Policy 5.1 of the Stormwater Management Sub-element, the County shall regulate development in areas designated as regulatory floodways on FEMA's most current Flood Insurance Rate Maps (FIRMs). Within designated regulatory floodways, all encroachment shall be prohibited, including: fill, new construction, substantial improvements, and other development within the adopted regulatory flood that would result in any increase in flood levels within the County during the occurrence of the base flood discharge.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Policy 4.1, pp. 128.	Flood Mitigation
The County shall continue to regulate development within flood prone areas to minimize flood storage capacity reduction and to afford protection to life and property within floodplains.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Policy 4.2, pp. 128.	Flood Mitigation
The County hereby adopts the following specific criteria pertaining to shoreline stabilization within the unincorporated portion of Indian River County and within the municipal limits of the City of Vero Beach: Only structures vulnerable to erosion from a 15 year or less storm event shall be permitted to construct rigid shoreline stabilization structures.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Policy 10.5, pp. 139.	Erosion Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
To reduce improper management of hazardous and solid waste, the County will investigate illegal waste disposal practices, evaluate current enforcement policies, and revise County enforcement policies if deemed appropriate.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Policy 11.3, pp. 141.	Hazardous Materials Disaster Mitigation
Existing known hazardous waste contaminated sites shall be monitored and remediated, when feasible.	Indian River County 2030 Comprehensive (Growth Management) Plan, Conservation Element, Policy 11.4, pp. 141.	Hazardous Materials Disaster Mitigation
Through 2030, there will be no expansion of infrastructure within the CHHA other than that which is deemed necessary to maintain existing levels-of-service.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Objective 5, pp. 51.	Erosion, Flood, and Hurricane Mitigation
The County shall not subsidize public facilities within the CHHA, other than those which are deemed necessary to maintain existing level-of-service standards, and those which are directly related to public access and/or resource management.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 5.2, pp. 52.	Erosion, Flood, and Hurricane Mitigation
Following a storm event, the Public Works Department shall assess all County facilities damaged from storm activity in the CHHA, and shall make recommendations to reduce future expenditures and potential damage risks. In addition, the Public Works Department shall conduct a cost/benefit analysis to evaluate the relocation of storm damaged infrastructure or infrastructure which is repeatedly threatened by potential storm damage.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 5.3, pp. 52.	Post-Disaster Redevelopment

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
The County shall maintain, at a minimum, a Federal Emergency Management Agency (FEMA) Community Rating System (CRS) classification of "6" by continuing to enforce LDR Chapter 930 - Stormwater Management and Flood Protection, and by evaluating structures for compliance with the FEMA's 50% Rule.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 5.4, pp. 52.	Flood Mitigation
The county will continue to monitor existing schools, municipally-owned buildings, and county-owned buildings to identify those building that are appropriately designed and located to serve as hurricane evacuation shelters. The county will solicit state funding for retrofitting primary shelters to increase hurricane-proofing of such structures as warranted.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 6.2, pp. 52.	Hurricane Mitigation
To ensure that all new developments within the CHHA incorporate hazard mitigation techniques such as dedication of emergency accesses, the county shall continue to assess the vulnerability of public infrastructure, private residences, and businesses within the CHHA through the County's inter-departmental development review process.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 6.3, pp. 52.	Hurricane, Flood, and Technological Disaster Mitigation
Indian River County shall continue to coordinate with the Treasure Coast Regional Planning Council (TCRPC), Brevard County and St. Lucie County concerning evacuation routes and populations involved to assess the impact of regional growth on local evacuation times.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 6.4, pp. 52.	Hurricane Mitigation
Consistent with the requirements of Chapter 163, F.S. and DCA Rule 9J-5, as an annex to the Indian River County Comprehensive Growth Management	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal	Post-Disaster Redevelopment; Natural and Technological Disaster Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Plan (CEMP). The LMS shall list and prioritize disaster mitigation projects.	Management Element, Objective 7, pp. 52.	
The county shall continue to maintain its LMS and to implement the short-term and long-term recommendations contained in the LMS.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 7.2, pp. 53.	Natural and Technological Disaster Mitigation
Following a natural disaster, principal structures and uses located east of the County's Dune Stabilization Setback Line (DSSL) which sustain greater than 50 percent of MAI (Member or Appraisal Institute) assessed current market value damage from a naturally occurring storm shall be required to relocate upland of their location and, when possible, west of the DSSL. Prior to reconstruction, principal structures east of the 1987 State Costal Construction Control Line (SCCCL) exhibiting damage from naturally occurring storm event, greater than 50 percent of MAI assessed market value, shall be required to obtain all applicable permits and comply with all applicable building codes concerning costal construction.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 7.3, pp. 53.	Natural and Technological Disaster Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
Consistent with National Flood Insurance Program (NFIP) requirements, any structure predating 1989 FEMA Flood Insurance Rate Maps (FIRMs) and located within a flood hazard area that sustains "substantial damage" due to natural disaster (i.e. repair costs that exceed 50% or more of the building's value) shall; be required to be elevated a minimum of six (6) inches above the base flood elevation (BFE), as depicted on current FIRMs.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 7.4, pp. 53.	Natural and Technological Disaster Mitigation
The county shall continue to regulate development and manage natural resources with the Coastal Zone.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 7.6, pp. 54.	Flood Mitigation
Indian River County shall assist the Federal Emergency Management Agency (FEMA) in its Flood Insurance Rate Map (FIRM) modernization project by making local drainage studies available to FEMA and by conducting public information workshops to advise development professionals, as well as the general public, of the floodplain map and modernization project.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 7.7, pp. 54.	Flood Mitigation
Through 2030, the level of service (LOS) for traffic circulation, recreational facilities, stormwater management, and potable water and sewer service in the coastal zone of Indian River County will be consistent with the LOS standards set forth in the concurrency section of the Capital Improvements Element.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Objective 10, pp. 56.	Flood Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
The County shall identify and assess all infrastructure located within the CHHA to determine its vulnerability. This vulnerability assessment will based on data from FIRMs. The Arbiter of Storms (TAOS) computer model, and the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) map. Any decision to abandon or relocate infrastructure outside the CHHA following a natural disaster will be based on a benefit-cost analysis of vulnerable infrastructure. This benefit-cost analysis will be included in the Local Mitigation Strategy, once completed.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 10.1, pp. 56.	Erosion, Flood, and Hurricane Mitigation
The County shall not allow new underground storage tanks or septic facilities to be located oceanward of the County's Dune Stabilization Setback Line (DSSL).	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 10.4, pp. 56.	Erosion, Flood, and Hurricane Mitigation
Through 2030, there will be no increase in the density of land use within the CHHA.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Objective 11, pp. 57.	Erosion, Flood, and Hurricane Mitigation
Lands acquired by the County under its Environmental Lands Program shall include property located within the Hurricane Vulnerability Zone (HVZ). This land shall be used for either natural resource conservation, passive recreation or both.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 11.1, pp. 57.	Erosion, Flood, and Hurricane Mitigation
Within the CHHA, the County will not make infrastructure improvements to accommodate	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal	Erosion, Flood, and Hurricane Mitigation

Table A.1. (Continued).

Policy/Objective/Project	Source	Notes
development more intense than allowed by the comprehensive plan.	Management Element, Policy 11.2, pp. 57.	
The County shall utilize all applicable State and Federal regulations, and the appropriate objectives and policies of the Indian River County Comprehensive Growth Management Plan, to limit public and private development in the CHHA.	Indian River County 2030 Comprehensive (Growth Management) Plan, Coastal Management Element, Policy 11.3, pp. 57.	Erosion, Flood, and Hurricane Mitigation

BFE = base flood elevation.
CEMP = Comprehensive Emergency Management Plan.
CHHA = Coastal High Hazard Area.
CIP = Capital Improvement Plan.
CRS = Community Rating System.
DHRS = Department of Health and Rehabilitative Services.
DSSL = Dune Stabilization Setback Line.
FDEP = Florida Department of Environmental Protection.
FEMA = Federal Emergency Management Agency.
FIRM = Flood Insurance Rate Map.
FPLOS = Flood Protection Level of Service
HRS = Health and Rehabilitative Services.
HVZ = Hurricane Vulnerability Zone.
LDR = Land Development Regulation.
LMS = Local Mitigation Strategy.
LOS = level of service.
NFIP = National Flood Insurance Program.
SJRWMD = St. Johns River Water Management District.
SLOSH = Sea, Lake, and Overland Surges from Hurricanes.
TAOS = The Arbiter of Storms.
TCRPC = Treasure Coast Regional Planning Council.

APPENDIX B
MITIGATION OPTIONS

Table B.1. Potential hazard mitigation measures.

Potential mitigation initiatives are presented by hazard type. Specific references are given by number for each mitigation initiative listed. **Table B.2** presents an annotated bibliography of data sources for all mitigation initiatives in the previous sections. This bibliography identifies, describes, and where possible, cross references data sources with funding sources for the proposed mitigation measures.

Natural Hazards

Hurricane.

- Encourage neighborhood preservation/revitalization for flood and wind damage retrofitting (50)
- Provide information to contractors and homeowners on the risks of building in hazard-prone areas (50)
- Develop a list of techniques for homeowner self-inspection and implementation of mitigation activities (50)
- Implement dune restoration programs (50)
- Acquire shorefront land for open space (50)
- Develop a beach management plan (30)
- Assess the need for beach nourishment projects (30)
- Develop maintenance program to clear debris from bridges (30)
- Develop a drainage system management and maintenance program (30)
- Develop a floodplain management plan (30)
- Construct shelters in mobile home parks (30)
- Require that new development be oriented to convey wind and water (30)
- Identify vulnerable properties for relocation programs (30)
- Encourage the construction of safe rooms in new construction (30)
- Require tie-downs for propane tanks and mobile homes (30)
- Install resilient street signs for navigation (30)
- Develop a comprehensive sheltering system with funding provided for the acquisition and construction of shelters (50)
- Identify “refuges of last resort” for those unable to reach shelters (50)
- Implement a Tree Hazard Management Program to encourage responsible planting practices and minimize future storm damage to buildings, utilities, and streets (2)
- Encourage building inspection by a hazard mitigation professional (2,15)
- Practice a tree trimming maintenance program (50)
- Re-landscape with native species (50)
- Distribute hurricane preparedness information including pet sheltering plans (9)
- Encourage the purchase of flood insurance (9)
- Enforce building codes (29)
- Award insurance premium credits (29)
- Retrofit:
  - Wet floodproofing (allowing water to enter uninhabited areas of the house) (35)
  - Dry floodproofing (sealing the structure to prevent floodwaters from entering) (35)
  - Install backflow valves on sewer systems (50)
  - Venting on roofs (3)
  - Garage doors with stiffer horizontal members (3, 24)
  - Glider tracks and track supports should be strengthened (3, 24)
  - In-place shutters (3, 9, 15, 24)
  - Hurricane straps and hurricane clips (15)

- Reinforcement of concrete block wall; concrete tie-columns at all corners (3)
- Bracing with struts or pilaster columns in walls perpendicular to freestanding walls (3)
- Elevation of structures by piers, posts, and columns, and pilings (3)
- Adequate connection or anchoring of each element to the adjacent element (3)
- Add shutters for glazed openings (3, 24)
- Re-nail sheathing (3)
- Create a secondary water barrier (35)
- Provide support for sliding glass doors and double doors opening to the outside (3, 24)
- Improve anchorage of windows to openings (3)
- Add ridge ventilators to reduce uplift of wood sheathing (3)
- Strengthen garage doors and particularly double-wide garage doors (3, 24)
- Anchor adjacent structures, including privacy fences, pool enclosures, and patio roofs (3)
- Improve connections of porch roofs and overhangs (3)
- Reinforce entry doors (3, 34)

• Modify building codes:
- Hip roofs instead of gable (3, 24, 34)
- Metal panels that simulate tile instead of tile roofs (3)
- Consistent mortar pad placement (3)
- Full 10-inch mason's trowel of mortar on tile roofs (3)
- 4 to 6 inch nail spacing on sheathing panel (3, 34)
- Venting on roofs (3, 34)
- Garage doors with stiffer horizontal members (3, 34)
- Multiple panel sliding glass doors and windows should be avoided (3)
- Individual panel width should be no more than 3 feet (3)
- Total window and door openings should be no more than 31% of a wall's total area (3)
- Shatter-resistant transparent material (3, 34)
- Improved adherence to adequate attachment procedures (3)
- Hurricane straps and hurricane clips (3, 34)
- Reinforcement of concrete block walls; concrete tie-columns at all corners (3)
- Bracing with struts or pilaster columns in walls perpendicular to freestanding walls (3)
- Walls sufficiently anchored in the foundation or story below (3)
- Adequate connection or anchoring of each element to the adjacent element (3)
- Require hurricane shelters on multi-unit housing (50)
- Construction products examined by independent laboratories under the guidance of the county compliance office (34)
- Contractors must install high-quality shutters or strong "impact" glass, like that found in car windshields in each new single family home (34)

Flood.

• Acquire flood prone homes (30)
    • Maintenance program to clear debris from bridges (30)
    • Develop a floodplain management plan (30)
    • Encourage the use of roadside grassy swales (30)

- Limit impervious surfaces by encouraging the use of porous pavement (30)
- Require new development to be oriented to convey floodwaters (30)
- Include retention ponds in new developments (30)
- Require setback from waterways for new construction or major renovation (30)
- Require tie-downs for propane tanks and mobile homes (30)
- Encourage neighborhood preservation/revitalization for floodproofing techniques (50)
- Elevate structures above the 100-year flood level (35, 50)
- Maintenance program to clear debris from stormwater drainage areas (50)
- Provide information to contractors and homeowners on the risks of building in hazard-prone areas and mitigation (50)
- Provide the public with Federal Emergency Management Agency (FEMA) floodplain maps (50)
- Develop a list of techniques for homeowner self-inspection and implementation of mitigation activities (50)
- Install backflow valves in sewer systems (50)
- Incorporate a “hazard disclosure” requirement for deed transfers, leases, or other contracts for sale or exchange of property in flood hazard areas (50)
- Improve storm drainage areas (50)
- Develop sediment control to prevent clogged drainage systems such as street sweeping, curb and gutter cleaning, paving dirt roads, and planting vegetation on bare ground (1, 40, 45)
- Investigate the use of flood prone areas as open space (29, 40, 42, 46, 47, 50)
- Retrofit critical facilities (50)
- Purchase flood insurance (7, 15)
- Know evacuation routes (7)
- After a flood, inspect foundations of buildings for cracks and other damage (7)
- Make sure buildings are not in danger of collapsing after a flood (7)
- Encourage building inspection by a hazard mitigation professional (2, 15)
- Regulate development in the floodplain (40, 46)
- Enforce building codes (29)
- Insurance premium credits (29)
- Retrofit:

- Elevate the lowest floor above the 100-year flood level (35)
- Wet floodproofing (allowing water to enter uninhabited areas of the structure) (35)
- Dry floodproofing (sealing the structure to prevent flood waters from entering) (35)
- Levees and floodwalls (constructing a barrier around the structure to keep out flood waters) (35)
- Demolition (tearing down the structure and rebuilding with appropriate flood proof techniques or relocating the structure) (7)
- Elevate the main breaker or fuse box (15)

Severe Thunderstorms and Lightning.

- Clear dead or rotting trees and branches (12)
- Public information on when to turn off gas, electricity, and water; how to develop an emergency communication plan; and actions to take during a

severe thunderstorm such as avoiding bathtubs, water faucets, and sinks (12) • Develop a stormwater drainage management and maintenance plan (31) • Construct shelters in mobile home parks (31) • Secure outdoor objects that could become projectiles (12) • Install lightning rods (12) • Encourage purchase of flood insurance (12)
Wildland Fire. • Acquire land susceptible to fire for conversion to open space (44, 48, 50) • BEHAVE (Fire Behavior Prediction and Fuel Modeling System) (32) • METAFIRE (National information system that transmits daily severity index values for every climate division in the country) (32) • Create fire breaks (30) • Conduct prescribed burns to limit fuel load (30) • Require larger side yards to allow access to backyards (30) • Encourage landscaping with fire-resistant or slow burning vegetation (30) • Move shrubs and other landscaping away from the sides of the structure (16) • Clean brush and dead grass from the property (13, 16) • Public information on safe fire practices (build away from nearby trees or bushes, fire extinguisher availability) (13, 30) • Building code modification - Fire-resistant materials when renovating, building, and retrofitting (13, 30) - Create a safety zone between the structure and combustible plants and vegetation (stone walls, swimming pools) (13) - Install power lines underground (13) - Install tile, fire-retardant shingles, asphalt, fiberglass, concrete tile, or metal on the roof (4, 13, 16) - Plant trees in clusters so that there are gaps in the tree branch canopies overhead (4) - Use alternatives to wood and other combustible materials such as brick, stone, or metal when building walls (4) - Adequate water supply (30) - Access for fire trucks (a turnaround) (30) • Prescribed burns (21, 22, 23, 43) • Keep trees trimmed so there is no contact with power lines or other wires (16) • Cut back tree limbs that overhang the structure (4) • Remove combustible debris from around the structure (4) • Adopt the wildland/urban interface building code (30) • Development of ongoing fire safety education programs (21) • Identification of businesses located within rural areas that contain flammable substances (21) - Assure that all water mains within the development be of proper size, looped or griddled with no dead-end, or low flow areas - Avoid dead-ended cul-de-sacs - Assure hydrants at cul-de-sacs to be on a loop or griddled to eliminate loss of water - flow due to high usage of the system during wildland fires

- Design swimming pools so that fire trucks can reach them for pumping water on fires
- Develop written provisions that afford access to subdivision water systems for firefighting services
- Assure the provision of alternative access roads
- Identify and provide proper signage for access points where fire trucks can drive within 16 feet of creeks, rivers, lakes, or ponds to fill pumpers
- Provide underground wiring for electric power supply
- Assure a minimum 30-foot non-combustible areas around housing units
- Provide a firebreak around all structures and around subdivision
- Include firesafe construction performance standards such as the use of fire-resistant materials for roofs and building exteriors

Tornadoes.

- Telephone warning system (31)
- Community warning sirens (31)
- Construct shelters in mobile home parks (31)
- Require tie-downs for propane tanks and mobile homes (31)
- Install resilient street signs for navigation (31)
- National Oceanic and Atmospheric Administration (NOAA) weather radio tone alerts (31)
- Underground shelter actions to be taken during hurricanes and tornadoes need better distinction, especially among elderly residents (31)
- Retrofit structures to include reinforced “safe room” (14)
- Modify building codes:

- Include an interior reinforced “safe room” in all new structures (14)
- Shingles around the edges of the roof should be set into a special mastic (28)
- Roof sheathing: the plywood or particle board should be nailed securely to the rafters; nails should be 6 inches on center at the edges, and 12 inches on center elsewhere (28)

Extreme Temperatures.

- Install window air conditioners snugly (6)
- Install temporary reflectors, such as aluminum foil covered cardboard to reflect any heat back outside (6)
- Consider keeping storm shutters up all year (6)
- Conserve electricity (6)
- Public information on heat-related disease prevention (drink plenty of water, avoid strenuous outdoor activities) (6)

Soil/Beach Erosion.

- Sand management (38)
- Relocation of threatened facilities (38)
- Threatened real estate may be set aside as open space (38)
- Vegetation replenishment program (36, 38)
- Develop a beach management plan (30)

Agricultural Pest and Disease.

- Prompt removal of citrus trees infected by citrus canker (18)
- Prompt removal of tomato plants infected with tomato yellow leaf curl virus (19)

- Eliminate breeding spots of insects (33)
- Patch screens and other places where pests enter greenhouses (33)

Drought.

- Create cooperative Federal/non-Federal drought contingency plans for rapid implementation during water shortages (27)
- Develop an early warning system (27)
- Evaluate the current use of ground water (27, 46)
- Establish new data collection networks (27)
- Study public willingness to pay more for more reliable water supplies (27)
- Study effectiveness of conservation measures (27, 46)
- Monitor vulnerable public water supplies (27)
- Pass legislation to protect and manage ground water (27)
- Provide funds for water recycling projects (27)
- Organize drought information meetings for the public and media (27)
- Implement water conservation awareness programs (27)
- Assist water agencies in developing contingency plans (27)
- Establish stronger economic incentives for private investment in water conservation (27)
- Implement water metering and leak detection programs (27)
- Adopt an emergency water allocation strategy to be implemented during severe drought (27)
- Evaluate worst-case drought scenarios for possible further actions (27)

Seismic Hazards.

- No mitigation activities have been listed as this is not a significant hazard to Martin County

Epidemic.

- Anthrax vaccine is available (17)
- Rodent control (25)
- Mosquito control (25)
- Regular maintenance of cooling and plumbing systems (25)
- Wellfield protection and water purification maintenance (25)
- Adequate sanitation control measures (25)
- Proper food processing (25)
- Regulate widespread use of antibiotics (25)

Technological Hazards

Nuclear Disaster.

- Prepare a community accident response plan (10)
- Install community sirens (10)
- Install a telephone warning system (10)
- Distribute tone alert radios (10)
- Conduct public information meetings (10)
- Disseminate emergency information throughout the community (in-place sheltering) (10)
- Voluntary conservation public information (bill inserts) (22)
- Electrical Emergency Contingency Plan (22)

Hazardous Materials Accident.

- Public information on detecting a spill/release (8)
- Public information on response/evacuation plans (8)
- Install a telephone warning system (8)
- Install community sirens (8)
- Retrofit seal gaps and air-conditioning systems (8)

Transportation System Accident.

- Develop accident contingency plans (49)
- Response training (49)

Wellfield Contamination.

- Have water tested by EPA (26)
- Maintain isolation distances from potential contamination sources (26)
- Inventory potential sources of contamination (26)
- Develop water supply contingency strategy (5)
- Reward landowners who do not conduct activities that could contaminate the water supply by easing their taxes (5)
- Investigate growth management programs to ensure that wellfield protection programs are in place before development occurs (5)

Communications Failure.

- No mitigation activities have been listed as this is not a significant hazard to Martin County

Societal Hazards

Terrorism and Sabotage.

- Encourage public education programs on terrorism including information on potential targets, visible targets, etc. (11)
- Drills for people who work in large buildings including knowing where fire exits are located, keeping fire extinguishers in working order, learning first aid (11)
- Develop a bomb threat plan (11)
- Develop an explosion plan for building (cover nose and mouth with a wet cloth, stay below smoke, exit building as quickly as possible, tap on a pipe if trapped so rescuers know where to look) (11)

Civil Disturbance.

- No mitigation activities have been listed as this is not a significant hazard to Martin County

Immigration Crisis.

- No mitigation activities have been listed as this is not a significant hazard to Martin County

All Hazards

- Map vulnerable areas and distribute information about the hazard mitigation strategy and projects (50)
- Provide information to contractors and homeowners on the risks of building in hazard-prone areas (50)

    - Develop a list of techniques for homeowner self-inspection and implementation of mitigation activities (50)
    - Organize and conduct professional training opportunities regarding natural hazards and hazard mitigation (50)
    - Distribute NOAA weather radios (school superintendents, etc.) (50)
    - Sound land use planning based on known hazards (50)
    - Enforcing effective building codes and local ordinances (30, 50)
    - Increasing public awareness of community hazards (50)
    - Provide sites that are as free as possible from risk to natural hazards for commercial and industrial activities (30, 50)
    - Consider conservation of open space by acquisition of repetitive loss structures (30, 50)
    - Ensure a balance among residential growth and conservation of environmental resources through a detailed analysis of the risks and vulnerability to natural hazards (30,50)
    - Joint planning and sharing of resources across regions, communities, and states (30, 50)
- Establish a hazard mitigation council (50)
    - For future proposed development design guidelines, incorporate hazard mitigation provisions, including improved maps (30, 50)
- Add a “safe room” requirement for all new buildings (15, 24)
    - Establish incentives to encourage business owners and homeowners to retrofit buildings with hazard-resistant features (29)
- Teach disaster and hazard awareness in schools (29)

Table B.2. Annotated bibliography for mitigation measure data sources.

#	Reference	Description	Funding Source
1	St. Johns River Water Management District. "The Indian River Lagoon's problems are as common as dirt." Indian River Lagoon Update. Winter 1998.	Describes the detrimental effects that uncontrolled sediment can have on local waterways and drainage areas; also presents potential mitigation projects to control sediment.	
2	Alachua County Office of Emergency Management. "Hazard mitigation page." http://www.co.alachua.fl.us/~acem/mitigati.htm (26 Jun 1998)	Defines mitigation and provides examples of community-wide and individual mitigation practices.	Florida Department of Community Affairs, Florida Department of Environmental Protection, Florida Department of Health, Florida Department of Agriculture, Federal Emergency Management Agency (FEMA), U.S. Department of Energy, U.S. Department of Housing and Urban Development.
3	Ayscue, J. Natural Hazards Research Center. Hurricane damage to residential structures: risk and mitigation. (Nov 1996) http://www.colorado.edu/hazards/wp/wp94/wp94.html#intro	Describes potential hurricane hazards from wind and water; discusses building techniques that can mitigate hurricane damage.	
4	Boulder County. "Wildfire hazard identification and mitigation system for Boulder County, Colorado." http://www.boco.gov/gislu/whims.html (25 Jan 1999)	Contains a summary of the Wildfire Hazard Identification and Mitigation System project, detailed maps from the project, and mitigation suggestions to protect structures from wildfire.	Multiple local, State, and Federal government inter-agencies.
5	Browning, C. "Community wellhead protection programs." http://hermes.ecn.purdue.edu/water_quality/documents/oef-890.ok.ascii (13 Nov 1998)	Describes each element of a community wellfield protection program.	
6	Federal Emergency Management Agency. "Fact sheet: extreme heat." (15 Jan 1998) http://www.fema.gov/library/heatf.htm (2 Dec 1998)	Mitigation measures related to extreme heat; most are individual actions.	
7	Federal Emergency Management Agency. "Fact sheet: floods and flash floods." (13 Jan 1998) http://www.fema.gov/library/floodf.htm (2 Dec 1998)	Describes activities that may prevent a flood emergency, reduce the chance of a flood emergency happening, or lessen the effects of unavoidable emergencies. Activities are categorized as before, during, and after a flood event.	

#	Reference	Description	Funding Source
8	Federal Emergency Management Agency. “Fact sheet: hazardous materials accidents.” (10 Jan 1998) http://www.fema.gov/library/hazmatf.htm (2 Dec 1998)	Contains information on preparing for and detecting a hazardous material accident.	
9	Federal Emergency Management Agency. “Fact sheet: hurricanes.” (14 Jan 1998) http://www.fema.gov/library/hurricaf.htm (2 Dec 1998)	Describes measures to be taken before, during, and after a hurricane to prevent loss of life and property.	
10	Federal Emergency Management Agency. “Fact sheet: nuclear power plant emergency.” (27 Feb 1997) http://www.fema.gov/library/radiolo.htm (2 Dec 1998)	Explains the nature of a nuclear disaster and describes related mitigation measures.	
11	Federal Emergency Management Agency. “Fact sheet: terrorism.” (10 Jan 1998) http://www.fema.gov/library/terrorf.htm (2 Dec 1998)	Mitigation measures related to various terrorist attacks.	
12	Federal Emergency Management Agency. “Fact sheet: thunderstorms and lightning.” (30 Jan 1998) http://www.fema.gov/library/thunderf.htm (2 Dec 1998)	Contains mitigation measures relating to thunderstorms and lightning.	
13	Federal Emergency Management Agency. “Fact sheet: wildland fires.” (10 Jan 1998) http://www.fema.gov/library/wildlanf.htm (2 Dec 1998)	Mitigation practices for before, during, and after a wildland fire event.	
14	Federal Emergency Management Agency. “Taking shelter from the storm: building a safe room in your house.” http://www.fema.gov/mit/tsfs01.htm (25 Nov 1998)	Contains two sections: one is a description of hazards that may threaten a structure, and the second is how to plan and construct a “safe room.”	
15	Federal Emergency Management Agency. “What can homeowners do to reduce their risk from disasters?” (24 Aug 1996) http://www.fema.gov/mit/lowcost.htm	Low-cost mitigation measures related to floods, seismic events, wind events, and wildfire.	
16	Federal Emergency Management Agency. “Wildfire - wildland/urban interface.” (17 Oct 1996) http://www.fema.gov/mit/wfmit.htm (30 Oct 1998)	Examples of how to create a “Safety Zone” around a home or business.	
17	Findlay, S. USA Today. “Clinton sees little anthrax threat to civilians.” (17 Dec 1997) http://home.eznet.net/~kenberry/materials/usatodayarticle.htm (12 Aug 1998)	Article found on the internet states that an anthrax vaccine is available.	

#	Reference	Description	Funding Source
18	Florida Department of Agriculture and Consumer Services. "Citrus canker - the threat to Florida agriculture - Frequently Asked Questions." http://doacs.state.fl.us/canker/faqs.htm (4 Nov 1998)	Identifies citrus canker and the procedure to eradicate the disease.	
19	Florida Department of Agriculture and Consumer Services. "The latest on Tomato Yellow Leaf Curl Virus." (26 Aug 1997) http://www.ifas.ufl.edu/~entweb/updatetyl.htm (3 Nov 1998)	Describes symptoms of Tomato Yellow Leaf Curl Virus and methods of eradication.	
20	Florida Department of Emergency Management. "Review of efforts to optimize management and production of timber on State lands and review of the prescribed burning policy of the Division of Forestry." (Oct 1998) http://www.state.fl.us/comaff/DEM/gwfrmrc/gwrmrc.htm (21 Dec 1998)	Reviews the benefits and drawbacks of prescribed burning.	Federal Rural Community Fire Protection Program
21	Florida Department of Community Affairs, Bureau of Recovery and Mitigation. Wildfire Mitigation Suggestions. Retrieved 10 October 1998 from the World Wide Web: http://www.dca.state.fl.us/brm/	Wildfire Mitigation Suggestions (website no longer active).	
22	Florida Reliability Coordinating Council. "Generating Capacity Shortage Plan." http://www.frcc.com/capacityemergencyplan.htm.#gca	Plan for when generating capacity is tight, also suggestions for voluntary conservation.	
23	Hickenlooper, B. "Fire damaged lands begin to heal." Stream Lines. Winter 1998, p.4	Prescribed burning is used to control wildfire outbreaks on St. Johns River Water Management District land, and this article describes its many benefits.	
24	Manatee County Emergency Management. "Hazard mitigation." http://www.co.manatee.fl.us/em_html/haz_mit.htm (20 Nov 1998)	Hurricane mitigation suggestions.	
25	McNeill, W. "Emerging infectious diseases plan." (1976) http://www.cdc.gov/ncidod/publications/eid_plan/summary.htm (11 Nov 1998)	Centers for Disease Control and Prevention Strategic Plan emphasizing surveillance, applied research, and prevention activities to maintain a strong defense against infectious diseases.	

#	Reference	Description	Funding Source
26	Minnesota Dept. of Health. "Wellhead protection for Minnesota." (23 Sep 1998) http://www.health.state.mn.us/divs/eh/whp_mn2.html (13 Nov 1998)	Wellfield protection plans.	
27	National Drought Mitigation Center. "Drought mitigation tools for states." (15 Nov 1995) http://enso.unl.edu/ndmc/mitigate/policy/tools.htm	Drought mitigation tools for governments based on two surveys of states.	
28	National Science Foundation. "Tornadoes - protecting your home from the mighty twister." http://whyfiles.news.wisc.edu/013tornado/strong_house.html (4 Feb 1999)	Suggestions for protecting your home against a tornado.	
29	Nelson. L. 1997. Emergency management - a legislator's guide. National Conference of State Legislatures, Denver, CO. 47 pp.	Explains how Illinois, Missouri, and Iowa purchased lands from homeowners whose homes were repetitive damage structures; describes how building code enforcement prevented damage from wildfires, floods, and earthquakes; explains how insurance premium credits work; mentions the development of a wildland/urban interface building code, etc.	FEMA, Community Development Block Grant, State government, State government competitive grant money from the Emergency Management and Assistance Trust Fund.
30	North Carolina Division of Emergency Management. "Tools and Techniques: An Encyclopedia of Strategies to Mitigate the Impacts of Natural Hazards." (23 Dec. 2003) http://www.ncem.org/mitigation/Library/Encyclopedia2.pdf	Comprehensive source of mitigation actions for all hazards.	
31	Schmidlin, T., et al. Natural Hazards Research Center. "Risk factors for death in the 22-23 February 1998 Florida tornadoes." (1998) http://www.colorado.edu/hazards/qr/qr106/qr106.html (7 Aug 1998)	Draws conclusions toward tornado mitigation from surveys, interviews, and damage reports from the 22-23 February 1998 Florida tornadoes.	
32	Subcommittee on Natural Disaster Reduction. "Agency success stories in natural disaster reduction." (18 Oct 1995) http://www.usgs.gov/sndr/success.html (30 Dec 1998)	Briefly describes the BEHAVE and METAFIRE prediction/modeling systems.	
33	The National Food Safety Database. "Controlling insects." (June 1993) http://www.foodsafety.org/dh/dho45.htm (14 Dec 1998)	Suggestions for insect control, and insect control after a natural disaster.	

#	Reference	Description	Funding Source
34	Tibbetts, J. Sea Grant Haznet. ”Racing to catch up: south Florida’s hurricane threat and building codes.” (6 Aug 1998) http://www.haznet.org/text/sflhurricane.html (9 Nov 1998)	Reveals the changes made in south Florida’s building codes since Hurricane Andrew.	
35	United States Army Corps of Engineers. “Local floodproofing programs.” June 1994, 28 pp.	Provides examples and photographs of projects financed by local governments and also identifies lessons learned that can help communities interested in financing floodproofing projects.	
36	United States Army Corps of Engineers. “New planting.” http://superior.lre.usace.army.mil/shore.protection/nwplntng.html (4 Nov 1998)	Explains how vegetation can be used as an erosion control device.	
37	United States Army Corps of Engineers. “Planning considerations.” http://superior.lre.usace.army.mil/shore.protection/plncns.html (4 Nov 1998)	Cooperative measures against beach erosion are detailed.	
38	United States Army Corps of Engineers. “Solutions to coastal erosion.” http://www.rain.org/~pjenkin/point/growing/solution.html (4 Nov 1998)	Examples of general solutions, hard solutions, soft solutions, and retreat as coastal erosion mitigation.	
39	United States Department of Agriculture. “USDA conservation programs - conservation plant material.” http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Explains the Conservation Plant Material Center Program’s purpose as providing native plants that can help solve natural resource problems such as erosion.	Conservation Plant Materials Center Program
40	United States Department of Agriculture. “USDA conservation programs - resource conservation and development program (RC&D).” http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Describes the RC&D Program.	Resource Conservation and Development Program
41	United States Department of Agriculture. “USDA conservation programs - conservation reserve program.” http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	The Conservation Reserve Program encourages farmers to convert highly erodible land to vegetative cover.	Conservation Reserve Program
42	United States Department of Agriculture. “USDA conservation programs - flood risk reduction program.” http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Describes the Flood Risk Reduction program, who is eligible, and what the requirements of the program are.	Flood Risk Reduction Program

#	Reference	Description	Funding Source
43	United States Department of Agriculture. "USDA conservation programs - forestry incentives program." http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Explains the Forestry Incentives Program. It supports good forest management practices on privately owned non-industrial forest lands nationwide.	Forestry Incentives Program
44	United States Department of Agriculture. "USDA conservation programs - stewardship incentives program." http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Qualifications to participate in the program and benefits provided.	Stewardship Incentives Program
45	United States Department of Agriculture. "USDA conservation programs - watershed and river basin planning and installation Public Law 83-566 (PL566)." (26 Oct 1998) http://www.ftw.nrcs.usda.gov/pl566/WHIP.html (2 Feb 1999)	Lists the purposes of watershed projects and describes the program.	Watershed and River Basin Planning and Installation Public Law 83-566.
46	United States Department of Agriculture. "USDA conservation programs - watershed surveys and planning." http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Overview of the Watershed Surveys and Planning Program.	Watershed Surveys and Planning Program.
47	United States Department of Agriculture. "USDA conservation programs - wetlands reserve program." http://www.nrcs.usda.gov/NRCSProg.html (2 Feb 1999)	Overview of this voluntary program to restore wetlands.	Wetlands Reserve Program
48	United States Department of Agriculture. "USDA conservation programs - wildlife habitat incentives program (WHIP)." (8 Oct 1997) http://www.ftw.nrcs.usda.gov/pl566/WHIP.html (2 Feb 1999)	Description of the WHIP program, benefits, and requirements.	Wildlife Habitat Incentives Program
49	United States Environmental Protection Agency. "Preparing for spills." (7 Oct 1998) http://www.epa.gov/oilspill/prepare.htm (3 Nov 1998)	U.S. Environmental Protection Agency oil spill preparedness program highlights.	
50	Watson, L. et al. 1998. Strategy for reducing risks from natural hazards in Pawtucket, Rhode Island: A multi-hazard mitigation strategy. Rhode Island Sea Grant. Narragansett, RI. 44 pp.	Section 1 explains why communities are writing hazard mitigation strategies and describes the hazard assessment that was completed by city officials. Section 2 uses the risk assessment from Section 1 to determine potential mitigation actions for high risk areas.	

APPENDIX C
FUNDING SOURCES

Primary Mitigation Funds (All Hazards)

Pre Disaster Mitigation (PDM) Fund

Hazard Mitigation Grant Program (HMGP) Funds

Flood Mitigation Assistance (FMA) Program Funds

Emergency Preparedness & Assistance Funds (EMPA)

EMPA Competitive Grant Program

EMPA Base Grant Program

Hurricane Mitigation Funding Sources

Anheuser-Busch Companies, Inc.

Bank Enterprise Award Program

Beach Erosion Control Projects

Business and Industry Loans

Challenge 21, Floodplain

Coastal Services Center

Coastal Zone Management Administration Awards

Coastal Wetlands Planning, Protection, and Restoration Act

Coastal Construction Building Zone Program

Community Development Block Grant

Community Facilities Loans and Grants

Community Development Block Grants/Economic Development Initiative

Community Development Block Grants/Entitlement Grants

Community Development Block Grants/State=s Program

Community Development Block Grants/Small Cities Program

Community Development Block Grants/Special Purpose Grants/Technical Assistance Program

Conservation Plant Material Centers

Conservation Reserve Program

Cooperative Extension Service

Cora Brown Fund

Crop Insurance

Direct Housing: Natural Disaster

Disaster Housing Program

Disaster Reserve Assistance

Disaster Recovery Initiative Grants

Economic Development - Public Works Impact Program

Economic Injury Disaster Loans

Emergency Loan Assistance

Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Relief Program

Emergency Management: State and Local Assistance

Emergency Advance Measures for Flood Prevention

Emergency Management Training Institute: Training Assistance

Emergency Operations Flood Response and Post Flood Response

Emergency Loans

Emergency Solutions Grants Program

Financial Assistance for Ocean Resources Conservation and Assessment Program

Flood Control Projects

Flood Insurance

Flood Plain Management Services

Habitat Conservation

Hazard Mitigation Grant Program

Highway Planning and Construction

Historic Preservation Fund Grants-in-Aid

Hurricane Program

Impact Aid: Facilities Maintenance

Individual and Family Grants

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Local Initiatives Support Corporation

Mitigation Assistance

National Weather Service

North American Wetlands Conservation Act Grant Program

Outdoor Recreation: Acquisition, Development and Planning

Physical Disaster Loans

Planning and Program Development Grants

Planning Assistance to States

Project Impact: Building Disaster Resistant Communities

Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures

Public Assistance

Rehabilitation Mortgage Insurance

Resource Conservation and Development

Rural Economic Development Loans and Grants

Snagging and Clearing for Flood Control

Soil and Water Conservation

Special Economic Development and Adjustment Assistance Program: Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

STP

Sustainable Agriculture Research and Education

Sustainable Development Challenge Grants

The Community Foundation for Palm Beach and Martin Counties

U.S. Army Corps of Engineers

U.S. Geological Survey

Urban Park and Recreation Recovery Program

Wallace Global Fund

Water Bank Program

Watershed Surveys and Planning

Watershed Protection and Flood Prevention Loans

Wetlands Protection Grants

Wetlands Program

Wetlands Reserve Program

Wetlands Protection: Development Grants

Wildlife Restoration

<u>Flood Mitigation Funding Sources</u>

Anheuser-Busch Companies, Inc.

Bank Enterprise Award Program

Beach Erosion Control Projects

Business and Industry Loans

Challenge 21, Floodplain

Coastal Services Center

Coastal Zone Management Administration Awards

Coastal Wetlands Planning, Protection, and Restoration Act

Community Rating System

Community Development Block Grant

Community Facilities Loans and Grants

Community Development Block Grants/Entitlement Grants

Community Development Block Grants/State=s Program

Community Assistance Program: State Support Services Element

Community Development Block Grants/Small Cities Program

Community Development Block Grants/Special Purpose Grants/Technical Assistance Program

Conservation Technical Assistance

Conservation Plant Material Centers

Conservation Reserve Program

Cooperative Extension Service

Cora Brown Fund

Crop Insurance

Direct Housing: Natural Disaster

Disaster Housing Program

Disaster Reserve Assistance

Disaster Recovery Initiative Grants

Disposal of Federal Surplus Real Property for Parks, Recreation, and Historic Monuments

Economic Development - Public Works Impact Program

Economic Injury Disaster Loans

Emergency Loan Assistance

Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Relief Program

Emergency Management: State and Local Assistance

Emergency Advance Measures for Flood Prevention

Emergency Management Training Institute: Training Assistance

Emergency Operations Flood Response and Post Flood Response

Emergency Loans

Environmental Quality Incentives Program

Farmland Protection Program

Financial Assistance for Ocean Resources Conservation and Assessment Program

Flood Control Projects

Flood Insurance

Flood Risk Reduction Program

Flood Mitigation Assistance Program

Flood Plain Management Services

Habitat Conservation

Hazard Mitigation Grant Program

Highway Planning and Construction

Historic Preservation Fund Grants-in-Aid

Individual and Family Grants

John D. and Catherine T. MacArthur Foundation

Land Protection, Natural Resources Conservation Service

Learn and Serve America Program

Local Initiatives Support Corporation

Mitigation Assistance

National Flood Mitigation Fund

National Flood Insurance Program

National Weather Service

North American Wetlands Conservation Act Grant Program

Outdoor Recreation: Acquisition, Development and Planning

Physical Disaster Loans

Planning Assistance to States

Project Impact: Building Disaster Resistant Communities

Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures

Protection of Essential Highways, Highway Bridge Approaches, and Public Works

Public Assistance

Rehabilitation Mortgage Insurance

Resource Conservation and Development

Rural Economic Development Loans and Grants

Snagging and Clearing for Flood Control

Soil and Water Conservation

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

STP

Sustainable Agriculture Research and Education

Sustainable Development Challenge Grants

The Community Foundation for Palm Beach and Martin Counties

Transportation Enhancements Program

U.S. Army Corps of Engineers

U.S. Geological Survey

Urban Park and Recreation Recovery Program

Wallace Global Fund

Water Bank Program

Watershed Surveys and Planning

Watershed Protection and Flood Prevention Loans

Wetlands Protection Grants

Wetlands Program

Wetlands Reserve Program

Wetlands Protection: Development Grants

Wildlife Restoration

Severe Thunderstorm and Lightning Funding Sources

Community Facilities Loans and Grants

Cooperative Extension Service

Direct Housing: Natural Disaster

Disaster Housing Program

Disaster Recovery Initiative Grants

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Solutions Grants Program

Hazard Mitigation Grant Program

Individual and Family Grants

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Local Initiatives Support Corporation

Mitigation Assistance

National Weather Service

Physical Disaster Loans

Project Impact: Building Disaster Resistant Communities

Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures

Public Assistance

Rehabilitation Mortgage Insurance

State Disaster Preparedness Grants

U.S. Army Corps of Engineers

Wallace Global Fund

Wildfire Funding Sources

Community Facilities Loans and Grants

Community Development Block Grants/Economic Development Initiative

Conservation Technical Assistance

Cooperative Forestry Service

Cooperative Extension Service

Cora Brown Fund

Direct Housing: Natural Disaster

Disaster Housing Program

Disaster Reserve Assistance

Disaster Recovery Initiative Grants

Economic Injury Disaster Loans

Emergency Loan Assistance

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Loans

Environmental Quality Incentives Program

Florida Game and Freshwater Fish Commission Environmental Grant Program

Hazard Mitigation Grant Program

Individual and Family Grants

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Local Initiatives Support Corporation

Mitigation Assistance

National Fire Academy Training Assistance

National Forest: Dependent Rural Communities

National Fire Academy Educational Program

North American Wetlands Conservation Act Grant Program

Outdoor Recreation: Acquisition, Development and Planning

Physical Disaster Loans

Project Impact: Building Disaster Resistant Communities

Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures

Protection of Forests and Rangelands

Public Assistance

Rehabilitation Mortgage Insurance

Resource Conservation and Development

Rural Economic Development Loans and Grants

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Stewardship Incentives Program

Sustainable Development Challenge Grants

The Community Foundation for Palm Beach and Martin Counties

Urban Park and Recreation Recovery Program

Wallace Global Fund

Wildlife Restoration

Tornado Funding Sources

Bank Enterprise Award Program

Business and Industry Loans

Community Development Block Grant

Community Development Block Grants/Entitlement Grants

Community Development Block Grants/State's Program

Cooperative Extension Service

Cora Brown Fund

Direct Housing: Natural Disaster

Disaster Housing Program

Disaster Recovery Initiative Grants

Economic Injury Disaster Loans

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Loans

Emergency Solutions Grants Program

Hazard Mitigation Grant Program

Impact Aid: Facilities Maintenance

Individual and Family Grants

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Mitigation Assistance

National Weather Service

Physical Disaster Loans

Project Impact: Building Disaster Resistant Communities

Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures

Public Assistance

Rehabilitation Mortgage Insurance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Sustainable Development Challenge Grants

The Community Foundation for Palm Beach and Martin Counties

Wallace Global Fund

Extreme Temperatures Funding Sources

Community Development Block Grants/State=s Program

Cooperative Extension Service

Crop Insurance

Disaster Reserve Assistance

Emergency Loan Assistance

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Loans

Hazard Mitigation Grant Program

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Local Initiatives Support Corporation

Mitigation Assistance

National Weather Service

Physical Disaster Loans

Project Impact: Building Disaster Resistant Communities

Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures

Public Assistance

Rehabilitation Mortgage Insurance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and

Long-Term Economic Deterioration

State Disaster Preparedness Grants

Sustainable Agriculture Research and Education

The Community Foundation for Palm Beach and Martin Counties

Weatherization Assistance for Low-Income Persons

Soil/Beach Erosion Funding Sources

Anheuser-Busch Companies, Inc.

Bank Enterprise Award Program

Beach Erosion Control Projects

Business and Industry Loans

Challenge 21, Floodplain

Coastal Services Center

Coastal Zone Management Administration Awards

Community Development Block Grant

Community Development Block Grants/Entitlement Grants

Conservation Technical Assistance

Conservation Plant Material Centers

Conservation Reserve Program

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Environmental Quality Incentives Program

Farmland Protection Program

Financial Assistance for Ocean Resources Conservation and Assessment Program

Hazard Mitigation Grant Program

Land Protection, Natural Resources Conservation Service

Learn and Serve America Program

Mitigation Assistance

North American Wetlands Conservation Act Grant Program

Outdoor Recreation: Acquisition, Development and Planning

Physical Disaster Loans

Planning Assistance to States

Project Impact: Building Disaster Resistant Communities

Protection of Essential Highways, Highway Bridge Approaches, and Public Works

Public Assistance

Rehabilitation Mortgage Insurance

Resource Conservation and Development

Soil and Water Conservation

State Disaster Preparedness Grants

STP

Sustainable Agriculture Research and Education

Sustainable Development Challenge Grants

Wallace Global Fund

Water Bank Program

Watershed Surveys and Planning

Wetlands Program

Wetlands Reserve Program

Wetlands Protection: Development Grants

Agricultural Pest and Disease Funding Sources

Bank Enterprise Award Program

Community Facilities Loans and Grants

Cooperative Extension Service

Crop Insurance

Disaster Reserve Assistance

Emergency Loan Assistance

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Loans

Hazard Mitigation Grant Program

Learn and Serve America Program

Mitigation Assistance

Physical Disaster Loans

Plant and Animal Disease, Pest Control, and Animal Care

Project Impact: Building Disaster Resistant Communities

Public Assistance

Rural Economic Development Loans and Grants

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Drought Funding Sources

Conservation Technical Assistance

Cooperative Extension Service

Crop Insurance

Disaster Reserve Assistance

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Conservation Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Loans

Hazard Mitigation Grant Program

Land Protection, Natural Resources Conservation Service

Learn and Serve America Program

Mitigation Assistance

Physical Disaster Loans

Project Impact: Building Disaster Resistant Communities

Public Assistance

Soil and Water Conservation

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

U.S. Army Corps of Engineers

Wallace Global Fund

Watershed Surveys and Planning

Seismic Hazards Funding Sources

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

Learn and Serve America Program

Mitigation Assistance

Physical Disaster Loans

Project Impact: Building Disaster Resistant Communities

Public Assistance

Rehabilitation Mortgage Insurance

State Disaster Preparedness Grants

Sustainable Development Challenge Grants

Epidemic Funding Sources

Cora Brown Fund

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

The Community Foundation for Palm Beach and Martin Counties

Nuclear Disaster Funding Sources

Bank Enterprise Award Program

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Emergency Solutions Grants Program

Hazard Mitigation Grant Program

Individual and Family Grants

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Radiation Control: Training Assistance and Advisory Counseling

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Power Failure Funding Sources

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Hazardous Materials Accident Funding Sources

Brownfield Pilots Cooperative Agreements

Capitalization Grants for Drinking Water State Revolving Fund

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Florida Coastal Protection Trust Fund

Grants-in-Aid for Railroad Safety: State Participation

Hazard Mitigation Grant Program

Hazardous Waste Worker Health and Safety

Hazardous Waste Management State Program Support

Hazardous Materials Training Program for Implementation of the Superfund Amendment and Reauthorization Act of 1986

Individual and Family Grants

Interagency Hazardous Materials Public Sector Training and Planning Grants

Learn and Serve America Program

Mitigation Assistance

NIEHS Hazardous Waste Worker Health and Safety Training (Superfund)

Project Impact: Building Disaster Resistant Communities

Public Assistance

Railroad Safety

State Disaster Preparedness Grants

Water Pollution Control: State and Interstate Program Support

Transportation System Accident Funding Sources

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Grants-in-Aid for Railroad Safety: State Participation

Hazard Mitigation Grant Program

Hazardous Waste Worker Health and Safety

Hazardous Waste Management State Program Support

Highway Planning and Construction (Federal Aid Highway Program)

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Protection of Essential Highways, Highway Bridge Approaches, and Public Works

Public Assistance

Railroad Safety

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

STP

Transportation Enhancements Program

Water Pollution Control: State and Interstate Program Support

Wellfield Contamination Funding Sources

Bank Enterprise Award Program

Brownfield Pilots Cooperative Agreements

Capitalization Grants for Drinking Water State Revolving Fund

Coastal Zone Management Administration Awards

Community Development Block Grant

Disaster Recovery Initiative Grants

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Habitat Conservation

Hazard Mitigation Grant Program

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Wallace Global Fund

Water Pollution Control: State and Interstate Program Support

Water Quality Program Management

Communications Failure Funding Sources

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Terrorism and Sabotage Funding Sources

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

First Responder Anti-Terrorism Training Assistance

Hazard Mitigation Grant Program

Learn and Serve America Program

Local Firefighting and Emergency Services Training

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Civil Disturbance Funding Sources

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Immigration Crisis Funding Sources

Community Services Block Grant

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program: Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

All Hazards Funding Sources

Economic Development - Technical Assistance

Emergency Management Institute: Independent Study Program

Emergency Management Institute: Resident Educational Program

Emergency Management: State and Local Assistance

Emergency Management Training Institute: Training Assistance

Hazard Mitigation Grant Program

Individual and Family Grants

John D. and Catherine T. MacArthur Foundation

Learn and Serve America Program

Mitigation Assistance

Project Impact: Building Disaster Resistant Communities

Public Assistance

Special Economic Development and Adjustment Assistance Program:

Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration

State Disaster Preparedness Grants

Wallace Global Fund

Table C.1. Description of potential funding sources.

Funding Source	Objective	Eligibility	Sponsoring Organization
Anheuser-Busch Companies, Inc.	Supports charitable organizations active in the fields of education, health care, programs for minorities and youth, cultural enrichment, and environmental protection.	Support is restricted almost entirely to cities where the company has manufacturing facilities.	Anheuser-Busch Companies, Inc. One Busch Place St. Louis, MO 63118 (314) 577-2000
Antiterrorism and Emergency Assistance Program	To provide assistance programs for victims of mass violence and terrorism occurring within and outside the United States, and a compensation program for victims of international terrorism.	Public and private nonprofit victim assistance agencies.	Department of Justice Office for Victims of Crimes www.usdoj.gov
Assistance to Firefighter Grants	To provide direct assistance, on a competitive basis, to fire departments of a State or tribal nation for the purpose of protecting the health and safety of the public and firefighting personnel against fire and fire-related hazards.	Eligible applicants for this grant program are limited to fire departments located in the fifty United States, tribal nations, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands.	Department of Homeland Security 245 Murray Drive S.W. Washington, DC 20528 (202) 282-8000 http://www.dhs.gov
Bioterrorism Training and Curriculum Development Grant	To equip a workforce of healthcare professionals to address emergency preparedness and response issues. The goals of this program are the development of a healthcare workforce that possesses the knowledge, skills, and abilities to 1) recognize indications of a terrorist event in their patients; 2) treat their patients and their communities in a safe and appropriate manner; 3) participate in a coordinated, multidisciplinary response to terrorist events; and 4) rapidly and effectively alert the public health system of such an event at the community, State, and national level. Effective responses to public health emergencies require close collaboration between all types of health professionals involved in patient care including healthcare providers, medical specialists, the public health infrastructure, and all participants in the emergency response. To achieve such a collaborative environment, it will be necessary to implement new models of undergraduate/graduate curricula and continuing education and training for health professionals that broaden public health knowledge and ensure that essential multidisciplinary and interdisciplinary collaborative	Applicant Eligibility: Continuing Education and Curriculum Development: Entities eligible to apply for this program are public or private nonprofit accredited or licensed health professions schools, multi-State or multi-institutional consortia of such schools, and other appropriate educational entities such as professional organizations and societies, and other nonprofit institutions or entities including faith-based organizations and community-based organizations. Beneficiary Eligibility: The public or private nonprofit accredited or licensed health professions schools, multi-State or multi-institutions or entities including faith-based organizations and community-based organizations.	The Bioterrorism Training and Curriculum Development Program is administered by Lynn Rothberg Wegman Division of State, Community and Public Health Bureau of Health Professions Health Resources and Services Administration (HRSA) Room 9-105 Parklawn Building, 5600 Fishers Lane Rockville, Maryland 20857 (301) 443-1648 Grants Management Contact: Director, Division of Grants Management Operations HRSA 5600 Fishers Lane, Room 11-03 Rockville, Maryland 20857

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	responses to emergencies will occur. Bioterrorism Training and Curriculum Development Program will consist of two discrete foci of activity: 1) Provision of Continuing Education for Practicing Providers, and 2) Curricular Development in Health Professions Schools. Each of the categories above must have a distinct and separate application.		
Capitalization Grants for Drinking Water State Revolving Fund (Drinking Water State Revolving Fund)	State may use Federal funds to establish new programs that emphasize preventing contamination problems through source water protection and enhanced water systems management.	States and Puerto Rico are eligible to receive capitalization grants.	James Bounne, Implementation and Assistance Division, Office of Groundwater and Drinking Water, U.S. Environmental Protection Agency, Washington, DC 20460 (202) 260-5526
Challenge 21, Floodplain	To protect floodplains.		Department of Defense U.S. Army Corps of Engineers Attn: CECW-PM DoD Washington, DC 20314-1000 (202) 272-0169 http://www.usace.army.mil/
Citizen Corps	To support the formation of State and local Citizen Corps Councils to help drive local citizen participation by coordinating Citizen Corps programs, developing community action plans, assessing possible threats, and identifying local resources to make communities safer, stronger, and better prepared to respond to the threats,of terrorism, crime, public health issues, and disasters of all kinds.	States with a pass through to local governments.	Department of Homeland Security Emergency Preparedness and Response Directorate www.citizencorps.gov
Clean Water Act Section 319 Grants	Grants to States to implement non-point source programs, including support for non-structural watershed resource restoration activities.		Non-point Source Management Program 2600 Blair Stone Road Mail Station 3570 Tallahassee, FL 32399-2400 (850) 245-7508

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Clean Water State Revolving Funds	Loans at actual or below-market interest rates to help build, repair, relocate, or replace wastewater treatment plants.		Environmental Protection Agency Office of Water State Revolving Fund Branch Branch Chief (202) 260-7359 A list of Regional Offices is available upon request
Coastal Construction Building Zone Program	This program establishes a standard to improve the resistance to hurricane-force winds of buildings in Florida's coastal building zone. Staff trains building officials, monitors local progress in adopting ordinances, and provides technical assistance.	Compliance program only.	Rick Dixon (850) 487-1824
Coastal Partnerships Initiative Grant	To provide financial assistance for projects in specific initiative categories. The categories are: Remarkable Coastal Places, Community Stewardship, Access to Coastal Resources, and Working Waterfronts. Financial awards are limited to no more than $50,000 and no less than $15,000 and may be used for planning and coordination activities, land acquisition, small construction, or capital improvement projects.	Local governments of the 35 coastal counties and all municipalities within their boundaries designated as "coastal" by the state land planning agency or required to include a coastal element in the local comprehensive plan; national estuarine research reserves; and national estuary programs. Public and private colleges and universities, regional planning councils, and non-profit groups, as long as an eligible local government, national estuarine research reserve, or national estuary program agrees to participate as a partner. Partnerships between regional and local agencies and non-profit organizations are encouraged.	Debbie Skelton Florida Coastal Management Program 3900 Commonwealth Boulevard, MS 47 Tallahassee, FL 32399-3000 (850) 245-2161 Fax: (850) 245-2191 E-mail: debbie.skelton@dep.state.fl.us

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Coastal Services Center	To support projects aimed at developing a science-based, multi-dimensional approach that will allow for the maintenance or improvement of environmental quality, while at the same time, allowing for economic growth. In Fiscal Year (FY) 96, five Fellowship Awards were made to the states of CA, CT, FL, MA, and OR. In FY 98, a cooperative agreement was awarded for an ecological and socioeconomic characterization of Kachemak Bay, AK. Uses will be in the following Center areas: Coastal Management Service: Training and Communications: training materials development and dissemination of information; and Coastal Information Services: Coastal Change Analysis Program: To develop land cover and change analysis products.	State and local governments, public nonprofit institution/organization, other public institution/organization.	Dr. Nancy Foster, Ph.D., Assistant Administrator, National Ocean Service 1305 East-West Highway Silver Spring, MD 20910 (301) 713-3074
Coastal Wetlands Planning, Protection and Restoration Act	To grant funds to coastal states to carry out coastal wetlands conservation projects.	Available to all states bordering on the Atlantic, Gulf (except Louisiana), and Pacific coasts, and states bordering the Great Lakes.	Department of the Interior Fish and Wildlife Service 4401 N. Fairfax Dr., Rm. 140 Arlington, VA 22203 (703) 358-2156 http://www.fws.gov
Coastal Zone Management Program	Grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration.		Department of Commerce National Oceanic and Atmospheric Administration National Ocean Service Office of Ocean and Coastal Resource Management Chief, Coastal Programs Division: (301) 713-3102
Community Development Block Grant (CDBG)	Provide for long-term needs, such as acquisition, rehabilitation, or reconstruction of damaged properties and facilities and redevelopment of disaster-affected areas. Funds also may be used for emergency response activities, such as debris clearance and demolition, and extraordinary increases in the level of necessary public services.	State governments that have elected to administer CDBG funds for non-entitlement communities. States with designated major disaster areas may receive statutory and regulatory waivers of program requirements regarding the use of regular CDBG funds, which recipients designate to address the damage.	Department of Housing and Urban Development Community Planning and Development 451 7th Street, S.W. Washington, DC 204107 (202) 708-3587 http://www.hud.gov

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Community Emergency Response Teams	To train people in neighborhoods, the workplace, and schools in basic disaster response skills, such as fire suppression, urban search and rescue, and medical operations, and help them take a more active role in emergency preparedness.	States with pass through to local jurisdictions.	Department of Homeland Security Emergency Preparedness and Response Directorate www.fema.gov
The Community Foundation for Palm Beach and Martin Counties	To provide innovative responses to recognized community needs, which do not unnecessarily duplicate other efforts; strive to equip people to help themselves; significantly strengthen the capacity of existing institutions to reach a broader segment of the community; emphasize shared values and collective interests and action among diverse groups that have little or no history of working together; programs that are neighborhood driven.	Unrestricted grants are made for charitable purposes primarily to organizations serving Palm Beach and Martin counties. Applicants must be exempt from income taxes under Section 501(c)(3).	The Community Foundation for Palm Beach and Martin Counties 324 Datura St., Suite 340 West Palm Beach, FL 33401 Palm Beach: (561) 659-6800 Martin: (888) 832-6542 e-mail: cfpbmc@aol.com
Community Rating System	Encourages State and community flood loss reduction activities beyond those required for participation in the National Flood Insurance Program. Flood insurance premiums are lower in those communities that undertake activities to reduce flood losses, facilitate accurate insurance rating, promote the awareness of flood insurance, and protect the natural and beneficial functions of flood hazard areas.		FEMA Region IV CRS Program 3003 Chamblee-Tucker Rd. Atlanta, GA 30431 (770) 220-5200
Community Services Block Grant	To provide services and activities having measurable and potential major impact on causes of poverty in the community.		Department of Health and Human Services, Administration for Children and Families Office of Community Services 370 L'Enfant Promenade, SW Washington, DC 220447 (202) 401-9340 http://www.acf.dhhs.gov/programs/ocs

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Conservation Reserve Program	The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.		Contact U.S. Department of Agriculture (USDA), Farm Service Agency http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Conservation Plant Material Centers	The purpose of the program is to provide native plants that can help solve natural resource problems. Beneficial uses for which plant material may be developed include biomass production, carbon sequestration, erosion reduction, wetland restoration, water quality improvement, streambank and riparian area protection, coastal dune stabilization, and other special conservation treatment needs.		Contact USDA, Natural Resources Conservation Service http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Conservation Technical Assistance	The purpose of this program is to assist land-users, communities, units of State and local government, and other Federal agencies in planning and implementing conservation systems. The purpose of the conservation systems are to reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands.	Individual land users, communities, conservation districts, and other units of State and local government and Federal agencies to meet their goals for resource stewardship and help individuals to comply with State and local requirements.	Contact USDA, Natural Resources Conservation Service http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Cooperative Extension Service	To provide information and educational material to farmers, ranchers, and others on what they can do to protect themselves and their property against the hazards associated with disasters; and advice on cleanup of damaged property, sanitation precautions, insect control, food preparation in an emergency, recovery actions on damaged farms, and renovation of damaged equipment and property.	Farmers and rural residents who have suffered losses as the result of natural disasters. There is also assistance available to producers who suffer losses as a result of crop or livestock disease or pest infestation.	Contact USDA, Natural Resources Conservation Service http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Community of Oriented Police Services (COPS) Interoperable Communications Technology Program	To facilitate communications interoperability public safety responders at the State and local level.	Tribal, State, and local law enforcement agencies.	Department of Justice Office of COPS www.cops.usdoj.gov
Cora Brown Fund	To use funds made possible by a bequest of funds from the late Cora C. Brown of Kansas City, Missouri, who left a portion of her estate to the United States for the purpose of helping victims of natural disasters not caused by or attributed to war.	Individuals, families, and groups in need of 1) disaster-related home repair and rebuilding; 2) disaster-related unmet needs; and 3) other services that alleviate human suffering and promote the well being of disaster victims.	Department of Homeland Security 245 Murray Drive SW Washington, DC 20528 (202) 282-8000 http://www.dhs.gov
Decision, Risk, and Management Science Program	Funding for research and related educational activities on risk, perception, communication, and management (primarily technological hazards).		National Science Foundation – Directorate for Social, Behavioral and Economic Science, Division of Social Behavioral and Economic Research, Decision, Risk, and Management Science Program (703) 306-1757 www.nsf.gov/sbe/drms/start.htm
Disaster Mitigation Planning and Technical Assistance	Technical and planning assistance grants for capacity building and mitigation project activities focusing on creating disaster-resistant jobs and workplaces.		Department of Commerce, Economic Development Administration (EDA): (800) 345-1222 EDA's Disaster Recovery Coordinator: (202) 482-6225 www.doc.gov/eda
Disaster Recovery Initiative (DRI) Grants	Provides flexible grants to help cities, counties, and states recover from Presidentially-declared disasters, especially in low-income areas. Grantees may use DRI funds for recovery efforts involving housing, economic development, infrastructure, and prevention of further damage. Examples include buying damaged properties in a flood plain and relocating them to safer areas; relocation payments for people and businesses displaced by the disaster; debris removal; rehabilitation of homes and buildings damaged by the disaster; buying, constructing, or rehabilitating public buildings; and code enforcement.	States and local governments in places that have been designated by the President of the United States as disaster areas.	For a guide to DRI, contact Community Connections at (800) 998-9999
Disaster Reserve Assistance	To provide emergency assistance to eligible livestock owners, in a state, county, or area approved by the secretary or designee, where because of disease, insect infestation, flood, drought, fire, hurricane, earthquake, hail	Basic program eligibility requirements include 1) For the Disaster Reserve Assistance Program, crop losses in areas that have suffered a 40 percent or greater loss of normal	Department of Agriculture, Farm Service Agency, Emergency and Noninsured Assistance Program Division, STOP 0526

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	storm, hot weather, cold weather, freeze, snow, ice, and winterkill, or other natural disaster, a livestock emergency has been determined to exist.	grazing, and feed grain and forage production, and determined to be in a livestock feed emergency due to a natural disaster; 2) for the Emergency Feed Grain Donation Program: a) the State committee must determine and document a livestock feed emergency on a county-by-county basis, when the danger of eligible livestock perishing as a result of snow and freezing conditions exists in the county; b) the livestock owner, or other person or entities (public or private) certify that the eligible livestock were or are in danger of perishing without immediate assistance; and 3) the Foundation Livestock Relief (Cost-Share) Program: a) when foundation livestock are stranded and in imminent danger of perishing; and b) when the State committee determines and documents livestock losses due to severe weather conditions.	1400 Independence Avenue SW Washington, DC 20250-0526 (202) 720-3168 http://www.fsa.usda.gov
Domestic Anti-Terrorism Technology Development Program	To support the development of counter terrorism technologies, assist in the development of standards for those technologies, and work with State and local jurisdictions to identify particular areas vulnerable to terrorist acts and be better prepared to respond if such acts occur.	States and local governments, non-profit and for-profit organizations, and universities.	Department of Justice National Institutes of Justice www.usdoj.gov
Economic Development: Public Works Impact Program	To promote long-term economic development and assist in providing immediate useful work to unemployed and underemployed persons in highly distressed areas. Examples of funded projects: 1) renovation of buildings, including historic preservation; 2) repairing industrial streets and roads; construction of water/sewer systems.	Eligibility is based on designation of a community or neighborhood as a redevelopment area.	David L. McIlwain, Director, Public Works Division, Economic Development Administration Room H7326, Herbert C. Hoover Bldg. Washington, DC 20230 (202) 482-5265
Economic Development - Technical Assistance	To promote economic development and alleviate underemployment and unemployment in distressed areas, Economic Development Administration operates a technical assistance program. The program provides funds to: 1) enlist the resources of designated university centers in promoting economic development; 2) support innovative economic development projects; 3) disseminate information and studies of economic development issues of national	Most technical assistance recipients are private or public non-profit organizations, educational institutions, municipal, county, or State governments.	Department of Commerce Research and National Technical Assistance Division, Economic Development Administration Rm. H7315 Herbert C. Hoover Bldg. Washington, DC 20230 (202) 482-4085 http://www.doc.gov/eda

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	significance; and 4) finance feasibility studies and other projects leading to local economic development.		
Emergency Advance Measures for Flood Prevention (Public Law 84-99 Code 500 Program)	To perform activities prior to flooding that would assist in protecting against loss of life and damages to property due to flooding. Examples of funded projects: emergency drawdown of Spirit Lake, Washington; emergency levee construction, Utah Lake, Provo, Utah; Temporary levee raising, Cowlitz River, Washington; and levee setback, Red River, Louisiana. Authorized assistance includes work such as removal of waterway obstructions, work necessary to prevent dam failure, and work necessary to prepare for abnormal snowmelt. There must be an immediate threat of unusual flooding present before advance measures can be considered. Any work performed under this program will be temporary in nature and must have a favorable benefit cost ratio.	The Governor of the affected state must request assistance. All persons living in areas subject to floods.	U.S. Army Corps of Engineers, Attn: CECW-OE, Washington, DC 20314 (202) 272-0251
Emergency Community Water Assistance Grants.	Through the Emergency Community Water Assistance Grant Program, the Rural Utilities Service is authorized to help rural residents who have experienced a significant decline in quantity or quality of water to obtain adequate quantities of water that meet the standards of the Safe Drinking Water Act.	Rural Utilities Service may make grants to public bodies, private nonprofit corporations, and political subdivisions of a state, as well as Indian tribes.	Assistant Administrator, Water and Environmental Programs, Rural Utilities Service, Department of Agriculture, Washington, DC 20250 (202) 690-2670
Emergency Conservation Program	To enable farmers to perform emergency conservation measures to control wind erosion on farmlands, to rehabilitate farmlands damaged by wind erosion, floods, hurricanes, or other natural disasters and to carry out emergency water conservation or water enhancing measures during periods of severe drought.	Any agricultural producer who as owner, landlord, tenant, or sharecropper on a farm or ranch, including associated groups, and bears a part of the cost of an approved conservation practice in a disaster area, is eligible to apply for cost-share conservation assistance. This program is also available in Guam, Commonwealth of the Northern Mariana Islands, Puerto Rico, and the Virgin Islands.	USDA/Farm Service Agency (FSA)/Conservation Environmental Programs Division (CEPD), Stop 0513, 1400 Independence Ave. SW Washington, DC 20250-0513 (202) 720-6221 http://www.fsa.usda.gov
Emergency Loans	To assist established (owner or tenant) family farmers, ranchers, and aquaculture operators with loans to cover losses resulting from major and/or natural disasters, which can be used for annual farm operating expenses, and for other essential needs necessary to return disaster victim's farming operations to a financially sound basis in order that they will be able to return to private sources of credit as	Must meet requirements.	Department of Agriculture, Farm Service Agency, Director, Loan Making Division, Ag Box 0522 Washington, DC 20250 (202) 720-1632

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	soon as possible. Loan funds may be used to repair, restore, or replace damaged or destroyed farm property and supplies that were lost or damaged as a direct result of a natural disaster.		
Emergency Management Performance Grants	To provide basic assistance to sustain the nation's emergency management system, build State and local emergency management capability, and serve as the foundation for first responder activities.	States with pass through to local emergency management organizations.	Department of Homeland Security Emergency Preparedness and Response Directorate www.fema.gov
Emergency Management Preparedness and Assistance Trust Fund: Emergency Management Competitive Grants Municipal Competitive Grant Program	Competitive: Provides competitive grants to State or regional agencies, local governments, and private non-profit organizations to implement projects that will further State and local emergency management objectives. Municipal: Provides competitive grants to municipalities that are legally constituted, have an authorized, established, and maintained emergency management program, and have signed the current Statewide Mutual Aid Agreement (SMAA) and supplied all required information and documentation such that the SMAA is ready to be signed by the Division as of the date of the application deadline.		Department of Community Affairs 2555 Shumard Oak Blvd Tallahassee, FL 32399-2100 (850) 488-8466 Fax: (850) 921-0781 http://www.dca.state.fl.us/cps/grants.htm
Emergency Management Institute Training Assistance	To defray travel and per diem expenses of State, local, and tribal emergency management personnel who attend training courses conducted by the Emergency Management Institute, at the Emmitsburg, Maryland facility, Bluemont, Virginia facility, and selected off-site locations. Its purpose is to improve emergency management practices among State, local, and tribal government managers, in response to emergencies and disasters. Program embodies the Comprehensive Emergency Management System by unifying the elements of management common to all emergencies: planning, preparedness, mitigation, response, and recovery.	State, local, and tribal emergency managers.	Department of Homeland Security Emergency Preparedness and Response Directorate www.fema.gov
Emergency Operations Centers	The purpose of the Emergency Operations Centers program is to supplement and assist State and local efforts to improve their capabilities to respond to emergencies or disasters including any that may be caused by terrorist attacks using conventional means or Weapons of Mass Destruction. The program provides grants to the States to	States are eligible to apply for the assistance under this program. For purposes of this program and consistent with the Stafford Act, 42 U.S.C. 5122(4), "State" means any State of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, Guam,	Gil Jamieson, Federal Emergency Management Agency, Office of National Preparedness 500 C Street, SW Washington, DC 20472 (202) 646-4090

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	encourage the development of Emergency Operations Centers that provide flexibility, sustainability, security, survivability, and interoperability. Fully capable emergency operations facilities at the State and local levels are an essential element of a comprehensive national emergency management system and are necessary to ensure continuity of operations and continuity of government in major disasters caused by any hazard.	American Samoa, and the Commonwealth of the Northern Mariana Islands. Local governments may receive assistance as subgrantees to the States in which they are located. The term "local government" as used in this program has the meaning set forth in the Stafford Act, 42 U.S.C. 5122(6).	e-mail: gil.jamieson@fema.gov Fax: (202) 646-4053 24-hour per day FEMA Telephone Operator Service is available at (202) 566-1600 http://www.fema.gov
Emergency Operations Flood Response and Post Flood Response (Public Law 84-99 Code 200 Program)	To provide emergency flood response and post flood response assistance as required to supplement State and local efforts and capabilities in time of flood or coastal storm. Emergency assistance is provided in all phases of flood response and post flood response to supplement State and local efforts.	State or local public agencies for flood response and the State for post flood response.	Commander, U.S. Army Corps of Engineers, Attn: CECW-OE Washington DC 20314-1000 (202) 272-0251
Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works (Public Law 84-99, Code 300 Program)	To assist in the repair and restoration of flood control works damaged by flood, or federally authorized hurricane flood and shore protection works damaged by extraordinary wind, wave, or water action. Authorized assistance includes emergency repair or rehabilitation of flood control works damaged by flood, and restoration of federally authorized coastal protection structures damaged by extraordinary wind, wave, or water action.	Owners of damaged flood protective works, or State and local officials of public entities responsible for their maintenance, repair, and operation must meet current guidelines to become eligible for Public Law 84-99 assistance.	Commander, U.S. Army Corps of Engineers, Attn: CECW-OE Washington DC 20314 (202) 272-0251
Emergency Relief Program	To assist State transportation agencies in the planning and development of an integrated, interconnected transportation system important to interstate commerce and travel by constructing and rehabilitating the National Highway System, including the Interstate System; and for transportation improvements to all public roads except those classified as local or rural minor collectors; to provide aid for the repair of Federal-aid roads following disasters; to foster safe highway design; to replace or rehabilitate deficient or obsolete bridges; and to provide for other special purposes.		Department of Transportation Federal Highway Administration Director, Office of Engineering Federal Highway Administration 400 7th St. SW Washington, DC 20590 (202) 366B4853 http://www.fhwa.dot.gov/
Emergency Solutions Grants (ESG) Program	The ESG Program provides funding to: (1) improve the number and quality of emergency shelters for homeless individuals and families; (2) help operate these shelters; (3) provide essential social services to shelter residents; and	States, metropolitan cities, urban counties, and territories. Local governments and non-profit organizations may apply for ESG funds directly from states. The territories receive their allocations based on their population size.	Community Planning and Development, Department of Housing and Urban Development Office of Special Needs Assistance Programs

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	(4) prevent families and individuals from becoming homeless.		451 7th St. SW, Rm. 7254 Washington, DC 20410 (202) 708-4300
Emergency Watershed Protection Program	Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events.		USDA – Natural Resource Conservation Service (NRCS) National Office: (202) 690-0848 Watersheds and Wetlands Division: (202) 720-3042
Emergency Medical Services for Children	To support demonstration projects for the expansion and improvement of emergency medical services for children who need treatment for trauma or critical care. It is expected that maximum distribution of projects among the States will be made and that priority will be given to projects targeted towards populations with special needs, including Native Americans, minorities, and the disabled.	State governments and schools of medicine.	Department of Health and Human Services Health Resources and Services Administration www.hrsa.gov
Environmental Quality Incentives Program (EQIP)	Technical, educational, and limited financial assistance to encourage environmental enhancement.		USDA-NRCS NRCS County Offices or NRCS EQUIP Program Manager: (202) 720-1834 www.nrcs.usda.gov
Federal Land Transfer/Federal Land to Parks Program	Identifies, assesses, and transfers available Federal real property for acquisition for State and local parks and recreation, such as open space.		DOI-National Park Service (NPS) General Services Administration Offices Fort Worth, TX: (817) 334-2331 Boston, MA: (617) 835-5700 or Federal Lands to Parks Leader NPS National Office: (202) 565-1184
Financial Assistance for Ocean Resources Conservation and Assessment Program	To determine the long-term consequences of human activities that affect the coastal and marine environment; to assess the consequences of these activities in terms of ecological, economic, and social impacts upon human, physical, and biotic environments, and to define and evaluate management alternatives that minimize adverse consequences of human use of the coastal and marine environments and resources.	Universities, colleges, technical schools, institutes, laboratories, State and local government agencies, public or private or profit or non-profit entities or individuals.	Department of Commerce Office of Ocean Resources Conservation and Assessment, National Ocean Service, National Oceanic and Atmospheric Administration 1305 East-West Hwy Silver Springs, MD 20910 (301) 713-2989 http://www.noaa.gov
Fire Management Assistance Grant –	Grants to states, tribal governments, and local governments for the mitigation, management, and control of any fire	State governments and Indian tribal governments are eligible for fire management	FEMA, RRR, Region IV

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
FEMA Readiness, Response and Recovery (RRR)	burning on publicly (non-Federal) or privately owned forest or grassland that threatens such destruction as would constitute a major disaster.	assistance grants. The State or Native American tribal government may be the Grantee. The Grantee is the government to which a grant is awarded and is accountable for the use of funds provided.	
Flood Control Projects (Small Flood Control Projects)	To reduce flood damages through projects not specifically authorized by Congress. Corps of Engineers designs and constructs the projects. Provides a cash contribution for land enhancement benefits and for project costs assigned to project features other than flood control; prevent future encroachment, which might interfere with proper functioning of the project for flood control; and, maintain the project after completion.	States, political subdivisions of states, or other responsible local agencies established under State law with full authority and ability to undertake necessary legal and financial responsibility.	U.S. Army Corps of Engineers Attn: CECW-PM Washington, DC 20314-1000 (202) 272-1975
Flood Insurance	To enable persons to purchase insurance against physical damage to or loss of buildings and/or contents therein caused by floods, mudslide, or flood-related erosion, thereby reducing Federal disaster assistance payments, and to promote wise floodplain management practices in the Nation's flood-prone and mudflow-prone areas.	Any state of political subdivision with authority to adopt floodplain management practices. Beneficiaries may include residents, businesses, and property owners in applicant community, in which like states can ensure municipal structures.	Federal Emergency Management Agency Federal Insurance Administration Washington, DC 20472 (202) 646-2781 http://www.fema.gov/nfip
Flood Mitigation Assistance (FMAP) Program Planning Grants	To assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). Examples of funded projects are published in a Biennial Report to Congress as required under Section 554 of the National Flood Insurance Reform Act (NFIRA). This report is available from Mr. Robert F. Shea, Jr., Program Support Division, Federal Emergency Management Agency (FEMA). Planning Grants may be used to assist states and communities in developing and updating Flood Mitigation Plans. Eligible activities under this grant are conducting local planning discussions, contracting for consulting technical services such as engineering and planning, surveying structures at risk, and assessing structures subject to repetitive flood loss. Eligible activities under this grant are the acquisition, relocation, elevation, or dry-floodproofing of insured	Eligible applicants of Technical Assistance Grants are State agencies or departments that are responsible for administering the FMAP program. Eligible applicants for Planning Grants are states and communities participating in the NFIP.	Mr. Robert F. Shea, Jr. Program Support Division Federal Emergency Management Agency 500 C Street, SW Washington, DC 20472 (202) 646-3619

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	structures, minor structural projects, and beach nourishment activities.		
Flood Plain Management Services	To promote appropriate recognition of flood hazards in land and water use planning and development through the provision of flood and flood plain related data, technical services, and guidance. Available information identifies areas subject to flooding and flood losses from streams, lakes, and oceans and describes flood hazard at proposed building sites. It can be used as a basis for planning flood plain use, for flood emergency preparedness planning, for hurricane evacuation and preparedness planning, for assistance in developing flood plain regulations, for setting elevations for flood proofing, and implementing flood proofing measures, and for indicating areas to be acquired for open space. Services are available to states and local governments without charge, but within annual funding limitations, on request.	States, political subdivisions of States, other non-Federal public organizations and the public.	U.S. Army Corps of Engineers Attn: CECW-PF Washington, DC 20314-1000 (202) 761-0169
Flood Risk Reduction Program	The Flood Risk Reduction Program was established to allow farmers who voluntarily enter into contracts to receive payments on lands with high flood potential. In return, participants agree to forego certain USDA program benefits. These contract payments provide incentives to move farming operations from frequently flooded land.		Contact USDA, Farm Service Agency http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Florida Coastal Protection Trust Fund	The purpose is to provide a mechanism to have financial resources immediately available for prevention of, and cleanup and rehabilitation after, a pollutant discharge, to prevent further damage by the pollutant, and to pay for damages.		Florida Statutes http://www.leg.state.fl.us/citizen/documents/statutes/1993/CHAPTER_376_11.html

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Florida Communities Trust	Florida Communities Trust (FCT) is a State land acquisition grant program housed at the Florida Department of Community Affairs. FCT provides funding to local governments and eligible non-profit environmental organizations for acquisition of community-based parks, open space, and greenways that further outdoor recreation and natural resource protection needs identified in local government comprehensive plans. Matching and full grants for land acquisition projects are provided to communities through an annual competitive application cycle. Approximately $66 million is available to eligible applicants each year, and applicants are eligible for up to 6.6 million or 10 percent of this amount.		2555 Shumard Oak Blvd Tallahassee, FL 32399-2100 (850) 922-2207 Fax: (850) 921-1747 E-mail: fctinfo@dca.state.fl.us http://www.dca.state.fl.us/ffct/
Florida Hurricane Catastrophe Fund (FHCF)	The purpose of the FHCF is to protect and advance the State's interest in maintaining insurance capacity in Florida by providing reimbursements to insurers for a portion of their catastrophic hurricane losses.		1801 Hermitage Blvd. Tallahassee, FL 32308 (850) 413-1349 Fax: (850) 413-1344 www.fsba.state.fl.us/fhcf/about.asp
Hazard Mitigation Grant Program	To prevent future losses of lives and property due to disasters, to implement State or local hazard mitigation plans, to enable mitigation measures to be implemented during immediate recovery from a disaster, and to provide funding for previously identified mitigation measures to benefit the disaster area.	State and local governments; certain private and nonprofit organizations or institutions; Native American tribes or authorized tribal organizations; and native villages or organizations.	Federal Emergency Management Agency Mitigation Directorate 500 AC@ St., SW Washington, DC 20472 (202) 646-4621 http://www.fema.gov/mit/
Hazard Reduction Program	Funding for research and related educational activities on hazards.		National Science Foundation, Directorate for Engineering, Division of Civil and Mechanical Systems, Hazard Reduction Program (703) 306-1360
Hazardous Materials Assistance Program (Comprehensive Environmental Response, Compensation and Liability Act [CERCLA] Implementation)	Provide technical and financial assistance through the States to support State, local, and tribal governments in oil and hazardous materials emergency planning and exercising. To support the Comprehensive Hazardous Materials Emergency Response – Capability Assessment Program activities.	State, local, and tribal governments, State emergency response committees, local emergency planning commissions.	Department of Homeland Security Emergency Preparedness and Response Directorate

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Hazardous Materials Emergency Preparedness (HMEP) Grant	The HMEP grant program is intended to provide financial and technical assistance as well as national direction and guidance to enhance State, territorial, tribal, and local hazardous materials emergency planning and training. The HMEP Grant Program distributes fees collected from shippers and carriers of hazardous materials to emergency responders for hazmat training and to Local Emergency Planning Committees for hazmat planning.		Federal Emergency Management Agency 500 C St., SW Washington, DC 20472 http://www.fema.gov/
Hazardous Materials Emergency Preparedness Training and Planning Grants	Increase State, local, territorial, and Native American tribal effectiveness to safely and efficiently handle HazMat accidents and incidents, enhance implementation of the Emergency Planning and Community Right-to-Know Act of 1986, and encourage a comprehensive approach to emergency planning and training by incorporating response to transportation standards.	States, local, territorial, tribal governments	Department of Transportation Research and Special Programs Administration www.rspa.dot.gov
Hazardous Waste Management State Program Support	To assist State governments in the development and implementation of an authorized hazardous waste management program for the purpose of controlling the generation, transportation, treatment, storage, and disposal of hazardous wastes. State project to develop a hazardous waste program designed to meet the substantive and procedural requirements of an authorized program. (Section 3006).	State agencies responsible for hazardous waste management within the 50 states.	Grants Administration Division (3903R), Environmental Protection Agency, Washington, DC 20460
Hazardous Waste Worker Health and Safety	To assist organizations in the development of institutional competency through appropriate training and education to hazardous waste workers.		Department of Health and Human Services, Public Health Service National Institutes of Health Office of Extramural Outreach and Information National Institutes of Health 6701 Rockledge Dr., MSC 7910 Bethesda, MD 20892-7910 (301) 435-7910 http://www.nih.gov/

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Healthy Homes Demonstration Grants.	The purpose of the Healthy Homes Demonstration Program is to develop, demonstrate, and promote cost-effective, preventive measures to correct multiple safety and health hazards in the home environment that produce serious diseases and injuries in children of low-income families. The U.S. Department of Housing and Urban Development (HUD) is interested in reducing health threats to the maximum number of residents, especially children, in a cost efficient manner.	Eligible applicants include not-for-profit institutions; for-profit institutions (for-profit firms are not allowed to profit from the project) located in the U.S., State, and local governments; and Federally-recognized Native American tribes. Federal agencies and Federal employees are not eligible to apply for this program.	Ms. Ellen Taylor, Director, Healthy Homes Program. Office of Healthy Homes and Lead Hazard Control, (202) 755-1785, extension 116 E-mail: Ellen_R._Taylor@hud.gov
Historic Preservation Fund Grants-in-Aid	To provide matching grants to states for the identification, evaluation, and protection of historic properties by such means as survey, planning technical assistance, acquisition, development, and certain Federal tax incentives available for historic properties; to provide matching grants to States to expand the National Register of Historic Places; and to provide matching grants to the National Trust for Historic Preservation for its congressionally chartered responsibilities to preserve historic resources.	State and local governments and public and private nonprofit organizations and individuals.	Department of the Interior National Park Service, Preservation Heritage Services Division 1849 C Street, NW Washington, DC 20240 (202) 343-6004
Historic Preservation Grants	To assist in the identification, excavation, protection, and rehabilitation of historic and archaeological sites in Florida; to provide public information about these important resources; and to encourage historic preservation in smaller cities through the Florida Main Street program.	Departments or agencies of the State (including universities), cities, counties, and other units of local government, and not-for-profit organizations.	Division of Historical Resources 500 S. Bronough Street Tallahassee, FL 32399-0250 (850) 245-6300
Human Health Studies, Applied Research and Development	To solicit scientific proposals designed to answer public health questions arising from situations commonly encountered at hazardous waste sites. The objective of this research program is to fill gaps in knowledge regarding human health effects of hazardous substances identified during the conduct of Agency for Toxic Substances and Disease Registry's (ATSDR's) health assessments, consultations, toxicological profiles, and health studies, including but not limited to those health conditions prioritized by ATSDR.	State health departments.	Department of Health and Human Services Centers for Disease Control www.atsdr.cdc.gov

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Hurricane Loss Mitigation Program	Funds Residential Construction Mitigation Program, which was developed in coordination with an advisory council consisting of representatives designated from the Department of Insurance, Florida Home Builders Association, Florida Insurance Council, Federation of Manufactured Home Owners, Florida Association of Counties, and Florida Manufactured Housing Association.		2555 Shumard Oak Blvd Tallahassee, FL 32399-2100 (850) 410-1563 Fax: (850) 410-1555 E-mail: ted.court@dca.state.fl.us http://www.floridacommunitydevelopment.org/programs/rcmp/files/onepager.PDF
Hurricane Program	To significantly reduce the loss of life, property, economic disruption, and disaster assistance costs resulting from hurricanes.	Texas, Louisiana, Mississippi, Alabama, Florida.	Federal Emergency Management Agency Mitigation Directorate 500 AC@ St., SW Washington, DC 20472 (202) 646-4621 http://www.fema.gov/mit
Immunization Grants	To assist states and communities in establishing and maintaining preventative health service programs to immunize individuals against vaccine-preventable diseases.	States.	Department of Health and Human Services Centers for Disease Control www.cdc.gov
Immunization Research, Demonstration, Public Information and Education	To assist states, political subdivisions of states, and other public and private nonprofit entities to conduct research, demonstrations, projects, and provide public information on vaccine-preventable diseases and conditions.	States and nonprofit organizations.	Department of Health and Human Services Centers for Disease Control www.cdc.gov
Individual Assistance	To provide assistance to individuals and families who have been affected by natural or man-made Presidentially declared disasters. Funding provided from the Disaster Relief Fund.	Individuals and families.	Department of Homeland Security Emergency Preparedness and Response Directorate
Interoperable Communications Equipment Grant	To facilitate communications interoperability among public safety emergency responders at the State and local level.	State and local governments.	Department of Homeland Security Emergency Preparedness and Response Directorate
John D. and Catherine T. MacArthur Foundation	Initiates programs and supports their purposes including community development activities in Palm Beach County, Florida.	Open to non-profit, tax-exempt organizations.	John D. and Catherine T. MacArthur Foundation Program Area, Grants Management, Research and Information 140 S. Dearborn St., Suite 1100 Chicago, IL 60603-5285 (312) 726-8000 E-mail: 4answers@macfdn.com

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Land and Water Conservation Fund (LWCF)	LWCF is a competitive program that provides grants for acquisition or development of land for public outdoor recreation use.	All local governmental entities with the legal responsibility for the provision of outdoor recreational sites and facilities for the use and benefit of the public.	Department of Environmental Protection Division of Recreation & Parks Bureau of Design & Recreation Services 3900 Commonwealth Boulevard MS #585 Tallahassee, Florida 32399-3000 (850) 488-7896 (Suncom 278-7896) Fax: (850) 488-3665 (Suncom 278-3665)
Land Protection, Natural Resources Conservation Service (NRCS)	The NRCS provides technical and financial assistance for runoff retardation and soil erosion prevention as needed to reduce hazards to life and property from floods, drought, and the products of erosion on any watershed impaired by a natural disaster. NRCS provides technical assistance for rehabilitation of land conservation systems for which FSA provides cost-sharing, and emergency protection to assist in relieving imminent hazards to life and property from floods and products of erosion created by natural hazards that are causing a sudden impairment of a watershed.		Contact USDA http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Local Firefighting and Emergency Services Training	To provide specialized training and equipment to enhance the capability of metropolitan fire and emergency service departments to respond to terrorist attacks. To enhance readiness and preparedness of fire and emergency services personnel to respond to terrorist incidents of mass destruction where incendiary devices, nuclear, biological, or chemical agents are utilized.	Applicants requesting funding must have the capability to develop and provide training for fire and emergency service personnel that will prepare them to respond to a terrorist incident.	Office of State and Local Domestic Preparedness Support, Office of Justice Programs, Department of Justice 633 Indiana Ave. NE Washington, DC 20531 (202) 616-2920
Local Initiatives Support Corporation (LISC)	Helps existing community development groups revitalize urban neighborhoods throughout the country. By combining investments, technical assistance, and grants, LISC seeks to increase the ability of experienced local development groups to design projects of significant scale, raise and manage necessary capital, and work effectively with their natural allies in the private sector.	Available upon request.	John Mascotte, Chairman of the Board, or Paul S. Grogan, President Local Initiatives Support Corporation 733 3rd Ave. New York, NY 10017 (212) 455-9800
Map Modernization	This funding provides assistance to develop digital flood maps, support flood-mapping activities, and expand the Cooperating Technical Partners Program to communities and regional entities.	State, local, and tribal governments.	Department of Homeland Security Emergency Preparedness and Response Directorate

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
National Fire Academy Educational Program	To increase the professional level of the fire service and others responsible for fire prevention and control. Students are provided an opportunity to attend courses at the National Fire Academy resident facility or at a convenient off-campus location with a minimal cost to the individual or the fire department represented. The increase in the number of students attending impacts the professional level of fire service personnel. Training is provided at the resident facility in Emmitsburg, Maryland, and in the field in cooperation with State or local fire training agencies on specific subjects to specific audiences.	Any individual who is a member of a fire department or has significant responsibility for fire prevention and control.	National Emergency Training Center, Educational and Technology Services Branch 16825 S. Seton Ave. Emmitsburg, MD 21727 (301) 447-1000
National Fire Academy Training Assistance (Student Stipend Reimbursement Program)	To provide travel stipends to students attending Academy courses. Examples of funded projects: students are provided an opportunity to attend courses at the National Fire Academy resident facility with a minimal cost to the individual or the fire department represented. The increase in the number of students attending impacts the professional level of fire service personnel.	Any student who is a member of a fire department or has significant responsibility for fire prevention and control and has been accepted into an eligible course at the National Fire Academy may apply for stipend reimbursement.	National Emergency Training Center, Educational and Technology Services Branch, 16825 S. Seton Ave Emmitsburg, MD 21727 (301) 447-1035
National Flood Insurance Program	Provides federally-backed flood insurance to those who generally were not able to obtain it from the private-sector companies, and to promote sound floodplain management practices in flood prone areas.		FEMA Region IV CRS Program 3003 Chamblee-Tucker Rd. Atlanta, GA 30431 (770) 220-5200
National Flood Mitigation Fund	To fund activities designed to reduce the risk of flood damage.	States and units of local government. Local governments must be participating in the National Flood Insurance Program.	Federal Emergency Management Agency Mitigation Directorate 500 AC@ St., SW Washington, DC 20472 (202) 646-4621 http://www.fema.gov/mit

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
National Hospital Bioterrorism Preparedness Grant	HRSA is providing financial assistance to authorized jurisdictions through the National Hospital Bioterrorism Preparedness Program's Cooperative Agreements to upgrade the preparedness of the Nation's health care system to respond to bioterrorism, other outbreaks of infectious disease, and other public health threats and emergencies. Awardees are required to address the following priority areas: hospital bed capacity, isolation capacity, health care personnel, hospital-based pharmaceutical caches, mental health services, trauma and burn care capacity, communications and information technology, personal protective and decontamination equipment, emergency medical services, linkages with public health departments, education and training, and preparedness exercises.	Public Health Departments in all 50 States Territories (USVI, Guam, Puerto Rico, American Samoa, N. Marianas Islands) Freely Associated States of the Pacific (Federated States of Micronesia, Marshall Islands, Palau) New York, NY, Los Angeles County, CA, Chicago, IL, District of Columbia.	National Bioterrorism Hospital Preparedness Program Contacts Parklawn Building, Room 18A-38 5600 Fishers Lane Rockville, MD 20857 Fax: (301) 443-1296
National Weather Service	Provides weather and flood warnings, public forecasts, and advisories for all of the United States and territories. Technical assistance is provided to local, regional, and State agencies developing and operating warning programs.		National Weather Service, National Oceanic and Atmospheric Administration 1325 East-West Highway Silver Spring, MD 20910 http://www.nws.noaa.gov
National Institute of Environmental Health Services Hazardous Waste Worker Health and Safety Training (Superfund Worker Training Program)	To provide cooperative agreements and project grant support for the development and administration of model worker health and safety training programs consisting of classroom and practical health and safety training of workers and their supervisors, who are engaged in activities related to hazardous materials, hazardous waste generation, treatment, storage, disposal, removal, containment, transportation, or emergency response. Programs provide health and safety training and education for occupational population involved in waste handling and processing at active and inactive hazardous substance treatment, storage, and disposal facilities; cleanup, removal, containment, or remedial action at waste sites; hazardous substance emergency response; hazardous substance disposal site risk assessment and investigation, remedial actions, or clean-up by State and local personnel; and transportation of hazardous wastes.	A public or private nonprofit entity providing worker health and safety education and training may submit an application and receive a cooperative agreement or project grant for support of waste worker education and training by a named principal investigator. Nonprofit organizations that are incorporated under 501(c)(4) are prohibited from receiving grants.	Grants Management Contact: Dorothy G. Williams, Grants Management Officer, Grants Management Branch, Division of Extramural Research and Training, National Institute of Environmental Health Sciences, National Institutes of Health, Department of Health and Human Services P.O. Box 12233 Research Triangle Park, NC 27709 (919) 541-2749 E-mail: Williams@niehs.nih.gov

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
National Institute of Environmental Health Sciences (NIEHS) Superfund Hazardous Substances: Basic Research and Education (NIEHS Superfund Research Program)	It is intended to integrate advanced or graduate training into the multidisciplinary research program to provide for training in environmental and occupational health and safety; the engineering aspects of hazardous waste control; and graduate training in the geosciences. This interdisciplinary program supports basic research in the following: development and use of methods and technologies to detect hazardous substances in the environment; development of advanced techniques for the detection, assessment, and evaluation of the effects of human health presented by hazardous substances; and the development and use of basic biological, chemical, and physical methods and technologies to reduce the amount of toxicity of hazardous substances.	An accredited institution of higher education, as defined in the Higher Education Act, 20 U.S.C. (annotated) 3381, may submit an application and receive a grant for support of research by a named principal investigator. Nonprofit organizations that are incorporated under 501(c)(4) are prohibited from receiving grants.	Grants Management Contact: Dorothy G. Williams, Grants Management Officer, Department of Health and Human Services P.O. Box 12233 Research Triangle Park, NC 27709 (919) 541-2749 E-mail: Williams@niehs.nih.gov
Non-Structural Alternatives to Structural Rehabilitation of Damaged Flood Control Works	Direct planning and construction grants for non-structural alternatives to the structural rehabilitation of flood control works damaged in floods or coastal storms ($9 million FY 99).		Department of Defense-U.S. Army Corps of Engineers (USACE) Emergency Management contact in respective USACE field office South Atlantic (404) 331-6795
North American Wetlands Conservation Act (NAWCA) Grant Program	The North American Wetlands Conservation Act Grant Program promotes long-term conservation of North American wetland ecosystems, waterfowl and other migratory birds, fish, and wildlife that depend upon such habitat. Principal conservation actions supported by NAWCA are acquisition, enhancement, and restoration of wetlands and wetlands-associated habitat. The program encourages voluntary, pubic-private partnerships to conserve North American wetland ecosystems by creating an infrastructure and providing a source of funding.	Public or private, profit or non-profit entities or individuals establishing pubic-private sector partnerships.	Department of the Interior Fish and Wildlife Service, North American Waterfowl and Wetlands Office 4401 N. Fairfax Dr., Rm. 110 Arlington, VA 22203 (703) 358-1784 http://www.fws.gov/~r9nawwo/homepag.html
Office of Domestic Acquisition Program (ODP)	The goal of the ODP Equipment Grant Program is to provide funding to enhance the capacity of State and local jurisdictions to respond to, and mitigate the consequences of, incidents of domestic terrorism involving the use of weapons of mass destruction.	All 50 states, the District of Columbia, the Commonwealth of Puerto Rico, American Samoa, the Commonwealth of Northern Mariana Islands (CNMI), Guam, and the U.S. Virgin Islands.	ODP Help Line at (800) 368-6498

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Outdoor Recreation: Acquisition, Development and Planning (Land and Water Conservation Fund Grants)	To provide financial assistance to the states and their political subdivisions for the preparation of Statewide Comprehensive Outdoor Recreation Plans (SCORPs) and acquisition and development of outdoor recreation areas and facilities for the general public, to meet current and future needs. Examples of funded projects: acquisition and development grants may be used for a wide range of outdoor recreation projects, such as picnic areas, inner city parks, campgrounds, tennis courts, boat launching ramps, bike trails, outdoor swimming pools, and support facilities such as roads, water supply, etc.	For planning grants, only the State agency formally designated by the Governor or State law as responsible for the preparation and maintenance of the SCORP is eligible to apply. For acquisition and development grants, the above designated agency may apply for assistance for itself, or on behalf of other State agencies or political subdivisions, such as cities, counties, and park districts.	Chief, Recreation Program, National Park Service, (2225), Department of the Interior 1849 C Street, NW, Room 3624 Washington, DC 20240 (202) 565-1133
Partners for Fish and Wildlife	Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.		Department of Interior – Fish and Wildlife Service National Coordinator, Ecological Services: (703) 358-2201 A list of State and regional contacts is available from the National Coordinator upon request.
Physical Disaster Loans and Economic Injury Disaster Loans	Disaster loans to non-farm, private sector owners of disaster damaged property for uninsured losses. Loans can be increased by up to 20 percent for mitigation purposes.		Small Business Administration National Headquarters Associate Administrator for Disaster Assistance: (202) 205-6734
Planning Assistance to States (Section 22)	To cooperate with any state in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources of drainage basins located within the boundaries of such state. The state must have a planning program for the development, utilization, or conservation of the water and related land resources underway or laid out in sufficient detail so that the relationship of a state's request for Corps input for some particular aspect of the program may be appraised.	The 50 states.	U.S. Army Corps of Engineers Attn: CECW-PF Washington, DC 20314-1000 (202) 272-0169
Planning Assistance to States Program	To assist the states in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. Floodplain management services intended to assist states in planning related to water supply, water quality, water conservation,	States, District of Columbia, U.S. Territories, and federally recognized Native American tribes.	Department of Defense U.S. Army Corps of Engineers Attn: CECW-PM DoD Washington, DC 20314-1000 (202) 272-0169 http://www.usace.army.mil/

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	environmental restoration and enhancement, hydropower development, flood control, or erosion and navigation.		
Port Security Grants for Critical National Seaports	To support efforts of critical national seaports/terminals to enhance port security through security assessments and mitigation strategies; and enhanced facility and operational security (e.g., terminal, commuter, or ferry vessels access control, physical security, cargo security, and passenger security), including proof of concepts.	Public and private ports or terminals; State/local government entities; and consortiums composed of local stakeholder groups (i.e., river groups, ports, and terminal associations). Private entities will be considered when security interests related to location and/or operation affects the greater public interest. Consultants may prepare applications for an eligible party, but only the eligible party may submit and be considered for the grant. Prerequisites: for Enhanced Facility and Operational Security grants, applicants must have already completed a security assessment and tie the security enhancements to the assessment.	Transportation Security Administration Headquarters, Office of Maritime and Land Security, Grants/Contracts Management Branch, TSA-8 701 South 12th Street Arlington VA 22202 Tony Corio tony.corio@dhs.gov (571) 227-1233
Post-Disaster Economic Recovery Grants and Assistance	Grant funding to assist with the long-term economic recovery of communities, industries, and firms adversely impacted by disasters.		Department of Commerce – Economic Development Administration (EDA) EDA Headquarters Disaster Recovery Coordinator: (202) 482-6225
Pre-Disaster Mitigation Program	This program provides funding for mitigation activities before disasters strikes. In recent years it has provided assistance for mitigation planning. In FY 03, Congress passed a competitive pre-disaster mitigation grant program that will include project funding.	State, local, and tribal government.	Department of Homeland Security Emergency Preparedness and Response Directorate
Project Modifications for Improvement of the Environment	Provides for ecosystem restoration by modifying structures and/or operations or water resources projects constructed by the USACE, or restoring areas where a USACE project contributed to the degradation of an area.		Department of Defense (DOD)-USACE Chief of Planning @ appropriate USACE Regional Office South Atlantic: (404) 331-6270
Property Improvement Loan Insurance for Improving All Existing Structures and Building of New Nonresidential Structures (Title I)	To facilitate the financing of improvements to homes and other existing structures and the building of new nonresidential structures. Insured loans may be used to finance alterations, repairs, and improvements for existing structures and the building of new nonresidential structures that substantially protect or improve the basic livability or utility of the properties.	Eligible borrowers include the owner of the property to be improved, lessee having a lease extending at least 6 months beyond maturity of the loan, or a purchaser of the property under a land installment contract.	Persons are encouraged to contact the Homeownership Center serving their state, or nearest local HUD office.

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Protection of Essential Highways, Highway Bridge Approaches, and Public Works (Emergency Bank Protection)	To provide bank protection of highways, highway bridges, essential public works, churches, hospitals, schools, and other nonprofit public services endangered by flood-caused erosion. Reinforced barriers at either side of bridge approachments. Corps of Engineers designs and constructs the project. Nonfederal sponsor must share in projects costs, including cash and lands, easements, right-of-way and utility relocations; hold and save the United States free from damages; and maintain the project at local cost after completion.	States, political subdivisions of states or other responsible local agencies established under State law with full authority and ability to undertake necessary legal and financial responsibilities.	U.S. Army Corps of Engineers Attn: CECW-PM Washington, DC 20314-1000 (202) 272-1975
Protection of Forests and Rangelands	The Forest Service (FS) sets priorities, establishes policies, and provides financial and technical assistance to State Foresters. The FS provides technical and financial assistance to State Foresters in mitigating and improving their fire suppression capability, and serves as a technical fire advisor to FEMA in the Fire Suppression Assistance Program.	Federal and State agencies and organizations, and State and private lands.	Contact USDA http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Public Assistance	To provide supplemental assistance to states, local governments, and certain private nonprofit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President.	State and local governments and any political subdivision of a state, Native American tribes, and native villages are eligible. Also eligible are private nonprofit organizations that operate educational, utility, emergency, or medical facilities and provide custodial care or other essential services of governmental nature to the general public.	Federal Emergency Management Agency Infrastructure Support Division, Response and Recovery Directorate 500 AC@ St., SW Washington, DC 20472 (202) 646-3026 http://www.fema.gov/mit/
Public Health and Social Services Emergency Fund	To continue to prepare our nation's public health system and hospitals for possible mass casualty events, and to accelerate research into new treatments and diagnostic tools to cope with possible bioterrorism incidents.	Individuals, families, Federal, State, and local government agencies and emergency health care providers.	Department of Health and Human Services ww.hhs.gov
Public Housing Modernization Reserve for Disasters and Emergencies	Funding to public housing agencies for modernization needs resulting from natural disasters (including elevation, floodproofing, and retrofit).		HUD Director, Office of Capital Improvements: (202) 708-1640

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Radiation Control: Training Assistance and Advisory Counseling	To assist states in achieving, maintaining, and improving their capabilities to conduct radiation control programs. This will assure that State programs established through agreements with NRC for transfer of certain NRC regulatory authority over atomic energy materials to the states will continue to be adequate to protect health and safety and be compatible with NRC's regulatory program. Training is made available to personnel of State and local governments in order to improve the radiological health training of staff members responsible for carrying out radiation control programs. Courses are provided in health physics and radiation protection, safety aspects of using radioactive materials, regulatory practices and procedures, and compliance inspection.	State and local government agencies that are or will be responsible for administering radiation control programs under an agreement with NRC for assumption by the State of regulatory authority initially exercised by the NRC.	Brenda Usilton, Office of State Programs, Nuclear Regulatory Commission, Washington, DC 20555 (301) 415-2348
Recreation Development Assistance Program	Florida Recreation Development Assistance Program (FRDAP) is a competitive program that provides grants for acquisition or development of land for public outdoor recreational use or to construct or renovate recreational trails.	Municipal and county governments or other legally constituted entities with the legal responsibility to provide public outdoor recreation.	Bureau of Design and Recreation Services 3900 Commonwealth Boulevard Mail Station #585 Tallahassee, Florida 32399-3000 (850) 488-7896 (Suncom 278-7896) Fax: (850) 488-3665 (Suncom Fax 278-3665)
Rehabilitation Mortgage Insurance (203[k])	To help families repair or improve, purchase and improve, or refinance and improve existing residential structures more than 1 year old. HUD insures lenders against losses on loans. These loans may be used to rehabilitate an existing one to four unit dwelling in one of four ways: purchase a structure and the land on which the structure is located and rehabilitate it; purchase a structure on another site, move it onto a new foundation on the mortgaged property, and rehabilitate it; refinance the existing indebtedness and rehabilitate such a structure; or rehabilitate such a structure.	Individual purchasers or investors are eligible to apply.	Persons are encouraged to contact the Homeownership Center serving their State, or the nearest local HUD office.

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Rural Development Assistance -- Utilities	Direct and guaranteed rural economic loans and business enterprise grants to address utility issues and development needs.		USDA-Rural Utilities Service Program Support: (202) 720-1382 Northern Regional Division: (202) 720-1402 Electric Staff Division: (202) 720-1900 Power Supply Division: (202) 720-6436
Rural Development Assistance – Housing	Grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary.		USDA-Rural Housing Service Community Programs: (202) 720-1502 Single Family Housing: (202) 720-3773 Multi Family Housing: (202) 720-5177
School Emergency Response and Crisis Management Plan Discretionary Grant Program	To provide school districts with funds to strengthen and improve current school crisis plans in preparation for emergencies including potential terrorist attacks.	School districts.	Department of Education www.ed.gov/emergencyplan/
Section 108 Loan Guarantee Program	Loan guarantees to public entities for community and economic development (including mitigation measures).		HUD Community Planning and Development staff at appropriate HUD field office, or the Section 108 Office at HUD Headquarters: (202) 708-1871
Small Business Administration (SBA) Pre-Disaster Mitigation Loan Program	The purpose of the Pre-Disaster Mitigation Loan Program is to make low-interest, fixed-rate loans to eligible small businesses for the purpose of implementing mitigation measures to protect business property from damage that may be caused by future disasters. The program is a pilot program, which supports FEMA's Pre-Disaster Mitigation Program. SBA's Pre-Disaster Mitigation Program is available to businesses whose proposed mitigation measure conforms to the priorities and goals of the mitigation plan for the community, as defined by FEMA, in which the business is located.		Disaster Area 2 Office One Baltimore Place, Suite 300 Atlanta, GA 30308 1-800-359-2227 http://www.sba.gov/disaster_recov/loaninfo/pre_disaster_mitigation.html
Small Cities Community Development Block Grant Program	Provides funds to rural communities to improve local housing, streets, utilities, and public facilities. The Section 108 Loan Guarantee Program offers local governments a source of financing for economic development, large-scale public facility projects, and public infrastructure.		Ian Smith (850) 922-1870 Susan Cook (850) 487-3644 Rick Stauts, Planning Manager with the Department of Community Affairs (850) 487-3644

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Snagging and Clearing for Flood Control (Section 208)	To reduce flood damages. Corps of Engineers designs and constructs the project. The nonfederal sponsor must provide all lands, easements, and rights-of-way; provide all project costs in excess of the Federal limit of $500,000; agree to maintain project after construction; hold and save the United States free from damages; provide a contribution toward construction costs for land enhancement or special benefits; agree to prevent future encroachment, which might interfere with proper functioning of the project for flood control.	States, political subdivisions of states, or other responsible local agencies established under State law with full authority and ability to undertake necessary legal and financial responsibilities.	U.S. Army Corps of Engineers Attn: CECW-PM Washington, DC 20314-1000 (202) 272-1975
South Florida Coastal Ecosystem Program	To seek the most technically sound and cost effective proposals that specifically address priority issues within South Florida's coastal ecosystem, such as restoring and enhancing degraded coastal uplands and estuarine wetlands, removing exotic vegetation from coastal areas and promoting research and public awareness of South Florida's ecological problems, to identify opportunities in which partnerships can be formed to create, restore and enhance coastal resources, and to develop partnerships among Federal, State, and local governments as well as academic, non-governmental, and business entities in South Florida.	Federal, State, and local government agencies, academic institutions, non-profit groups, and/or citizens are eligible to respond directly.	U.S. Fish & Wildlife Service South Florida Ecological Services Office 1339 20th Street Vero Beach, Florida 32960-3559
Special Economic Development and Adjustment Assistance Program - Sudden and Severe Economic Dislocation and Long Term Economic Deterioration	To help State and local areas develop and/or implement strategies designed to address structural economic adjustment problems resulting from sudden and severe economic dislocation such as plant closings, military base closures, and defense contract cutbacks, and natural disasters, or from long-term economic deterioration in the area's economy.	States, cities, counties, or other political subdivisions of a State, consortia of such political subdivisions, public or private nonprofit organizations representing redevelopment areas designated under the Public Works and Economic Redevelopment Act of 1965, Economic Development Districts established under Title IV of the Act, and Native American tribes.	Department of Commerce Economic Adjustment Division, Economic Development Administration Room H7327, Herbert C. Hoover Bldg. Washington, DC 20230 (202) 482-26659 http://www.doc.gov/eda/
State Disaster Preparedness Grants (Disaster Preparedness Improvement Grants)	To assist states in developing and improving State and local plans, programs, and capabilities for disaster preparedness and prevention. Improvement grants have produced a variety of products such as mitigation training courses, enhanced State preparedness efforts, revised assistance, and hazard mitigation plans.	All states are eligible.	C. Dwight Poe, State and Local Preparedness, Training, and Exercises Directorate, Federal Emergency Management Agency Washington, DC 20472 (202) 646-3492

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
State Domestic Preparedness Equipment Support Program	Funding will be provided to enhance first responder capabilities, and to provide for equipment purchases and exercise planning activities for response to Weapons of Mass Destruction domestic terrorist incidents.	State and local governments.	Department of Justice Office of Domestic Preparedness www.usdoj.gov
State Homeland Security Grant Program	To provide for the purchase of specialized equipment to enhance the capability of State and local agencies to prevent and respond to incidents of terrorism involving the use of chemical, biological, radiological, nuclear or explosive (CBRNE) weapons; for the protection of critical infrastructure and prevention of terrorist incidents; for costs related to the design, development, conduct, and evaluation of CBRNE exercises; for costs related to the design, development, and conduct, of a State CBRNE Training Program; and for costs associated with updating and implementing each state's Homeland Security Strategy.	State and local governments; first responders.	Department of Homeland Security Border and Transportation Security Directorate www.ojp.usdoj.gov
State and Local All Hazards Emergency Operations Planning	The purpose of the State and Local All Hazards Emergency Operation Planning Program is to supplement and assist State and local efforts to prepare themselves to respond to emergencies or disasters including any that may be caused by terrorist attacks using conventional means or Weapons of Mass Destruction. Such preparedness requires an extraordinary level of inter-service and inter-jurisdictional planning and coordination. The program provides grants to the states to encourage the development or updating of comprehensive, all-hazard emergency management plans by the states and by local governments. The requisite planning base supports and promotes efforts to establish lasting working relationships and facilitates the development of a common incident command system, general availability of interoperable communications, and effective mutual aid. In partnership with the Federal Government, strong emergency management and emergency services organizations at the State and local levels ensure the continuance of a comprehensive national emergency management system for disasters or emergencies resulting from natural disasters or accidental or man-made events.	States are eligible to apply for assistance under this program. For purposes of this program and consistent with the Stafford Act, 42 U.S.C. 5122(4), "state" means any state of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. Local governments may receive assistance as subgrantees to the states in which they are located. The term "local government" as used in this program has the meaning set forth in the Stafford Act, 42 U.S.C. 5122(6).	Gil Jamieson, Federal Emergency Management Agency, Office of National Preparedness 500 C Street, SW Washington, DC 20472 (202) 646-4090 E-mail: gil.jamieson@fema.gov Fax: (202) 646-4053 24-hour per day FEMA Telephone Operator Service is available at (202) 566-1600 http://www.fema.gov

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
State and Local Anti-Terrorism Training	To provide delivery of specialized, multi-agency anti-terrorism preparedness training. This training, along with related research, law enforcement intelligence, operational issues development, and technical assistance support activities, is delivered to State and local law enforcement and prosecution authorities. While State and local law enforcement preparation and readiness issues addressed in this project are tailored to interventions in domestic terrorism, major portions of the program's preparedness and operational readiness outcomes are equally applicable to any terrorist threat or incident whether domestically or internationally inspired.	State and local law enforcement and prosecution authorities.	Office of Justice Programs, Bureau of Justice Assistance, Department of Justice 810 Seventh Street, NW Washington, DC 20531 Contact: Program Development Division (202) 514-5943 www.usdoj.gov/bja
State and Local Domestic Preparedness Exercise Support	To enhance the capacity of State and local first responders to respond to a weapons of mass destruction terrorism incident involving chemical, biological, nuclear, radiological, incendiary, and explosive devices.	Eligible applicants are public or private organizations with the expertise and experience to provide assistance to State and local jurisdictions; to facilitate, conduct, and evaluate exercises; and/or to develop guidance, materials, and publications related to the conduct of exercises or lessons learned.	Office for Domestic Preparedness, Office of Justice Programs U.S. Department of Justice 810 Seventh Street, NW Washington, DC 20531 (202) 305-9887 http://www.ojp.usdoj.gov
State and Local Domestic Preparedness Technical Assistance	To enhance the capacity of State and local first responders to respond to a weapons of mass destruction terrorism incident involving chemical, biological, nuclear, radiological, incendiary, and explosive devices. The program goals are to enhance the ability of State and local jurisdictions to develop, plan, and implement a program for weapons of mass destruction preparedness and to sustain and maintain specialized equipment.	Applicants may be public or private organizations with the expertise and experience to provide a specialized service or a full range of assistance to enhance the capacity of State and local emergency response agencies to respond to a weapons of mass destruction terrorism incident.	Office for Domestic Preparedness, Office of Justice Programs U.S. Department of Justice 810 Seventh Street, NW Washington, DC 20531 (202) 305-9887 http://www.ojp.usdoj.gov
State Rural Hospital Flexibility Program	To help states work with rural communities and hospitals to develop and implement a rural health plan, designate critical access hospitals, develop integrated networks of care, improve emergency medical services, and improve quality, service, and organizational performance.	States with at least one hospital in a non-metropolitan region.	Department of Health and Human Services Health Resources and Services Administration www.ruralhealth.hrsa.gov

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Stewardship Incentives Program	The Stewardship Incentives Program provides technical and financial assistance to encourage non-industrial private forest landowners to keep their lands and natural resources productive and healthy. Qualifying land includes rural lands with existing tree cover or land suitable for growing trees and which is owned by a private individual, group, association, corporation, Native American tribe, or other legal private entity. Eligible landowners must have an approved Forest Stewardship Plan and own 1,000 or fewer acres of qualifying land. Authorization may be obtained for exceptions of up to 5,000 acres.		Contact USDA, Forest Service http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Surface Transportation Program (STP)	The STP provides flexible funding that may be used by States and localities for projects on any Federal-aid highway, including the National Highway System, bridge projects on any public road, transit capital projects, and Intra-City and Inter-City bus terminals and facilities. A portion of funds reserved for rural areas may be spent on rural minor collectors. Eligible activities include environmental restoration and pollution abatement projects, including retrofit or construction of stormwater treatment facilities and natural habitat mitigation.		Florida Department of Transportation
Superfund Hazardous Substances Basic Research and Education	To establish and support an innovative program of basic research and training consisting of multi-project, interdisciplinary efforts that may include each of the following: methods and technologies to detect hazardous substances in the environment; advance techniques for the detection, assessment, and evaluation of the effects of hazardous substances on humans; methods to assess the risk to human health presented by hazardous substances; and basic biological, chemical, and physical methods to reduce the amount and toxicity of hazardous substances.	Any public or private entity involved in the detection, assessment, evaluation, and treatment of hazardous substances; and State and local governments.	Department of Health and Human Services National Institute of Health www.nih.gov

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Surveillance of Hazardous Substance Emergency Events	To assist State health departments in developing a State-based surveillance system for monitoring hazardous substance emergency events. This surveillance system will allow the State health department to better understand the public health impact of hazardous substance emergencies by developing, implementing, and evaluating a State-based surveillance system	State, local, territorial, and tribal public health departments.	Department of Health and Human Services Centers for Disease Control www.atsdr.cdc.gov
Surveys, Studies, Investigations, Training Demonstrations and Educational Outreach	Grants are awarded to support Surveys, Studies, Investigations, Training Demonstrations, Educational Outreach and Special Purpose assistance relating to the protection of public health and the environment from potential risk from toxic chemicals to come. Funding priority: annual funding priority topics for FY 2003 include, but are not limited to, promotion of pollution prevention and the public's right to know about chemical risks, evaluation of pesticides and chemicals to safeguard all Americans, including children and other vulnerable members of the population, as well as our most threatened species and ecosystems from environmental harm and emerging issues like biotechnology, endocrine disruptors, and lead poisoning prevention.	Assistance under this program is generally available to states, U S territories or possessions, federally recognized Native American tribal governments and organizations, public and private universities and colleges, hospitals, laboratories, and other public or private nonprofit institutions and individuals. Non-profit organizations described in Section 501(c)(4) of the Internal Revenue Code that engage in lobbying activities as defined in Section 3 of the Lobbying Disclosure Act of 1995 are not eligible to apply.	EPA, Office of Prevention, Pesticides, and Toxic Substances 1200 Pennsylvania Avenue, NW Washington, DC 20460
Sustainable Development Challenge Grants	To catalyze community-based and regional projects and other actions that promote sustainable development, thereby improving environmental quality and economic prosperity; leverage significant private and public investments to enhance environmental quality by enabling community sustainability efforts to continue past Environmental Protection Agency funding; build partnerships that increase a community's long-term capacity to protect the environment through sustainable development; and enhance the Environmental Protection Agency's ability to provide assistance to communities and promote sustainable development, through lessons. Examples of funded projects: from Grassroots to Tree Roots – Sustaining Forestry in New Hampshire promotes using better forest management practices to protect environmental quality and sustain the State's timber industry. Mid-City Green Project Building Materials Exchange will expand its current Paint Exchange into a	Eligible applicants include community groups and other nonprofit organizations, local governments, universities, tribes, and states.	Office of Air and Radiation Environmental Protection Agency Program Contact: Pamela Hurt (202) 260-2441

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	full-scale building materials exchange to reduce the amount of discarded construction materials waste in the New Orleans area and encourage urban renewal. This will be accomplished through construction materials recovery, transformation, and low-cost resale; neighborhood rehabilitation promotion; creative reuse; and education.		
Transfers of Inventory Farm Properties to Federal and State Agencies for Conservation Purposes	Transfers title of certain inventory farm properties owned by Farm Service Agency to Federal and State agencies for conservation purposes (including the restoration of wetlands and floodplain areas to reduce future flood potential).		U.S. Department of Agriculture – Farm Service Agency Farm Loan Programs National Office: (202) 720-3467 extension 1632
Transportation Enhancements Program	Transportation enhancements are transportation-related activities that are designed to strengthen the cultural, aesthetic, and environmental aspects of the nation's intermodal transportation system. Eligible projects include environmental mitigation to address water pollution due to highway runoff or reduce vehicle-caused wildlife mortality while maintaining habitat connectivity.		Florida Department of Transportation
Trauma/Emergency Medical Services Grant	To improve the nation's overall emergency medical system, including the joint efforts between HRSA and National Highway Traffic Safety Administration to assess State systems and recommend improvements to the current system.		Rick Smith (301) 443-5372 rsmith@hrsa.gov
Urban Park and Recreation Recovery Program	To provide Federal grants to local governments for the rehabilitation of recreation areas and facilities, demonstration of innovative approaches to improve park system management and recreation opportunities, and development of improved recreation planning. Rehabilitation grants have been awarded to renovate a wide variety of existing community park and recreation facilities. Innovation grants have been awarded to demonstrate unique and cost-effective methods for providing better recreation services.	Eligible applicants are cities and counties meeting the eligibility requirements. Eligibility is based on need, economic and physical distress, and the relative quality and condition of urban recreation facilities and systems.	National Park Service, Recreation Programs 1849 C Street, NW, Room 3624 Washington, DC 20240 Contact: Ken Compton (202) 565-1133

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
U.S. Army Corps of Engineers	Provide planning and technical assistance to local governments to address local flood problems. The Floodplain Management Service Program and Planning Assistance to States Program can help local governments develop their own plans and initiate floodplain management actions. Under these programs, the Corps can provide flood data and carry out certain local studies.		http://www.usace.army.mil http://www.saw.usace.army.mil
U.S. Geological Survey	Assists states and local governments in maintaining stream gauge stations. In addition, the agency has prepared inundation maps in many communities. These quadrangle floodplain maps of flood prone areas are often used to delineate the approximate floodplain boundaries on the maps FEMA has provided to local governments.		Florida Geological Survey http://www.usgs.gov
Volunteer Fire Assistance (VFA) Grants	The purpose of the VFA Program, formerly known as the Rural Community Fire Protection Program, is to provide Federal financial, technical, and other assistance to State foresters to organize, train, and equip fire departments in rural areas and rural communities to prevent and suppress fires.	A single fire department serving a rural area or a rural community with a population of 10,000 or less is eligible (latest census). Area fire departments (fire districts, townships, etc.) may serve an aggregate population of greater than 10,000 as long as the service area of the fire department includes a rural area or a rural community having a population of 10,000 or less. The VFA funding must be used to benefit the rural population. A single county or town with a population over 10,000 that is served by two or more fire districts operating entirely within the bounds of the county or town may qualify as long as the service area of a given fire department includes a rural area or a rural community or the population of the fire department's jurisdiction is 10,000 or less. The VFA funding must be used for the rural area. A single community with a population greater than 10,000 and having a single fire department with one or more fire stations may	Forest Protection Bureau Division of Forestry 3125 Conner Boulevard Tallahassee, FL 32399-1650 (850) 488-6111

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
		qualify. The fire department must have a service area that includes a rural area or community that does not exceed 10,000 in population. The VFA funding must be used only for the benefit of the rural population. Similarly a single community with a population greater than 10,000, which also provide fire protection to an adjoining rural community of 10,000 or less population by contract, also may be eligible, provided the VFA funding is used entirely to support the rural community. A single community fire department serving a population greater than 10,000 and not providing protection to a rural area or to a rural community is not eligible for VFA financial assistance.	
Wallace Global Fund	The Wallace Global Fund supports initiatives that promise to advance globally sustainable development in some fundamental way. The Fund seeks to maximize its impact by investing its resources in projects that meet the following criteria: tackle root problems that impede progress toward a sustainable future; propose compelling strategies for promoting environmentally and/or socially sustainable development, such as leveraging additional financial resources, catalyzing policy change, implementing innovative programs; offer potential for significant impact at the global level; and require private money, at least initially.		http://www.wgf.org/program_criteria.html
Water Pollution Control: State and Interstate Program Support (106 Grants)	To assist states and interstate agencies in establishing and maintaining adequate measures for prevention and control of surface and ground water pollution. Grants are made to states and tribes for the administration of State and tribal programs for the prevention, reduction, and control of pollution. Activities funded include administration of State and Tribal Water Quality Standards programs; National Pollutant Discharge Elimination System permit programs; and compliance and enforcement, monitoring, and hazardous materials spills response. Broad support for the prevention and abatement of surface and ground water	Eligible entities include State and interstate water pollution control agencies as defined in the Federal Water Pollution Control Act.	Carol Crow, State and Interstate Agencies, Section 106 Coordinator, Section 106, Office of Wastewater Management (4201), Office of Water, Environmental Protection Agency Washington, DC 20460 (202) 260-6742

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
	pollution from point and non-point sources including water quality planning, monitoring, water quality standards, assessments, permitting, pollution control studies, planning, surveillance and enforcement; advice and assistance to local agencies; training; and public information.		
Water Quality Program Management	To improve water quality.		Environmental Protection Agency Office of Water Office of Wastewater Management (4201), Office of Water Washington, DC 20460
Watershed Operations -Small Watershed Program and Flood Prevention Program (WF 08 or FP 03)	The Small Watershed Program works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres. Both technical and financial assistance are available.		Contact USDA, Natural Resources Conservation Service http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Watershed Protection and Flood Prevention	To provide technical and financial assistance in carrying out works of improvement to protect, develop, and utilize the land and water resources in small watersheds.	Any State agency, county or groups of counties, municipality, town or township, soil and water conservation district, flood prevention or flood control district, Indian tribe or tribal organization, or any other non-profit agency with authority under State law to carry out, maintain, and operate watershed works of improvement may apply for assistance.	U.S. Department of Agriculture Natural Resources Conservation Service P.O. Box 2890 Washington, DC 20013
Watershed Protection and Flood Prevention Loans	To provide loan assistance to sponsoring local organizations in authorized watershed areas for share of cost for works of improvement.	Be a sponsoring local organization, such as a municipal corporation, soil and water conservation district, or other organization not operated for profit in the approved watershed project; and have authority under State law to obtain, give security for, and raise revenues to repay the loan and to operate and maintain the facilities to be financed with the loan.	Department of Agriculture Water and Waste Rural Utilities Service Washington, DC 20250 (202) 690-2670

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Watershed Surveys and Planning	The purpose of the program is to help Federal, State, and local agencies and tribal governments to protect watersheds from damage caused by erosion, floodwater, and sediment and to conserve and develop water and land resources. Resource concerns addressed by the program include water quality, opportunities for water conservation, wetland and water storage capacity, agricultural drought problems, rural development, municipal and industrial water needs, upstream flood damages, and water needs for fish, wildlife, and forest-based industries. Types of surveys and plans include watershed plans, river basin surveys and studies, flood hazard analyses, and flood plain management assistance. The focus of these plans is to identify solutions that use land treatment and nonstructural measures to solve resource problems.		Contact USDA, Natural Resources Conservation Service, Watershed Surveys and Planning http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Watershed Surveys and Planning (Small Watershed Program; PL-566; Watershed Surveys and Planning)	To provide planning assistance to Federal, State, and local agencies for the development of coordinated water and related land resources programs in watersheds and river basins. Special priority is given to the objectives of setting priorities in helping to solve problems of upstream rural community flooding, water quality improvement coming from agricultural non-point sources, wetland preservation and drought management for agriculture and rural communities. Special emphasis is given to helping communities that desire to adopt floodplain management regulations to meet the requirements of the National Flood Insurance Program and State agencies in developing a strategic water resource plan. Examples of funded projects: in New Castle County, Delaware, the Central Pencader flood plain management study was initiated to guide land use, zoning, and subdivision decisions to develop sound flood plain and storm water management practices.	Any local or State water resource agency or other Federal agency concerned with water and related land resource development, counties, municipalities, town or township, soil and water conservation district, flood prevention or flood control district, Native American tribe or tribal organization or nonprofit organization.	Deputy Chief For Programs, Natural Resources Conservation Service, Department of Agriculture P.O. Box 2890 Washington, DC 20013 (202) 720-4527

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Wetlands Program	To protect natural wetlands.		Department of Defense U.S. Army Corps of Engineers Attn: CECW-PM DoD Washington, DC 20314-1000 (202) 272-0169 http://www.usace.army.mil/
Wetlands Protection Grants	To assist states and Native American tribes in developing new or enhancing existing wetlands protection programs.	States, Native American tribes, and local governments.	Environmental Protection Agency Office of Water Office of Wastewater Management (4201), Office of Water Washington, DC 20460
Wetlands Reserve Program	The Wetlands Reserve Program is a voluntary program to restore wetlands. Participating landowners can establish conservation easements of either permanent or 30-year duration, or can enter into restoration cost-share agreements where no easement is involved.		Contact USDA, Natural Resources Conservation Service http://mimosa.itc.nrcs.usda.gov/scripts/ndisapi.dll/oip_public/USA_map for a USDA service center in your area. WPB: West Palm Beach Service Center 559 N. Military Tr. West Palm Beach, FL 33415
Wetlands Protection: Development Grants	To assist states, tribes, and local governments in developing new or enhancing existing wetlands protection management and restoration programs. The projects that will be funded under this program should support the initial development of a wetlands protection restoration program or support enhancement/refinement of an existing program. Projects must clearly demonstrate a direct link to increasing a State's, tribe's, or local governments' ability to protect, manage, and/or restore its wetlands resources.	State or tribal agencies, interstate/inter-tribal entities and associations, and local governmental entities are eligible to receive funding.	Peter Kalla, Wetlands Protection Section, Environmental Protection Agency Region IV, Atlanta, GA 30365 (404) 562-9414
Wetlands Reserve Program	Financial and technical assistance to protect and restore wetlands through easements and restoration agreements.		USDA-NRCS National Policy Coordinator NRCS Watersheds and Wetlands Division: (202) 720-3042

Table C.1. (Continued).

Funding Source	Objective	Eligibility	Sponsoring Organization
Wildland Urban Interface Community and Rural Fire Assistance	To implement the National Fire Plan and assist communities at risk from catastrophic wildland fires by providing assistance in the following areas: provide community programs that develop local capability including assessment and planning, mitigation activities, and community and homeowner education and action; plan and implement hazardous fuels reduction activities, including the training, monitoring, or maintenance associated with such hazardous fuels reduction activities, on Federal land, or on adjacent nonfederal land for activities that mitigate the threat of catastrophic fire to communities and natural resources in high risk areas; enhance local and small business employment opportunities for rural communities; enhance the knowledge and fire protection capability of rural fire districts by providing assistance in education and training, protective clothing, and equipment purchase, and mitigation methods on a cost share basis.	States and local governments at risk as published in the Federal Register, Native American tribes, public and private education institutions, nonprofit organizations, and rural fire departments serving a community with a population of 10,000 or less in the wildland/urban interface.	Bureau of Land Management Jackson, Mississippi Field Office 411 Briarwood Drive, Suite 404 Jackson, MS 39206 (601) 977-5400

APPENDIX D

DATA SOURCES

Table D.1. Data sources used for the Indian River County Hazard Vulnerability and Risk Assessment.

Source	Data Type
Natural Hazards - Hazards resulting from weather conditions, geologic conditions, or disruption of natural systems	
Hurricanes and Severe Storms (Includes Tropical Storms and Northeasters)	
Natural Hazards Research Center	Historical and current data on all types of natural hazards
Atlantic Hurricane Tracking Database	Historical data on hurricane tracks and intensities
National Oceanic and Atmospheric Administration (NOAA) Tropical Cyclone Database	Historical hurricane data
Colorado State University (Dr. Gray online site)	Hurricane probability
National Aeronautics and Space Administration (NASA) Natural Disaster Reference Database	Historical data on all types of natural hazards
National Weather Service	Weather statistics
National Climate Data Center - online database	Weather statistics
Atlantic Ocean and Meteorological Laboratory, Hurricane Research Division	Hurricane forecast models
U.S. Census	Housing data
Federal Emergency Management Agency	Emergency management procedures
Tropical Storm Watch Database	Tropical storm data worldwide
Flood Insurance Rate Maps and Community Status Book	Areas vulnerable to potential rising water
Storm Surge Atlas for Indian River County (Sealand Overland Surges for Hurricanes [SLOSH] model)	Areas vulnerable to storm surge flooding based on the SLOSH model
U.S. Geological Survey	Base maps and historical flood plain and elevation data
Florida State University (Meteorology Department)	Data and expertise concerning all Florida natural hazards
Florida Atlantic University	Data and expertise concerning all Florida natural hazards
National Severe Storms Laboratory	Data on storm effects
Independent Insurance Agents of America (Natural Disaster Risk Database)	Probability data and estimated exposure. Building code recommendations to reduce exposure
Florida Coastal Management Program	Population in surge zone data

Source	Data Type
Florida Department of Community Affairs, Division of Emergency Management	The Arbiter of Storms (TAOS) maps and computer model projections as well as technical support and data
Florida Department of Environmental Protection	Environmental risk and exposure to hurricanes, environmental effects, and environmental hazards
Florida Game and Fresh Water Fish Commission	Hurricane effects on fish and wildlife
Florida Department of Corrections	Prison statistics and emergency management plans
Florida Department of Education	School and Board of Education emergency guidelines
St. Johns River Water Management District	Climatic and weather data, hydrologic data, water release schedules, and emergency management plans
Treasure Coast Regional Planning Council	Building codes and impacts of proposed State-wide unified building code
Indian River County Airports	Weather data and hurricane protection procedures
Indian River County Comprehensive Growth Management Plan	Land management, zoning, and hurricane mitigation related ordinances
Indian River County Building Division	Building codes and zoning ordinances
Indian River County Community Development Department	Building codes and zoning ordinances
Indian River County Property Appraiser	Tax assessor records for use in determining dollar value of exposed property
Indian River County Computer Support Services	Statistical data
Indian River County Traffic Engineering and Public Works	Engineering, drainage, road elevations, and storm water data
Indian River County Health Department	Critical facilities and health risk data
Indian River County School District	Schools, shelter, and critical facilities data and emergency management plans
Indian River County Attorney's Office	Building codes and ordinances
Indian River County Parks Division	Environmental and recreational data and potential impacts data
Indian River County Emergency Services	Emergency management plans, historical data, critical facilities, special needs, and general guidance
Indian River County Clerk of the Court	County prison population and emergency management plans

Source	Data Type
Indian River County Animal Control	Animal protection, regulation, and control plans following natural disasters (hurricanes)
Indian River County Sheriff's Department	Emergency management plans and law enforcement procedures following a natural disaster
Indian River County Tourist Development Council	Potential economic loss and specific areas of economic vulnerability
Indian River County Utilities Department	Critical facilities locations and emergency management procedures
Indian River County Red Cross	Historical data, shelter data, and emergency management plans
Hospitals, Clinics, and Nursing Facilities	Critical facilities locations, special equipment, special needs, and evacuation plans
Florida Power & Light and Other Municipal/Private Power Companies	Power grid vulnerabilities, structure, and emergency management plans
Home Depot/Lowe's	Emergency management supply plans for preparation and recovery
Publix/Winn Dixie	Emergency food supply plans
Southern Bell	Critical facilities locations, and emergency communication maintenance plans
AT&T Wireless Services	Critical facilities locations, and emergency communication maintenance plans
U.S. Cellular Wireless Communications	Critical facilities locations and emergency communication maintenance plans
Local Radio and Television Stations	Critical facilities locations and emergency management plans (operating plans) during natural disaster
Tornadoes and Thunderstorms	
Natural Hazards Research Center	Historical and current data on all types of natural hazards
The Tornado Project On-Line	Historical data
U.S. Census	Housing data
Optical Transient Detector Database	Lightning associated with thunderstorms (lightning statistics)
NASA Natural Disaster Reference Database	Historical data on all types of natural hazards
National Weather Service	Weather statistics
National Climate Data Center - online database	Weather statistics
NOAA Wind Related Fatalities Database	Wind related fatalities
NOAA Tropical Prediction Center	Storm predictions

Source	Data Type
Florida State University	Data and expertise concerning all Florida natural hazards
Florida Atlantic University	Data and expertise concerning all Florida natural hazards
National Severe Storms Laboratory	Storm and tornado statistics and storm effects
Independent Insurance Agents of America (Natural Disaster Risk Database)	Financial data concerning losses resulting from thunderstorms and tornadoes
Florida Department of Community Affairs, Division of Emergency Management	Incident reports and historical data
St. Johns Water Management District	Climatic data
Indian River County Airports	Weather data and protection plans and procedures during thunderstorms and tornadoes
Indian River County Fire Rescue	Thunderstorm and tornado fire and fatality data
Indian River County Emergency Services	Thunderstorm and tornado historical data
Public Safety, Emergency Management, Health Department, and Fire and Rescue Departments within each municipality	Historical data on impacts of thunderstorms and tornadoes at the local level
American Red Cross	Historical data on impacts
Florida Power & Light and other municipal/private power companies	Historical data on impacts to the power grid
Southern Bell	Historical data on communications impacts
AT&T Wireless Services	Historical data on communications disruptions
U.S. Cellular Wireless Communications	Historical data on communications disruptions
Local radio and television stations	Historical data on losses and possible future losses
Lightning/Electromagnetic Disturbances (normally included under thunderstorms but along the Treasure Coast, we believe this hazard is significant enough to be considered alone)	
Natural Hazards Research Center	Lightning research and statistics
NASA Natural Disaster Reference Database	Lightning statistics
National Weather Service	Lightning strike data
National Climate Data Center - online database	Lightning strike data
NOAA Lightning Related Fatalities Database	Lightning fatalities
National Lightning Safety Institute (NLSI)	Lightning research and protection measures

Source	Data Type
Florida State University	Data and expertise concerning all natural hazards
Florida Atlantic University	Data and expertise concerning all natural hazards
University of Florida Lightning Research Laboratory	Current research on lightning causes and effects
National Severe Storms Laboratory	Lightning statistics
Independent Insurance Agents of America (Natural Disaster Risk Database)	Financial losses attributable to lightning and related electromagnetic discharges
Florida Department of Community Affairs, Division of Emergency Management	Data on major fires caused by lightning
Florida Fire Chief's Association	Data on fires caused by lightning
St. Johns River Water Management District	Data on lightning related losses
Indian River County Airports	Lightning data and protective measures
Indian River County Fire Rescue Division	Lightning related fires and injuries
Indian River County Parks & Division	Data on lightning related losses
Indian River County Emergency Services	Lightning protection procedures
Indian River County Sheriff's Department	Data on communication disruption
Florida Power & Light	Financial losses and power grid disruptions due to lightning
Southern Bell	Financial losses and communications disruptions due to lightning
AT&T Wireless Services	Financial losses and communications disruptions due to lightning
U.S. Cellular Wireless Communications	Financial losses and communications disruptions due to lightning
Coastal and Riverine Flooding	
Association of State Floodplain Managers	Flood plain data, flooding statistics, and mitigation approaches
Natural Hazards Research Center	Technical data on all natural hazards
NOAA Flood Related Fatalities Database	Flood related fatalities
NOAA Hydrologic Information Center	Hydrologic data
NOAA Tropical Cyclone Database	Rainfall associated with specific types of storm events
NASA Natural Disaster Reference Database	Specific flooding and mitigation data nationwide
NASA Flood Hazard Research Center	Flood research and mitigation approaches
National Weather Service	Climatic data
National Climate Data Center - online database	Weather/rainfall historical data
National Flood Proofing Committee Database	Mitigation procedures

Source	Data Type
National Association of Flood and Storm Water Management Agencies	Storm water management data and procedures
Atlantic Ocean and Meteorological Laboratory, Hurricane Research Division	Historical meteorological data
Federal Emergency Management Authority	Historical flooding data
Tropical Storm Watch Database	Rainfall events and flooding data
Flood Insurance Rate Maps and Community Status Book	Identification of properties within the flood plain
U.S. Geological Survey	Topographic maps
U.S. Army Corps of Engineers	Historical flooding data and flood prevention projects
Dartmouth Flood Observatory	Flooding research
Earth Satellite Corporation (EarthSat) Floodwatch Database	Historical flooding data
Florida State University	Data and expertise concerning all Florida natural hazards
Florida Atlantic University	Data and expertise concerning all Florida natural hazards
National Severe Storms Laboratory	Rainfall data and related flooding events
Independent Insurance Agents of America (Natural Disaster Risk Database)	Property and financial losses as a result of flooding
Florida Department of Community Affairs, Division of Emergency Management	Historical data on flooding events in Indian River County
Florida Association of Floodplain Managers	Flood data specific to Florida
Florida Department of Environmental Protection	Environmental parameters and risk associated with flooding
Florida Game and Fresh Water Fish Commission	Wildlife resources impacted by flooding
St. Johns Water Management District	Water management, hydrology, and flood prevention procedures
Indian River County Community Development Department	Zoning ordinances and building codes that affect flood protection
Indian River County Property Appraiser	Property value within flood zones
Indian River County Traffic Engineering and Public Works Departments	Highway and storm water management procedures
Indian River County Fire Rescue	Flooding associated fires and injuries
Indian River County Health Department	Disease risk and contamination potential associated with flooding
Indian River County Parks Division	Recreational resources at risk due to flooding
Indian River County Emergency Services	Historical flooding data and emergency management procedures

Source	Data Type
Indian River County Animal Control	Animal control problems associated with flooding
Indian River County Sheriff Department	Emergency management procedures associated with flooding
Indian River County Utilities Department	Critical facilities at risk due to flooding and potential impacts
American Red Cross	Historical flooding data and repetitively damaged structures data
Florida Power & Light	Flooding emergency plans and critical facilities at risk
Extreme Temperatures	
National Weather Service	Historical records on extreme temperatures
National Climate Data Center - online database	Historical records on extreme temperatures
U.S. Department of Agriculture - County Extension Agents	Local agricultural data on frequency, impacts, and financial losses due to extreme temperatures (heat and cold)
Florida Citrus Commission	Frequency and amount of financial losses to citrus crops due to freezing temperatures and long-term industry impacts
Florida Department of Citrus	Frequency and amount of financial losses to citrus crops due to freezing temperatures and current mitigation strategies
Florida Department of Children and Families	Homeless population data
Florida Department of Agriculture & Consumer Services	Frequency and amount of financial losses to all agricultural business as a result of extreme temperatures (heat and cold)
Florida Farm Bureau	Frequency and amount of financial losses to all agricultural business as a result of extreme temperatures and current mitigation and risk reduction strategies
Florida State University	Agricultural research and new mitigative strategies to reduce freeze impacts
Florida Atlantic University	Temperature impacts to aquaculture industry
University of Florida	Agricultural research and new mitigative strategies to reduce freeze impacts
University of Miami	Agricultural research and new mitigative strategies to reduce freeze impacts
Florida Department of Environmental Protection	Environments at risk from temperature extremes and environmental consequences of current mitigation strategies
St. Johns River Water Management District	Climate records and water demands associated with freeze mitigation

Source	Data Type
Indian River County Agriculture Extension Service	Historical impact and financial losses resulting from freezing temperatures in Indian River County
Indian River County Citrus and Farming Interest	Historical freeze/heat losses and current mitigation strategies
American Red Cross	Impacts to poor and homeless due to temperature extremes
Wildland Fires (Urban interface wildland fires and muck fires)	
National Weather Service	Climate data/drought predictions
National Interagency Coordination Center Reports	Wildland fire reports
National Climate Data Center - online database	Climate data
Florida Forestry Service	Wildland fire reports and preventative measures
U.S. Department of Agriculture - County Extension Agents	Controlled burning/muck deposits
U.S. Geological Survey	Soil types/muck deposits
Florida Geological Society	Soil types/muck deposits
The Wildland Fire Assessment System	Wildland fire statistics and containment procedures
Florida Forest Protection Bureau	Florida specific wildland fire statistics and current preventative practices
Florida Department of Environmental Protection	Natural resources at risk and protective measures
Florida Fire Chief's Association	Florida specific wildland fire statistics, firefighting technology, and potential mitigative measures for Florida communities
St. Johns River Water Management District	Water resources and right-of-way management practices
Indian River County Agriculture Extension Service	Land use patterns in Indian River County to establish areas at risk
Indian River County Community Development Department	Land use patterns in Indian River County to establish areas at risk
Indian River County Parks Division	Land use patterns in Indian River County to establish areas at risk
Indian River County Fire Rescue - Fire Prevention Plan Review and Inspection	Land use patterns in Indian River County to establish areas at risk and current or in-place protective measures
Indian River County Wildland Fire Mitigation Plan	Risk maps and wildland fire history
Wildland Fire Magazine Database	Wildland fire statistics

Source	Data Type
Drought	
National Weather Service	Climate data/drought predictions
National Climate Data Center - online database	Climate data
U.S.G.S historical and real time data on water resources of south Florida	Water resources
U.S. Department of Agriculture - County Extension Agents	Historical data on droughts and the economic impacts to local agriculture
Florida Citrus Commission	Economic losses to the citrus industry from droughts
Florida Department of Citrus	Economic losses to the citrus industry from droughts and current irrigation technology
Florida Forest Protection Bureau	Drought statistics
Florida Department of Environmental Protection	Environmental impacts of droughts to natural ecosystems
Florida Department of Agriculture & Consumer Services	Agricultural losses due to droughts and current irrigation technology
St. Johns River Water Management District	Water allocations during drought conditions
Indian River County Agricultural Extension Service	County specific economic losses from drought and current economic vulnerability
Indian River County Parks Division	Recreational resources impacted by droughts
Indian River County Utilities Department	Impacts from droughts of the potable water supplies and impacts in urban areas. Water rationing plans
Municipal water utilities	Impacts of, and water allotment plans during times of droughts in cities. Water rationing plans
Erosion (Beach and Waterways)	
U.S. Army Corps of Engineers	Indian River County beach erosion statistics and beach restoration projects
Florida Department of Environmental Protection – Bureau of Beaches and Coastal Systems	Critical erosion areas in Florida
Florida Inland Navigational District	Maintenance records for the Intracoastal Waterway and other Indian River County navigable waters
St. Johns Water Management District	Canal maintenance and erosion
Indian River County Engineering Department	Environmental problems associated with erosion control and natural resources threatened by erosion
Indian River County Engineering and Public Works Departments	Current erosion prevention measures
Indian River County Parks Division	Current erosion prevention measures

Source	Data Type
Indian River County Municipalities	Current erosion problems and prevention measures
Sebastian Inlet District	Information on beach erosion in and around Sebastian Inlet
Agricultural Pests and Diseases	
U.S. Forest Service	Forest diseases and current problem/preventative measures
U.S. Department of Agriculture - County Extension Agents	Local agricultural pests and potential exotic threats
U.S. Customs	Current programs to prevent introduction of agricultural pests and diseases
Florida Farm Bureau	Economic losses due to agricultural pests and diseases
Florida Citrus Commission	Citrus losses due to agricultural pests and diseases
Florida Forest Protection Bureau	Forest diseases and current problem/preventative measures
Florida State University	Agricultural research and pest control
Florida Atlantic University	Agricultural research and pest control
University of Florida	Agricultural research and pest control
University of Miami	Agricultural research and pest control
Florida Department of Environmental Protection	Environmental resources at risk and environmental consequences of current or proposed control measures
Florida Department of Agriculture & Consumer Services	Economic losses from agricultural pests and diseases and current control technology
Indian River County Agricultural Extension Service	Economic losses and current control programs
Indian River County Parks Division	Pest control programs on public lands
Seismic Hazards (Sinkholes, Tidal Waves, and Other Geologic Hazards)	
U.S. Geological Survey	Geologic structure and seismic risk
Florida Geological Society	Geologic structure and soil characteristics
Technological/Manmade Hazards - Hazards due to accidents involving man-made facilities or functions	
Radiological Hazards	
U.S. Nuclear Regulatory Commission	Nuclear power plant regulation, accident statistics, and emergency procedures
Federal Emergency Management Agency	Nuclear power plant accident statistics and emergency procedures
National Emergency Management Agency	Nuclear power plant and radiological emergency management procedures

Source	Data Type
Florida Division of Emergency Management	Nuclear power plant and radiological emergency management procedures
Florida Emergency Preparedness Association	Radiological emergency management procedures
State and Local Emergency Data Users Group Database	Radiological accident management database
Florida Power and Light Emergency Plan	Industry emergency management plans
Indian River County Emergency Services - Emergency Management Comprehensive Emergency Management Plan (CEMP)	Local radiological emergency management plan
Hospital Plans - Both Radiological Materials Disposal (Hazardous Waste) and Mass Radiation Casualties or Nuclear Accident Plans	Local radiological emergency plans and safeguards
Hazardous Materials	
Federal Emergency Management Agency	Hazardous material emergency management guidelines
National Transportation Safety Board	Hazardous material transport regulation, spill cleanup procedures, and spill statistics
Occupational Safety and Health Agency	Hazardous material handling requirements
U.S. Environmental Protection Agency	List of hazardous materials
Hazardous Chemicals Database (online)	Hazardous materials data
Material Safety Data Sheets (online)	Specific chemical facts
State Emergency Response Commission (SERC) Emergency Plan for Hazardous Materials	Spill response procedures
Florida District and Local Emergency Planning Committee (LEPC) Emergency Plan for Hazardous Materials	Local sources and emergency management plans (vulnerabilities)
Facilities Database for Users of Extremely Hazardous Substances (EHS) and Hazardous Materials	Geo-referenced local database of users
Florida Division of Emergency Management	Methodology for handling hazardous material releases
Florida Emergency Preparedness Association	Methodology for handling hazardous material releases
Florida Department of Transportation	Highway spill data for hazardous material spill data. Methodology for handling hazardous material releases
State and Local Emergency Data Users Group Database	Spill and release of hazardous materials statistics
Florida Fire Chief's Association	Hazardous material emergency plans and containment procedures. Spill/release statistics

Source	Data Type
Indian River County Emergency Services	Methodology for handling hazardous material releases
Indian River County Fire Rescue	Methodology for handling hazardous material releases
Municipal Fire and Police Departments	Methodology for handling hazardous material releases
Indian River County Health Department	Methodology for handling hazardous material releases and emergency treatment procedures
Identified Users of EHS Emergency Plans	Industry control and emergency management plans for hazardous material
Local Gasoline and Natural Gas Companies	Location of critical facilities/infrastructure elements
Transportation System Accidents	
Federal Aeronautical Administration	Aircraft accident statistics and airport safety procedures
National Transportation Safety Board	Aircraft accident statistics
U.S. Coast Guard	Boating/shipping accidents (including oil and hazardous materials releases) and spill containment procedures
Florida Department of Transportation - Motor Carrier Compliance Division	Truck accidents (including oil and hazardous materials releases)
Florida Highway Patrol	Truck accidents (including oil and hazardous materials releases)
Florida Marine Patrol	Boating/shipping accidents (including oil and hazardous materials releases) and spill containment procedures
Indian River County Airports Administration	Aircraft accident statistics and airport safety procedures
Indian River County Sheriff's Department - Marine Unit and Environmental Crimes Unit	Boating/shipping accidents (including oil and hazardous materials releases), spill containment procedures, and environmental crimes statistics
Florida East Coast Railway	Railway accident statistics (including oil and hazardous materials releases), and safety procedures
CSX Rail	Railway accident statistics (including oil and hazardous materials releases), and safety procedures
Indian River County Fire Rescue	Accident statistics involving injuries in Indian River County
Municipal police and fire departments	Accident statistics involving injuries in the cities

Source	Data Type
Power/Communications/Computer Grid System Failures	
Washington Post Article	2003 Northeast Power Failure
Florida Power & Light Emergency Management Plans and Historical Database	Historical data and emergency management plans
SouthernBell Emergency Management Plan and Historical Database	Historical data and emergency management plans
Cellular and Satellite Communication Companies	Historical data and emergency management plans
The Banking Industry (Large Area Networks - LANs Protection and Emergency Restoration Plans, as well as historical data on system failures)	Historical data and emergency management plans
Societal Hazards - Hazards arising from disruptions in normal government and community function	
Civil Disturbance	
Federal Bureau of Investigation Database	Historical data
National Security Council Database	Historical data and risk analysis
Drug Enforcement Agency Database	Historical data
Immigration and Naturalization Service Database	Historical data
U.S. Customs Service	Historical data
U.S. Census Database	Population demographics
Florida Department of Law Enforcement	Historical data and situation plans
Florida Department of Health Education and Welfare	Historical data
Indian River County Sheriff's Office	Historical data and situation plans
Municipal Police Departments	Historical data and situation plans
Indian River County Fire Rescue	Historical data and situation plans
Terrorism and Sabotage	
National Conference of State Legislators	Economic data for September 11th
Federal Bureau of Investigation Database	Historical data, situation plans, and risk analysis
National Security Council Database	Historical data, situation plans, and risk analysis
Drug Enforcement Agency Database	Historical data
Immigration and Naturalization Service Database	Historical data and preventative measures
U.S. Census Database	Population demographics
American Society for Industrial Security	Risk analysis techniques and database
Florida Department of Law Enforcement	Historical data, situation plans, and risk analysis

Source	Data Type
Florida Department of Health Education and Welfare	Population demographics
Indian River County Sheriff's Office	Historical data, situation plans, and risk analysis
Municipal Police Departments	Historical data, situation plans, and risk analysis
Indian River County Fire Rescue	Historical data on injuries
Mass Immigration	
U.S. Coast Guard	Historical data and situation plans
Immigration and Naturalization Service	Historical data, situation plans, and risk analysis
Florida Marine Patrol	Situation plans and interagency coordination
Florida Department of Law Enforcement	Historical data, situation plans, risk analysis, and interagency coordination
Florida Department of Health Education and Welfare	Population demographics
Indian River County Sheriff's Office	Historical data, situation plans, risk analysis, and interagency coordination
Municipal Police Departments	Historical data, situation plans, risk analysis, and interagency coordination
Indian River County Emergency Services	Situation plans and interagency coordination
Indian River County Fire Rescue	Historical data and medical risk analysis
Other Hazards **Crime, Drug Abuse, Economic Crises, Communicable Diseases**	
Federal Bureau of Investigation Database	Historical data
National Security Council Database	Historical data
Drug Enforcement Agency Database	Historical data
Immigration and Naturalization Service Database	Historical data
U.S. Census Database	Population demographics
U.S. Public Health Service - Center for Communicable Disease	Disease risk
Florida Department of Law Enforcement	Historical data
Florida Department of Health Education and Welfare	Historical data
Florida Department of Labor	Historical data
Indian River County Sheriff's Office	Historical data
Municipal Police Departments	Historical data
Indian River County Emergency Services	Historical data
Indian River County Fire Rescue	Historical data

Source	Data Type
Indian River County Health Department	Historical data

APPENDIX E

PARTICIPATION DOCUMENTATION

E.1 BACKGROUND

The ever-increasing time and cost associated with responding to and recovering from disasters has prompted a shift towards planning for disasters before they strike. This shift towards pre-disaster mitigation planning is evident in the Federal Emergency Management Agency's (FEMA's) development of the Disaster Mitigation Act of 2000 (DMA2K). DMA2K requires that local jurisdictions have a natural hazard mitigation plan in place in order to be eligible for hazard mitigation grant funds as well as some post-disaster assistance programs. The development of DMA2K has created a number of new natural hazard planning responsibilities for both local and State jurisdictions, including responsibilities for identifying hazards, completing risk assessments, and involving citizens. With the focus of the requirements being on the process rather than the product, citizen involvement has become a vital component of the mitigation planning process (see **Table E.1**).

Table E.1. Language of the Disaster Mitigation Act of 2000.

Citizen Involvement Requirements of the Disaster Mitigation Act of 2000
Planning Process. An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include 1. An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval. 2. An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process.

Source: National Archives and Records Administration. 2002. Federal Emergency Management Agency 44 CFR Parts 201 and 206 Hazard Mitigation Planning and Hazard Mitigation Grant Program; Interim Final Rule in Federal Register.

This Appendix documents the steps taken to include various stakeholder groups and the public in general in the LMS planning process.

E.2 WORKING GROUP MEETINGS

The main method of involving jurisdictions, community organizations, stakeholders, and the public in the LMS planning process was through the Working Group. Individuals and organizations with directives or programs supporting mitigation were invited to become involved in the Working Group. The groups listed below were invited to join the Working Group:

- Comcast Cable Communications
- Sebastian River Chamber of Commerce
- Gifford Progressive League

- Indian River Citrus League
- Indian River Community College
- Indian River County Department of Emergency Services
- Town of Indian River Shores Public Safety
- City of Sebastian
- Town of Orchid
- City of Vero Beach
- St. Johns Water Management District
- Indian River County Sheriff's Office
- Indian River County Building Division
- Indian River Planning Division
- City of Fellsmere
- BellSouth Telecommunications
- Florida Power & Light
- Treasure Coast Regional Planning Council
- Indian River County Chamber of Commerce
- American Red Cross
- Indian River County School District
- Indian River County Community Development Department
- National Association for the Advancement of Colored People
- Indian River County Public Works

The Indian River County LMS Working Group met a total of five times throughout the 2020 plan update process. Each meeting's invitation process and outcome are described below.

E.2.1 Meeting #1 (Kick-off Meeting) April 26, 2019

The first meeting of the Working Group was held on 26 April 2019 at the Indian River County Emergency Operations Center and served as a kick-off meeting for the LMS update process. E-mail invitations were sent to all Working Group members who were identified as being key stakeholders in mitigation hazards in Indian River County. Organizations in attendance included:

- American Red Cross
- City of Sebastian
- City of Vero Beach Public Works
- Fellsmere Police Department
- Florida Division of Forestry
- Indian River County Community Development
- Indian River County Emergency Services – Fire Rescue, Emergency Mgt.
- Indian River County Planning Division
- Indian River County Public Works Department

The focus of this meeting was to review the update requirements for the 2020 LMS and go over the tasks to be completed, review the existing project list and member directory, and review the project scoring procedure. The letter of invitation, agenda, sign-in sheet, and minutes from this meeting can be found attached to this Appendix.

E.2.2 Meeting #2 (Second Update Meeting) June 14, 2019

The second meeting of the Working Group took place on 14 June 2019 at the Indian River County Emergency Operations Center. Working Group members were notified of the meeting through e-mailed communication. The following organizations were in attendance:

- American Red Cross
- City of Fellsmere
- City of Sebastian
- City of Vero Beach
- Indian River County Emergency Services – Fire Rescue, Emergency Mgt.
- Indian River County Community Development
- Indian River County Parks
- Indian River County Public Works
- Town of Orchid

The focus of the meeting was to review Sections ES, 1, and 2 of the LMS. The letter of invitation, agenda, sign-in sheet, and minutes from this meeting can be found attached to this Appendix.

E.2.3 Meeting #3 (Third Update Meeting) August 9, 2019

The third meeting of the Working Group was held on 9 August 2019 at the Indian River County Emergency Operations Center. Working Group members were notified of the meeting through e-mail reminders. The following organizations were in attendance:

- Indian River County Emergency Services – Fire Rescue, Emergency Mgt.
- Florida Forest Service
- Town of Orchid
- Indian River County Public Works
- City of Vero Beach
- City of Sebastian
- American Red Cross
- Indian River County Planning
- Indian River County Community Development

The focus of the meeting was to review Sections 3 and 4 of the LMS. The letter of invitation, agenda, sign-in sheet and minutes from this meeting can be found attached to this Appendix.

E.2.4 Meeting #4 (Fourth and Final Update Meeting) October 11, 2019

The fourth meeting of the Working Group was held on 11 October 2019 at the Indian River County Emergency Operations Center. Working Group members were notified of the meeting through e-mail reminders. The following organizations were in attendance:

- Indian River County Emergency Services – Fire Rescue, Emergency Mgt.
- Indian River County ARES
- Indian River County Planning

The focus of the meeting was to review Sections 5 and 6 of the LMS. The letter of invitation, agenda, sign-in sheet and minutes from this meeting can be found attached to this Appendix.

ATTACHMENTS
(See separate file)

APPENDIX F
ACRONYMS

Table F.1. Acronyms used in the Local Mitigation Strategy.

Acronym	Full Name
ARC	American Red Cross
ASFPM	Association of State Floodplain Managers
BFE	Base Flood Elevation
BOAF	Building Officials Association of Florida
CBRA	Coastal Barrier Resources Act
CDBG	Community Development Block Grant
CDD	Community Development Department
CEMP	Comprehensive Emergency Management Plan
CGMP	Comprehensive Growth Management Plan
CHHA	Coastal High Hazard Area
CIE	Capital Improvements Element
CNMI	Commonwealth of North Mariana Islands
COOP	Continuity of Operations Plan
CPR	Cardiopulmonary Resuscitation
CR	County Road
CRS	Community Rating System
CSA	Continental Shelf Associates, Inc.
DEM	Division of Emergency Management
DEP	Department of Environmental Protection
DES	Department of Emergency Services
DMA2K	Disaster Mitigation Act of 2000
DOC	Department of Commerce
DRI	Disaster Recovery Initiative
DWMP	District Water Management Plan
EDA	Economic Development Administration
EHS	Extremely Hazardous Substance
EMPA	Emergency Management and Preparedness Assistance
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPCRA	Emergency Preparedness and Community Right to Know Act
EPZ	Emergency Planning Zone
EQIP	Environmental Quality Incentives Program
ESF	Emergency Support Function
ESG	Emergency Shelter Grant
F.A.C.	Florida Administrative Code
FCMP	Florida Coastal Management Program
FCT	Florida Communities Trust
FDBPR	Florida Department of Business and Professional Regulation
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDOC	Florida Department of Corrections
FDOE	Florida Department of Education

Acronym	Full Name
FDOI	Florida Department of Insurance
FDOMS	Florida Department of Management Services
FDOT	Florida Department of Transportation
FEC	Florida East Coast Railroad
FEMA	Federal Emergency Management Agency
FFS	Florida Forestry Service
FIND	Florida Inland Navigation District
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
F.S.	Florida Statutes
FSA	Farm Service Agency
HI	Heat Index
HMEP	Hazardous Materials Emergency Preparedness
HUD	United States Department of Housing and Urban Development
IBHS	Institute of Business and Home Safety
IRFWCD	Indian River Farms Water Control District
LEPC	Local Emergency Planning Committee
LMS	Local Mitigation Strategy
LOD	Letter of Dispute
MEMPHIS	Mapping for Emergency Management, Parallel Hazard Information System
MOM	Maximum of Maximums
MPH	Miles Per Hour
MPO	Metropolitan Planning Organization
NASA	National Aeronautics and Space Administration
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NFPA	National Fire Protection Administration
NLSI	National Lightning Safety Institute
NHC	National Hurricane Center
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NRT	National Response Team
NWR	National Wildlife Refuge
NWS	National Weather Service
PAGs	Protective Action Guidelines
PCCIP	President's Commission on Critical Infrastructure Protection
PDM	Pre-Disaster Mitigation
PHSW	Public Health, Safety, and Welfare
PPL	Project Prioritization List
PWD	Public Works Department
SBA	Small Business Administration
SCORP	Statewide Comprehensive Outdoor Recreation Plan

Acronym	Full Name
SERC	State Emergency Response Commission
SHIP	State Housing Initiative Partnership Program
SJRWMD	St. Johns River Water Management District
SLOSH	Sea Land Overland Surges for Hurricanes
SR	State Road
STP	Surface Transportation Program
TAOS	The Arbiter of Storms
TCRPC	Treasure Coast Regional Planning Council
TDR	Transfer of Development Rights
TIP	Transportation Improvement Plan
TYLCV	Tomato Yellow Leaf Curl Virus
USACE	United States Army Corp of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USDOT	United States Department of Transportation
USFA	United States Fire Administration
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WHIP	Wildlife Habitat Incentives Program

APPENDIX G
PRIORITIZED PROJECTS AND PROJECT STATUS LIST

Indian River County
Local Mitigation Strategy
Project Prioritization List
General Project List

Project Priority	Project Score	Project Description	Estimated Project Cost & *Estimated Time of Completion* & *Est. Federal Share*	Applicant/ Responsible Party	Mitigation to be Accomplished	Hazards Mitigated	Jurisdiction(s) Involved*	Possible Funding Sources	Date Confirmed/ Added
1	94	Replace and upgrade roof of the Vero Beach Police Department building.	$450,000 12 months $337,500	City of Vero Beach Don Dexter	The police department serves as the city's EOC and the existing roof is approximately 30 years old and does not meet current wind load standards.	Hurricane/Tropical Storm	City of Vero Beach	HMGP, CDBG, Pre-disaster Mitigation Program	Confirmed HMGP 1/16/19 (Don Dexter)
2	93	Retrofits to the county's public schools that serve as public shelters.	$75,000 <12 months $56,250	Indian River County Emergency Management Tad Stone	Reduces vulnerability to wind and flood damage and provides for critically needed shelter (primary critical facilities) and reducing the county's safe shelter space deficit.	Hurricane and Tropical Storm	All Jurisdictions	Coastal Construction Building Zone Program; CDBG; DRI; HMGP; Hurricane Program; NFMF	Confirmed 1/5/19 (Tad Stone)
3	93	Fellsmere Culvert Replacement	$630,000 6 months $47,250	City of Fellsmere Jason Nunemaker	Replacement of all existing culverts along New York/97th Street with RCP at proper intervals to reduce head loss to Park Lateral.	Hurricane and Tropical Storm	Multiple	CDBG, HMGP, DRI, USDA, EDA	Confirmed 2/27/19 (Jason Nunemaker)
4	91	Blue Cypress Park access repair	$100,000 48 months $75,000	Indian River County Parks Division Kevin Kirwin	Provide access to the park, raise roadbed, replace failing culvert, flood mitigation.	Tropical Storm/Hurricane, Flood	All Jurisdictions	HMGP, FWC/DEP, SJRWMD	Confirmed 2/27/19 (Kevin Kirwin)
5	86	Rebuild non-wind code compliant Fire Rescue Stations.	$4 million 18 months $3,000,000	Indian River County Emergency Services Tad Stone	This will allow these critical facilities to withstand major hurricane impact, and support the personnel on an extended basis with power water and sewer facilities. These projects will benefit all citizens and visitors of Indian River County as well as the surrounding counties we assist through mutual aid by providing uninterrupted Fire Rescue and EMS service during and after a major disaster event.	Hurricane, Tropical Storm and Flood	All Jurisdictions	HMGP	Confirmed 1/5/19 (Tad Stone)

Indian River County
Local Mitigation Strategy
Project Prioritization List
General Project List

Project Priority	Project Score	Project Description	Estimated Project Cost & *Estimated Time of Completion* & *Est. Federal Share*	Applicant/ Responsible Party	Mitigation to be Accomplished	Hazards Mitigated	Jurisdiction(s) Involved*	Possible Funding Sources	Date Confirmed/ Added
6	85	Conservation Area Prescribed Burn	$255,000 12-36 months **$191,250**	Indian River County Community Development Roland DeBlois	Purchase of equipment contract work to treat areas vulnerable to wildfire, especially conservation areas with added material from Hurricane Matthew through mechanical means and prescribed burns.	Wildfire	All jurisdictions	HMGP	**Confirmed** **HMGP** 1/17/19 (Roland DeBlois)
7	84	Historic Fellsmere Flood Study	$50,000 **12 months** **$37,500**	City of Fellsmere Jason Nunemaker	An accurate flood map will mitigate against future floods by ensuring homes will be properly elevated.	Flood	City of Fellsmere	**HMGP**	**Confirmed** 7/23/18 (Jason Nunemaker)
8	83	Generator project for Sebastian Adult Day Care Center.	$100,000 **<12 months** **$75,000**	Senior Resource Association, Karen Deigl IRCES, Cory Richter	Generator upgrade for the Sebastian Adult Day Care Center to increase the shelter capacity for a step-down shelter for Special Needs Shelter clients.	Hurricane/Tropical Storm	All Jurisdictions	HMGP	**Confirmed** 1/26/18 (Karen Deigl/Cory Richter)
9	83	Elkcam Canal dredging and seawalls	$4 million **>12 months** **$3,000,000**	City of Sebastian Paul Carlisle	Reduces the exposure of possible flooding and property damage to residential homes, businesses, and city owned facilities.	Flooding and erosion	City of Sebastian	**HMGP,** FMA, SJRWMD, FPMS, USACE, CDBG	**Confirmed** 2/12/19 (Tim Walker)
10	81	Retrofits to the North County Library to reduce vulnerability to wind and flood damage.	$10,000 **<12 months**	Indian River County Public Works Rich Szpyrka	Reduces vulnerability of a public building and contents (library) to flooding damage.	Severe Weather: including Hurricane, Tropical Storm, Tornado, lightning and Flood	All Jurisdictions	Public Library Construction Grant; Coastal Construction Building Zone Program; CDBG; DRI; FMAP; **HMGP;** Hurricane Program; NFMF	**Confirmed** 3/1/19 (Rich Szpyrka)
11	81	Retrofits to the county's main library to reduce vulnerability to wind and flood damage.	$10,000 **<12 months**	Indian River County Public Works Rich Szpyrka	Reduces vulnerability of a public building and contents (library) to flooding damage.	Severe Weather: including Hurricane, Tropical Storm, Tornado, lightning and Flood	All Jurisdictions	Public Library Construction Grant; Coastal Construction Building Zone Program; CDBG; DRI; FMAP; **HMGP;** Hurricane Program; NFMF	**Confirmed** 3/1/19 Rich Szpyrka
12	80	Indian Lane drainage canal	$933,400 **>1 2 months**	Indian River Shores Joe Griffin	Dredging the Indian Lane storm water drainage canal to improve holding capacity and provide better flow from the storm water drainage system	Severe Weather: including Hurricane, Tropical Storm, Tornado, lightning and Flood	Town of Indian River Shores	Flood Plain Management Services, **HMGP,** FMA, State Preparedness Grant	**Confirmed** 2/27/19 (Joe Griffin)
13	80	Barber Street bridge replacement	$2.5 million **>12 months** **$1,875,000**	City of Sebastian Paul Carlisle	Ensures traffic circulation, emergency response, and public transportation from the city to U.S. #1, C.R. 512, and I-95.	Hurricane/tropical storm, erosion, and flooding	City of Sebastian	CDBG, **HMGP,** EDA	**Confirmed** **HMGP** 2/27/19 (Scott Baker)

Indian River County LMS
*Indicates jurisdiction interest in this project and support wherever necessary.

Updated July 31, 2019

Indian River County
Local Mitigation Strategy
Project Prioritization List
General Project List

Project Priority	Project Score	Project Description	Estimated Project Cost & *Estimated Time of Completion* & *Est. Federal Share*	Applicant/ Responsible Party	Mitigation to be Accomplished	Hazards Mitigated	Jurisdiction(s) Involved*	Possible Funding Sources	Date Confirmed/ Added
14	80	George Street canal dredging and seawalls	$4 million **>12 months** **$3,000,000**	City of Sebastian Paul Carlisle	Reduces the exposure of flooding and property damage to residential homes, businesses, and city owned facilities.	Hurricane/tropical storm, flooding, and erosion	City of Sebastian	**HMGP,** FMA, SJRWMD, FPMS, USACE, CDBG	**Confirmed** 2/12/19 (Tim Walker)
15	79	Retrofits to the City of Vero Beach Public Works facility including roof replacement and hardening of building.	$2 million **>12 months** **$1,500,000**	City of Vero Beach Don Dexter	Reduces the vulnerability to category 4 or 5 hurricanes for two critical facilities.	Severe Weather: including Hurricane, Tropical Storm, Tornado, lightning and Flood	City of Vero Beach	**HMGP,** CDBG, EMP&A Trust Fund (DCA), Pre-disaster Mitigation Program (FEMA), Hurricane Program (FEMA)	**Confirmed** 1/16/19 (Don Dexter)
16	79	Fleming Street bridge replacement	$2 million **>12 months** **$1,500,000**	City of Sebastian Paul Carlisle	Ensures traffic circulation, emergency response, and public transportation from the city to U.S. #1, C.R. 512, and I-95.	Hurricane/tropical storm, flooding, and erosion	City of Sebastian	CDBG, **HMGP,** EDA	**Confirmed** 2/27/19 (Scott Baker)
17	79	Replacement of county bridges constructed below the 100-year flood plain for improved access, evacuation and exposure to flooding.	$10 million **>12 months** **$7,500,000**	Indian River County Public Works Department Rich Szpyrka	Reduces the risk of fatalities (loss of life) during evacuation.	Flooding	All Jurisdictions	CDBG; DRI; Emergency Relief Program; FMAP; **HMGP;** Hurricane Program; NFMF; STP	**Confirmed** 3/1/19 (Rich Szpyrka)
18	78	Install flood control structures Vero Isles.	$60,000 **12 months** **$45,000**	City of Vero Beach Don Dexter	Installation will help to minimize tidal flooding of the homes and businesses from the Indian River Lagoon to 8th Avenue in the Miracle Mile and Royal Palm Point shopping areas.	Flooding, hurricane/tropical storm, tsunami	City of Vero Beach	**HMGP,** FDEP	**Confirmed** **HMGP** 1/16/19 (Don Dexter)
19	78	Hibiscus Children's Center	$575,000 **<12 months** **$431,250**	Hibiscus Children's Center/IRCEM	Fortification of group home for 40 at-risk teenagers to allow shelter-in-place. Harden roofs and install generators.	Tropical Storm/Hurricane, Flood	Vero Beach	**HMGP**	**Added** 2/1/18 (Lisa Wynne)
20	75	Protection of the Surficial Aquifer groundwater quality and quantity as a secondary potable water source through acquisition of primary recharge areas and through the plugging of abandoned artesian wells.	$2 million **>12 months** **$1,500,000**	Indian River County Community Development Roland DeBlois	Reduces the exposure to potential wellfield contamination.	Drought	All Jurisdictions	Capitalization Grants for Drinking Water State Revolving Fund; Conservation Technical Assistance; DRI; **HMGP;** Planning Assistance to States Program; Water Pollution Control: State and Interstate Program Support; Water Quality Program Management	**Confirmed** 1/17/19 (Roland DeBlois)
21	77	Laconia Avenue extension	$5 million **>12 months** **$3,750,000**	City of Sebastian Paul Carlisle	This project will provide a major emergency evacuation route. that will include a new bridge over the St. Sebastian River. It will provide a much-needed major escape route not directly impacted by the Florida East Coast Railway.	Flooding	Sebastian	CDBG, Emergency Relief, FMAP, **HMGP**	**Confirmed** 2/27/19 (Scott Baker)

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22	74	Culvert/Pipe for Stonecrop Main ditch alignment	$500,000 **<12 months** **$375,000**	City of Sebastian Paul Carlisle	Ensures circulation of storm water system and reduces possible flooding and property damage.	Hurricane/tropical storms, flooding, erosion	Sebastian	**HMGP,** FMA, SJRWMD, FPMS	**Confirmed** **HMGP** 2/12/19 (Tim Walker)
23	74	Relocation of City of Vero Beach wastewater treatment plant.	$25,000,000 **36 months** **$18,750,000**	City of Vero Beach Rob Bolton	Relocate WWTP located next to the I.R. Lagoon to City owned property located near the WTP at the Vero Beach Airport.	Hurricane/tropical storms, tsunami	City of Vero Beach	**HMGP,** FMA, EPA	**Confirmed** 1/16/19 (Don Dexter)
24	72	Construction of seawall/revetment along Humiston Beach in the City of Vero Beach.	$600,000 **>12 months** **$450,000**	City of Vero Beach Don Dexter	Residents and business owners will benefit from continued and uninterrupted access to the beach facilities and associated parking.	Flood and erosion	Vero Beach	**HMGP**	**Confirmed** **HMGP** 1/16/19 (Don Dexter)
25	71	Construction of tilting Weir gates across two canals that connect Rockridge subdivision with the lagoon.	$6.5 million **>12 months** **$4,875,000**	Indian River County Public Works Rich Szpyrka	Will prevent flooding in the subdivision during hurricane events.	Flood	Unincorporated Indian River County	**HMGP**	**Confirmed** 3/1/19 (Rich Szpyrka)
26	67	Study of sea level rise potential impacts to public facilities.	$100,000 **>12 months** **$75,000**	Indian River County Community Development Roland DeBlois	This project will provide information for long range planning of new public facilities and retrofit of existing facilities.	Flooding	Unincorporated Indian River County	**HMGP,** PDM, EMPA	**Confirmed** 1/17/19 (Roland DeBlois)
27	66	Acquisition of land along the Indian River Lagoon within the Coastal High Hazard Area to reduce potential future losses.	Phase I - $2 million Phase II - $7 million **>12 months** **Phase I - $1,500,000** **Phase II - $5,250,000**	Indian River County Community Development Roland DeBlois	Will reduce county exposure by preventing development in a high hazard area.	Hurricane, Tropical Storm, Flood and coastal erosion	Indian River County and City of Vero Beach	Coastal Wetlands Planning, Protection, and Restoration Act; CDBG; DRI; **HMGP;** NFMF; North American Wetlands Conservation Act Grant Program; Outdoor Recreation: Acquisition, Development, and Planning	**Confirmed** 1/17/19 (Roland DeBlois)
28	64	Culvert replacement for ditch/street crossings	$1 million **>12 months** **$750,000**	City of Sebastian Paul Carlisle	Replace all ditch culverts that intersect streets to promote better drainage.	Flood	Sebastian	CDBG, Emergency Relief, FMAP, **HMGP**	**Confirmed** **HMGP** **2/12/19** (Tim Walker)
29	64	Establishment of a county GIS department to improve flood mapping for flood damage reduction.	$1 million to $2 million **>12 months** **$750,000 to $1,500,000**	Indian River County Public Works Rich Szpyrka	Reduces countywide flood exposure by allowing better management of flood zones.	Flood	All Jurisdictions	Challenge 21: Floodplain; Conservation Technical Assistance; FMAP; **HMGP;** Land Protection; NFMF	**Confirmed** 3/1/19 (Rich Szpyrka)

Indian River County LMS
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Project Priority	Project Score	Project Description	Estimated Project Cost & *Estimated Time of Completion* & *Est. Federal Share*	Applicant/ Responsible Party	Mitigation to be Accomplished	Hazards Mitigated	Jurisdiction(s) Involved*	Possible Funding Sources	Date Confirmed/ Added
30	64	Construction of seawall along Conn Beach in the City of Vero Beach.	$1.7 million >12 months $1,275,000	City of Vero Beach Don Dexter	This project will provide erosion control, prevent damage to Ocean Drive and the Boardwalk which sustained approximately $1 million in damages from Hurricanes Frances and	Hurricane/Tropical Storm, flood and coastal erosion	Vero Beach	HMGP	Confirmed 1/16/19 (Don Dexter)
31	63	Modifications to the outfall structure at Stonebridge Subdivision for flood damage reduction.	$5000 >12 months $3,750	Indian River County Public Works Rich Szpyrka	Reduces vulnerability to flooding at this site.	Flood	Unincorporated Indian River County	CDBG; DRI; Emergency Rehabilitation of Flood Control Works; FMAP; HMGP; Hurricane Program; NFMF; Public Assistance	Confirmed 3/1/19 (Rich Szpyrka)
32	61	Jones' Pier floodproofing/elevation	$800,000 <12 months $600,000	Indian River County Community Development	Elevating historic structures to above base flood elevation (BFE); storm shutters; drainage improvements	Flooding, Hurricane/tropical storm	All Jurisdictions	HMGP, DHR	Confirmed 1/17/19 (Roland DeBlois)
33	59	Restoration of critically eroded areas along an 8.3-mile stretch of the Atlantic shoreline in an effort to provide needed storm protection.	$18 million initial/ $48 million long-term >12 months $13,500,000/ $36,000,000	Indian River County Public Works Department Rich Szpyrka	Reduces storm surge and flooding vulnerability.	Flood	City of Vero Beach	CDBG; Conservation Plant Material Centers, Conservation Technical Assistance; DRI; FMAP; HMGP; Hurricane Program; Land Protection, Planning Assistance to States Program	Confirmed 3/1/19 (Rich Szpyrka)
34	55	Historic Fellsmere Regional Lakes	$2,000,000 12 months $1,500,000	City of Fellsmere Jason Nunemaker	Will mitigate against future floods by storing flood waters within large regional lakes thereby reducing the flood level in the basins served by the deterion lakes.	Flood	City of Fellsmere	HMGP	Confirmed 7/23/18 (Jason Nunemaker)
35	48	Historic Fellsmere Alleyway Grading	$1,400,000 12 months $1,050,000	City of Fellsmere Jason Nunemaker	Will mitigate against future floods by storing flood waters in the alleyways thereby reducing the flood level in the basins served by the alleyway flood storage system.	Flood	City of Fellsmere	HMGP	Confirmed Added 7/23/18 (Jason Nunemaker)
36	48	Historic Fellsmere Stormwater Greenway	$1,800,000 12 months $1,350,000	City of Fellsmere Jason Nunemaker	Will mitigate against future floods by storing flood waters in the stormwater greeway thereby reducing the flood level in the basins served by the stormwater greenway.	Flood	City of Fellsmere	HMGP	Confirmed Added 7/23/18 (Jason Nunemaker)

Indian River County
LMS Working Group
2009-2019 LMS Project Status

ID#	Project Description	DR or State Assigned Project #	Project Status (Pending, Completed, Denied, Withdrawn, etc.)	NOTES
1	Improved mapping of the Coastal High Hazard Area to allow for better and more precise implementation of County regulations related to the development within that area.	N/A	**WITHDRAWN** 10/7/2009 (Sasan Rohani)	State (Department of Community Development) is doing the mapping of the Coastal High Hazard Area.
2	Establishment of a public education program on the importance of maintaining drainage systems.	N/A	**COMPLETED** 10/5/2009 (Chris Mora)	This project is complete and on-going. The county stormwater educator has prepared and regularly provides presentations to discuss drainage systems. No mitigation funds were used.
3	Stabilization of Jungle Trail along the Indian River Lagoon to improve public access and reduce erosion.	N/A	**WITHDRAWN** 9/15/2009 (Roland DeBlois)	Project completed with a cost-share grant from the Florida Inalnd Navigation District (FIND).
4	Improvements to CR 512 for improved traffic access and emergency evacuations.	N/A	**COMPLETED** 10/5/2009 (Chris Mora)	Completed in 2009 using funds from the County Incentive Grant Program (CIGP) and state sidewalk funds.
5	Elevation of grade crossing over RR at 41st St. for improved traffic access and emergency evacuation.	N/A	**WITHDRAWN** 10/5/2009 (Chris Mora)	This project was removed from the county's long-range transportation plan.
6	Proposed Egret Marsh Regional Stormwater Park.	N/A	**COMPLETED** 10/5/2009 (Chris Mora)	Expected to be completed in January 2010. No mitigation funds were used.
7	Raise elevation for six homes in Country Club Pointe.	N/A	**WITHDRAWN** 10/5/2009 (Chris Mora)	This project was withdrawn due to a poor cost/benefit ratio and lack of funding.
8	Remove vegetation, particularly exotics, in 8 miles of drainage canals and 50 miles of rear drainage ditches in the City of Sebastian.	N/A	**COMPLETED** 10/22/09 (Al Minner)	Al Minner reported that project is complete, a success and proved extremely helpful during T.S. Fay.
9	Provide shoreline stabilization at Main Street dock area in the City of Sebastian.	N/A	**WITHDRAWN** 10/22/2009 (Al Minner)	The City recently completed a major renovation on the Main Street boat ramp and the surrounding area. Funds were used from the county's CRA and grants were received from FIND and FWS. After the 2004 hurricanes, the city received FEMA funds to stabilize the lagoon banks. After these improvements were made, it was determined that this project was no longer a priority.
10	Refurbish / replace approximately 10,000 LF of seawalls along both sides of Collier Creek Canal north of CR-512 in the City of Sebastian.	N/A	**COMPLETED** 10/22/2009 (Al Minner)	Al Minner reports that the city received a 319 grant and the project was around $4 million and a "huge" project for the city.
11	Rehabilitate the two primary drainage ditches that run parallel to Runways 13-31 and 4-22 at Sebastian Municipal Airport.	N/A	**COMPLETED** 10/22/2009 (Al Minner)	Road improvements in this area have addressed the drainage concern.

Indian River County
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ID#	Project Description	DR or State Assigned Project #	Project Status (Pending, Completed, Denied, Withdrawn, etc.)	NOTES
12	Elevating structures within the City of Vero Beach that are in the flood plain that are below base flood elevation and/or experienced flood damage as a result of Hurricanes Frances and/or Jeanne.	N/A	**WITHDRAWN** 9/4/2009 (Maria Lewicka)	
13	Dredge IRFWCD settling basin within the Main Canal. Project includes the removal of an estimated 50,000 C.Y. of sand along a 1,750 L.F. section of canal East of Indian River Blvd.	N/A	**WITHDRAWN** 10/7/2009 (Deborah Vaughn)	FEMA rejected the project stating it was a "maintenance" issue.
14	Replacement of undersized culverts along the IRFWCD Sub-lateral B-2-E ditch (adjacent to 12th Street), between 20th Avenue and 58th	N/A	**WITHDRAWN** 10/7/2009 (Deborah Vaughn)	It was determined that this project was too expensive for the district to participate.
15	Construction of five seawalls in the Oceanside Subdivision along the Atlantic Ocean.	N/A	**WITHDRAWN** 10/5/2009 (Chris Mora)	Individual property owners built 2 of the 5 seawalls on their own. The beach along the remaining properties was restored with the Section 7 Beach Renourishment project and completed in 2007 with
16	Mockingbird Drive stormwater facilities – provide positive outfall in low-lying area previously served by percolation inlets.	N/A	**PARTIALLY COMPLETED** 8/31/09 (Don Dexter) Needs to construct outfall treatment structure.	Portions were funded as a capitol projects without the benefit of grant monies.
17	Replacement and relocation of the emergency power generation plant.	N/A	**COMPLETED** 10/2/2009 (Cliff Schroeder)	Funded without the benefit of grant monies.
18	Rockridge sewer collection system to improve sewer service during prolonged power outages and/or flood conditions.	FEMA-1561-DR	**COMPLETED in 2008** 11/25/2009 (Larry Brown - IRC Utilities)	The $8 million project was funded for by a HUD, CDBG & FEMA hazard mitigation grant.
19	Wind retrofits to preserve the 1916 Fellsmere School.	N/A	**WITHDRAWN** 12/1/2009 (Jason Nunemaker)	The entire structure is being restored in accordance with state historical guidelines that would not permit the aggressive windstorm measures originally considered. The City of Fellsmere is funding this project themselves.
20	Club Drive drainage project – Sandfly and Painted Bunting - provide positive outfall in low-lying area currently served by percolation inlets.	N/A	**COMPLETED 2/15/2011 (Don Dexter)**	Project was funded utilitzing other funding sources.
21	Harden facility roof and windows for disaster activities.	N/A	**PARTIALLY COMPLETED 8/30/11 (Freddie Wolfork)**	Received partial funding from the John's Island Foundation for roof hardening but still needs funding for window hardening.
22	Mockingbird Drive stormwater facilities – provide positive outfall in low-lying area previously served by percolation inlets.	N/A	**WITHDRAWN 12/1/2011 (Don Dexter)**	This project is currently underway utilizing funding from capital improvement funds.
23	Retrofits to the City of Fellsmere library for flood damage reduction.	N/A	**WITHDRAWN 3/11/14 (Jason Nunemaker)**	This project should be completed in 2014 with funding provided by the Division of Historical Resources.

Indian River County
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2009-2019 LMS Project Status

ID#	Project Description	DR or State Assigned Project #	Project Status (Pending, Completed, Denied, Withdrawn, etc.)	NOTES
24	34th Avenue bridge replacement over the Main Relief Canal. This project will replace the existing bridge that provides a connection to the Vero Beach Airport from S.R. 60.	N/A	**WITHDRAWN 3/17/14 (Don Dexter)**	Design is currently is progress for this project and should be under construction with a year. They were able to obtain FDOT grant funding for this project.
25	Retrofits to the City of Vero Beach Recreation Facility (a secondary critical facility) to reduce vulnerability to wind and flood damage.	N/A	**WITHDRAWN 3/17/14 (Don Dexter)**	This building (the old county jail) has been returned to Indian River County ownership.
26	Construction of a hurricane debris staging area in Indian River Shores to enhance recovery efforts.	N/A	**WITHDRAWN 10/22/14 (Robert Stabe)**	No further need for this project.
27	Indian River Shores Trauma Helipad.	N/A	**WITHDRAWN 10/22/14 (Robert Stabe)**	No further need for this project.
28	Improvements to 53rd St. (East-West connector) for improved traffic access and emergency evacuations.	N/A	**WITHDRAWN 10/22/14 (Chris Mora)**	The improvements to 53rd Street were done with developer funds from Pulte/DiVosta and North American Properties, as well as County funds from 1-cent optional sales tax, transportation impact fees and fuel tax revenues.
29	Study the feasibility and appropriateness of relocating the county dune stabilization setback line (DSSL) westward.	N/A	**WITHDRAWN 10/29/14 (Roland DeBlois)**	Preliminary review indicates that moving the DSSL westward would render a substantial number of platted lots as nonconforming or unbuildable. Oceanfront lot development will continue to be reviewed by the county and state on a lot-by-lot basis, with consideration of the 30-year erosion control line established by the state.
30	Revise Indian River Farms Water Control District (IRFWCD) elevation references from NGVD29 to NAVD88 to reduce potential for elevation data inconsistency with modernized NFIP FIRMs.	N/A	**WITHDRAWN 10/29/14 (Roland DeBlois)**	Indian River County converted to requiring NAVD 88 vertical datum in December 2012 with adoption of modernized FEMA flood maps. A conversion factor has been established to translate NGVD 29 to NAVD 88, so revision of IRFWCD elevation reference points to NAVD 88 is no longer a priority.
31	Potomac ditch improvements for Sebastian's NW outfall to prevent flooding and assist with drainage in the area.	N/A	**WITHDRAWN 2/9/15 (Frank Watanabe)**	The project was completed in 2012 using alternative funds.
32	Laconia Avenue extension that will provide a major emergency evacuation route. The project will include a new bridge over the St. Sebastian River. It will provide a much-needed major escape route not directly impacted by the Florida East Coast Railway.	N/A	**WITHDRAWN 2/9/15 (Frank Watanabe)**	The project was completed in 2009 using alternative funds.

Indian River County
LMS Working Group
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ID#	Project Description	DR or State Assigned Project #	Project Status (Pending, Completed, Denied, Withdrawn, etc.)	NOTES
44	Adopt procedures in the LMS for removal of marine debris resulting from natural disasters.	N/A	**WITHDRAWN 1/17/19 (Roland DeBlois)**	To be determined in-house, not a viable grant funding project.
45	Obtain an updated countywide geohydrological study with seismic profiles.	N/A	**WITHDRAWN 1/17/19 (Roland DeBlois)**	Groundwater supply monitoring/assessment is a function of the SJRWMD/IRC Utilities.
46	Oslo Riverfront Conservation Area hazardous tree removal (ORCA Wildlife Mitigation).	DR-4283	**PROJECT HMGP FUNDED 2/25/19 Beth Powell**	This project has been funded and will be completed with 3-years. (Awarded HMGP 4283-56).
47	Remove approximately 5 acres of large, hazardous Australian Pine and Brazillian Pepper trees adjacent to private property/homes which is the only ingress/egress to neighborhood.	N/A	**WITHDRAWN 2/27/19 Beth Powell**	Hazardous tree removal is not an eligible activity.
48	Prescribed burns in certain conservation areas vulnerable to wildfire.	N/A	**WITHDRAWN 2/27/19 Beth Powell**	Prescribed burning is not an eligible activity.
49	Oyster Bar Salt Marsh hazardous trees	N/A	**WITHDRAWN 2/27/19 Beth Powell**	Hazardous tree removal is not an eligible activity.
50	Captain Forster Hammock Preserve historic cottage	N/A	**WITHDRAWN 2/27/19 Beth Powell**	Project is not eligible due to age/condition of structure.
51	Wabasso Causeway erosion control, revetment repair and fishing pier	N/A	**WITHDRAWN 2/27/19 Rich Szpyrka**	The project is not eligible and will be demolished and disposed.
52	Old Winter Beach Road Flood Control and Stormwater Improvements.	N/A	**WITHDRAWN 2/28/19 Joe Griffin**	The project received funding from FDEP.
53	Boat Club Island dock	N/A	**WITHDRAWN 2/25/19 Beth Powell**	This project received funding from IRC one-cent sales tax and conservation area improvements account.
54	Fire Escape Replacement (IRMC)	N/A	**WITHDRAWN 3/5/19**	No response to numerous update requests.
55	Portable water storage system (IRMC)	N/A	**WITHDRAWN 3/5/19**	No response to numerous update requests.
56	Retrofitting Gifford Youth Activity Center	N/A	**WITHDRAWN 3/5/19**	No response to numerous update requests.
57	Generator improvements for Wave One public shelters (IRCSD)	N/A	**WITHDRAWN 3/5/19**	No response to numerous update requests.
58	Well for emergency use (IRMC)	N/A	**WITHDRAWN 3/5/19**	No response to numerous update requests.

Indian River County
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59	Open Water and wetland system - Fellsmere South Regional Lake	N/A	Denied	Moving forward with either self-funding or other grant sources.

Appendix H
Indian River County Hazard Summary

Appendix H
List of Indian River County LMS Hazard Summary Sheets

Flooding **H.2**
Tropical Storm/ Category 1Hurricane **H.3**
Category 2 Hurricane **H.4**
Category 3 Hurricane **H.5**
Category 4 Hurricane **H.6**
Category 5 Hurricane **H.7**
Severe Weather, lightning, and Tornadoes **H.8**
Wildfire **H.9**
Extreme Heat **H.10**
Winter Storms/ Freezes **H.11**
Erosion (Soil/beach) **H.12**
Drought **H.13**
Seismic Events/Sinkholes **H.14**
Tsunami **H.15**
Agricultural Pests and Diseases **H.16**
Epidemics **H.17**
Radiological Accidents **H.18**
Communications/Power Failure/ **H.19**
Hazardous Materials **H.20**
Technological Hazards **H.21**
Military Ordnance **H.22**
Terrorism/Sabotage **H.23**
Mass Migration **H.24**
Civil Disturbance **H.25**

Hazard Summary

Hazard	*Frequency of Occurrence*
Flooding	☒Annual event ☐Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

Flooding in Indian River County results from one or a combination of both of the following meteorological events:

1) Tidal surge associated with northeasters, hurricanes, and tropical storms; and
2) Overflow from streams and swamps associated with rain runoff.

Impacts	
Public and Responders	• High risk to loss of life and injury, displacement, increased distress • Public health and safety: increased rates of diarrhea (including cholera and dysentery), respiratory infections, hepatitis A and E, typhoid fever, leptospirosis, diseases borne by insects, and a significant health risk from mold. • Risk to life and safety while responding to populations affected by flooding
Continuity of Operations and Program Operations	• Operations may be interrupted if affected by flooding • Staffing difficulties are possible (personnel unable to drive to work)
Property, Facilities, and Infrastructure	• High impact • Utility outages, transportation infrastructure closures, and isolated populations • Varying levels of damage to structures in low-lying areas
Delivery of Services	• High risk to disruption of basic life support systems, typically for short duration • Potable water system loss or disruption • Sewer system outage
Public's Confidence in Jurisdiction's Governance	Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Impact dependent on severity of flooding • High impact on insurance industry • Agricultural/fisheries damage
Environment	• Increased risk of exposure to hazardous materials • Displacement of wildlife may increase public health and safety issues • Increased arboviral vectors • Soil/beach erosion • Navigable waterway impairment • Stormwater drainage impairment

Hazard Summary

Hazard	*Frequency of Occurrence*
Tropical Storm/Category 1 Hurricane	☐Annual event ☒Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

From 1871 – 2018, 60 storms of hurricane intensity have passed within 125 miles of Indian River County. This represents an average of one hurricane every 2.45 years. Twelve land-falling Category 1 hurricanes have affected the county since 1871. Four tropical storm events have affected the county since 1950.

Impacts	
Public and Responders	• Injuries or casualties caused by preventable circumstances • Increased fatigue and distress • Food and water issues if residents are unprepared to shelter in place for duration of event • Injuries/fatalities possible when responding to calls for service during the event • Increased fatigue and stress from hazardous conditions • Status of responder's family will affect the responder's ability to perform his/her duties
Continuity of Operations and Program Operations	• Local governments may have to shut down non-essential functions for duration of event • Indian River County EOC is rated to withstand the winds of a Category 5 hurricane
Property, Facilities, and Infrastructure	• Minor damage to buildings and structures • Damage primarily to unanchored mobile homes; some damage to poorly constructed signs • Also, some coastal road flooding
Delivery of Services	• Minor disruption in the service delivery • Some operations may choose to continue business while others may suspend actions
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Highly unlikely to affect the overall economic condition; however, uncontrolled rumors could worsen the situation
Environment	• Negligible damage to environment • Soil/beach erosion

Hazard Summary

Hazard	*Frequency of Occurrence*
Category 2 Hurricane	☐Annual event ☒Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years
Five land falling Category 2 hurricanes have affected Indian River County since 1871.	

Impacts	
Public and Responders	• Evacuation of homes near coast that cannot withstand Category 2 hurricane conditions • Injuries/fatalities caused from preventable circumstances • Injuries/fatalities possible when responding to calls for service after the event • Increased fatigue and stress from hazardous conditions • Status of responder's family will affect the responder's ability to perform his/her duties
Continuity of Operations and Program Operations	• Local governments will shut down non-essential functions for duration of event • Implementation of continuity of operations (COOP) for essential functions. • Indian River County EOC is rated to withstand the winds of a Category 5 Hurricane
Property, Facilities, and Infrastructure	• Considerable damage to mobile homes, poorly constructed signs, and piers • Some roofing material, door, and window damage of buildings • Coastal and low-lying escape routes flood 2–4 hours before arrival of the hurricane center • Small craft in unprotected anchorages break moorings
Delivery of Services	• Disruption in the delivery of services for the duration of the event • Non-essential services are suspended for several days to a week until recovery functions are implemented
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Low impact to the industries in the area of storm's path; however, could also affect industries in other areas if import/export schedules are interrupted • Uncontrolled rumors could worsen the situation
Environment	• Considerable damage to shrubbery and trees, with some trees blown down

Hazard Summary

Hazard	*Frequency of Occurrence*
Category 3 Hurricane	☐Annual event ☐Every 5 years or less ☐Every 10 years or less ☒Every 30 years or less ☐Greater than 30 years
Five land falling Category 3 hurricanes have impacted the county since 1871.	

Impacts	
Public and Responders	• Evacuation of low-lying residences within several blocks of the shoreline may be required • Increased fatigue and distress • Food and water issues if residents are unprepared to shelter in place for duration of event • Injuries/fatalities caused from hazardous conditions • Injuries/fatalities possible when responding to calls for service after the event • Increased fatigue and stress from hazardous conditions • Status of responder's family will affect the responder's ability to perform his/her duties
Continuity of Operations and Program Operations	• May have to relocate if government offices are damaged • Implementation of COOP for essential functions • Indian River County EOC is rated to withstand the winds of a Category 5 hurricane.
Property, Facilities, and Infrastructure	• Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures • Low-lying escape routes are cut by rising water 3–5 hours before arrival of the center of the hurricane • Debris
Delivery of Services	• Disruption in the delivery of services for the duration of the event • Non-essential services are suspended for several weeks to a month until recovery operations are implemented
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Low to moderate impact to the industries in the area of storm's path; however, could also affect industries in other areas if import/export schedules are interrupted • Uncontrolled rumors could worsen the situation
Environment	• Damage to shrubbery and trees, with foliage blown off trees and large trees blown down • Terrain continuously lower than 5 feet above sea level may be flooded inland 8 miles • Increase in debris and hazardous materials

Hazard Summary

Hazard	*Frequency of Occurrence*
Category 4 Hurricane	☐Annual event ☐Every 5 years or less ☐Every 10 years or less ☒Every 30 years or less ☐Greater than 30 years
Two land falling Category 4 hurricanes have affected the county since 1871.	

Impacts	
Public and Responders	• Massive evacuation of residential areas as far inland as 6 miles • Injuries/fatalities caused from hazardous conditions (e.g., flood, fire, downed electrical lines) • Injuries/fatalities possible when responding to calls for service after the event • Increased fatigue and stress from hazardous conditions • Status of the responder's family will affect the responder's ability to perform his/her
Continuity of Operations and Program Operations	• May have to relocate if government offices are damaged; implementation of COOP for essential functions. • Indian River County EOC is rated to withstand the winds of a Category 5 Hurricane
Property, Facilities, and Infrastructure	• More extensive curtain wall failures, with some complete roof structure failures on small residences • Complete destruction of mobile homes • Extensive damage to doors and windows
Delivery of Services	• Disruption in the delivery of services for the duration of the event • Non-essential services are suspended for a month to several months until recovery operations are implemented
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Moderate to extensive impact to the industries in the area of storm's path; however, could also affect industries in other areas if import/export schedules are interrupted • Uncontrolled rumors could worsen the situation
Environment	• Shrubs and trees are blown down • Terrain lower than 10 feet above sea level may be flooded, requiring massive evacuation of residential areas as far inland as six miles • Contamination of inland environment with seawater mixed with debris and other hazardous materials could affect aquifer

Hazard Summary

Hazard	*Frequency of Occurrence*
Category 5 Hurricane	☐ Annual event ☐ Every 5 years or less ☐ Every 10 years or less ☐ Every 30 years or less ☒ Greater than 30 years
The Labor Day Hurricane in 1935, Hurricane Andrew in 1992, and Hurricane Michael in 2018 are the only land falling Category 5 hurricanes impacting Florida in a 100- year period.	

Impacts	
Public and Responders	• Massive evacuation of residential areas on low ground within 5–10 miles of the shoreline may be required • Injuries/fatalities possible when responding to calls for service after the event • Increased fatigue and stress from hazardous conditions • Status of the responder's family will affect the responder's ability to perform his/her duties
Continuity of Operations and Program Operations	• May have to relocate if local government offices are damaged • Implementation of COOP for essential functions • Indian River County EOC is rated to withstand the winds of a Category 5 hurricane
Property, Facilities, and Infrastructure	• Complete roof failure on many residences and industrial buildings • Some complete building failures, with small utility buildings blown over or away • Complete destruction of mobile homes • Major damage to lower floors of structures located less than 15 feet above sea level and within 500 yards of the shoreline
Delivery of Services	• Disruption in the delivery of services for the duration of the event • Non-essential services are suspended for a month to several months until recovery operations are implemented
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Extensive to catastrophic impact to the industries in the area of storm's path; however, could also affect industries in other areas if import/export schedules are interrupted • Uncontrolled rumors could worsen the situation
Environment	• All shrubs, trees, and signs blown down • Contamination of inland environment with seawater mixed with debris and other hazardous materials could affect aquifer

Hazard Summary

Hazard	*Frequency of Occurrence*
Severe Weather/ Lightning/Tornadoes	☒ Annual event ☐ Every 5 years or less ☐ Every 10 years or less ☐ Every 30 years or less ☐ Greater than 30 years

Florida ranks third in the United States in the number of tornado strikes, and the first in the number of tornadoes per square mile. The odds of a tornado striking any specific point in southeastern Florida are 0.04, or once per 250 years. Severe weather affects Florida every day during the summer season. However, extensive severe weather events occur an average of five times annually, most often in the spring and fall. Extreme strong winds level tropical storm force and intense lengthy period of lightning. Annually, fatalities occur as a result of tornadoes.

Impacts	
Public and Responders	• Potential for minimal loss of life and injuries resulting from severe weather • Potential for mass fatalities and large number of injuries resulting from tornadoes • Requires shelter operations • Major impact on mental and physical health • Injuries/fatalities possible in areas affected by tornadoes • Protective actions required for responders from hazards; personal protective equipment (PPE) is required for emergency worker safety from downed utility line, hazardous materials, and debris; basic responder needs must be met • Status of responder's family will affect the responder's ability to perform his/her duties
Continuity of Operations and Program Operations	• Impact unlikely to cause relocation of government operations as a result of severe weather; locally affected government agencies may be forced to relocate to continue essential operations as a result of impact from tornadoes
Property, Facilities, and Infrastructure	• Severe weather may cause utility outages and transportation infrastructure closures • Tornadoes may cause massive failures in electrical, communications, and other critical infrastructures
Delivery of Services	• Local disruption in services, typically of short duration. • With regard to tornadoes, the area impacted may have widespread disruptions • 911 systems may be overwhelmed
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Moderate to extensive impact on affected area's economy depending on the type of hazard
Environment	• Moderate impact • Impact on environmental tolerances can easily be overwhelmed from any of the hazards classified under severe weather • Debris and hazardous materials could be released into the environment

Hazard Summary

Hazard	*Frequency of Occurrence*
Wildfire/Urban Interface Zone	☒ Annual event ☐ Every 5 years or less ☐ Every 10 years or less ☐ Every 30 years or less ☐ Greater than 30 years

Florida's wildfire season is twelve months long. Indian River County has wildfires throughout the year. The most active part the year is typically December through the beginning of June. Generally, Indian River County experiences the greatest number of wildfires during April, May, and June. On average, Indian River County has 23 wildfires a year depending on weather conditions.

Impacts	
Public and Responders	• Health affected from smoke inhalation • Displacement possible • Special needs populations will require more attention • Increased distress • Increased exposure to smoke inhalation • High risk to health and safety of responders
Continuity of Operations and Program Operations	• If affected, operations may have to be relocated or suspended
Property, Facilities, and Infrastructure	• Moderate impact to the transportation and utility infrastructure, damage to properties
Delivery of Services	• Moderate impact to the delivery of services • Services likely to be temporarily interrupted in affected areas
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Impact on Florida's agricultural and timber industry • High impact on insurance industry
Environment	• Extensive impact to wildlife and vegetation

Hazard Summary

Hazard	*Frequency of Occurrence*
Extreme Heat	☒Annual event ☐Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years
While extended extreme heat events are not as common, the State of Florida routinely experiences excessive heat outlooks, watches, and warnings/advisories throughout the State.	

Impacts	
Public and Responders	• Extreme heat leads to an increase in heat-related illnesses • Infants and children, elderly and access and functional needs populations, and pets may require more attention • Increased risk of dehydration • Prolonged exposure to severe conditions • Overexertion required by job will increase risk of heat-related illness
Continuity of Operations and Program Operations	• Negligible impact to government
Property, Facilities, and Infrastructure	• Negligible impact to property, facilities and infrastructure
Delivery of Services	• Low impact to the delivery of services • Non-essential services (e.g., outdoor government activities) may be suspended to mitigate impacts to staff and attendees.
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• High impact to tourism, agri-business, public utilities, and other industries tasked with caring for the population or providing services for comfort
Environment	• Low impact • A reduction in ground water supplies creates a situation conducive to sinkholes • Non-domesticated animals will be directly impacted Flora may die off

Hazard Summary

Hazard	*Frequency of Occurrence*
Winter Storms/Freezes	☐ Annual event ☒ Every 5 years or less ☐ Every 10 years or less ☐ Every 30 years or less ☐ Greater than 30 years

According to the U.S. Department of Agriculture and Consumer Services, a moderate freeze may be expected every 1 to 2 years. Severe freezes may be expected on an average of once every 15 to 20 years. Freezes pose a major hazard to the agriculture industry in Indian River County on a recurring basis, and are a significant threat to the economic vitality of the State's vital agriculture industry. Agricultural lands represent nearly one-half of all land in Indian River County.

Impacts	
Public and Responders	• Risk of hypothermia and extreme loss of heat if residents are not prepared for conditions • Infants and children, elderly and access and functional needs populations, and pets will require more attention • Low impact to emergency workers • Exposure to extended periods of cold weather increases the risk for hypothermia, frostbite, fatigue, etc.
Continuity of Operations and Program Operations	• Low impact to government • Prolonged severe cold weather periods may strain utility company
Property, Facilities, and Infrastructure	• High impact • Risk of electrical outages
Delivery of Services	• Low Impact • Impacted services would include medical facilities, nursing homes, and assisted living facilities
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Prolonged periods of extreme cold weather could greatly affect agriculture, especially susceptible plant and animal industries within the state • Impact on Indian River County's citrus can have national repercussions
Environment	• Moderate impact • Damage or loss of susceptible plants and animals

Hazard Summary

Hazard	*Frequency of Occurrence*
Erosion (soil/beach)	☒ Annual event ☐ Every 5 years or less ☐ Every 10 years or less ☐ Every 30 years or less ☐ Greater than 30 years

The wave climate impacting the County's 22.4 miles of coastline has contributed to the long term erosion of the County's barrier island. The need for shore protection often results in property owners "hardening" the coast with a structure such as a seawall or revetment.

Impacts	
Public and Responders	• Low impact on majority of public • There may be isolated incidents of distressed citizens • Public may not be able to visit beaches while erosion repair is underway • Low impact to responders • There may be isolated incidents of responding to calls
Continuity of Operations and Program Operations	• Minimal impact on operations
Property, Facilities, and Infrastructure	• Moderate impact on property near or on the coastlines • Facilities and infrastructure near the coast could be impacted
Delivery of Services	• Low impact • Services normally provided in the areas near the coast may be shut down during repairs
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• $3 million and $5 million per mile to restore a coastal shore
Environment	• Moderate impact to coastline. Beaches serve as a natural barrier

Hazard Summary

Hazard	*Frequency of Occurrence*
Drought	☐Annual event ☒Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

Since 1900, nine drought cycles (typically of two-year periods) have occurred in Florida. Most often, the area of impact was regional rather than Statewide. Most summer seasons have micro-heat waves based on a geographic area of Florida. Florida averages 12 heat-related fatalities annually. In 1993 and 1999, 241 and 68 fatalities, respectively, were the result of heat waves affecting the southeastern United States.

Impacts	
Public and Responders	• Drought conditions may require water use restrictions, which could cause distress to agricultural concerns • Increase in heat-related illnesses • Infants and children, elderly and access and functional needs populations, and pets may require more attention • Increased risk of dehydration • Prolonged exposure to severe conditions • Overexertion required by job will increase risk of heat-related illness
Continuity of Operations and Program Operations	• Low impact to government • Prolonged drought periods may require the suspension of services
Property, Facilities, and Infrastructure	• Low impact to property, facilities, and infrastructure • Heat-sensitive components may be compromised
Delivery of Services	• Low impact to the delivery of services • Non-essential services (e.g., park and recreational area watering, public property watering) may be suspended
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• High impact to agri-business, public utilities, and other industries reliant upon water for production or services
Environment	• Low impact • A reduction in ground water supplies creates a situation conducive to sinkholes • Non-domesticated animals will be directly impacted Flora may die off

Hazard Summary

Hazard	*Frequency of Occurrence*
Seismic Events/Sinkholes	☐Annual event ☐Every 5 years or less ☐Every 10 years or less ☒Every 30 years or less ☐Greater than 30 years

Although Florida is not usually considered to be a state subject to earthquakes, several minor shocks have occurred over time. Seismic events were more common approximately 30–100 years ago, ranging from slight tremors to a 6 on Modified Mercalli intensity scale.
There are areas in western Indian River County where canal bank failures could cause or exacerbate flooding during heavy rain events or storms. This problem is, however, more related to soil erosion than to actual levee failure. There has never been any seismic activity, soil failures, and few sinkholes in Indian River County. While these hazards may exist, County vulnerability to them at this time is considered very low.

Impacts	
Public and Responders	• Low impact on public outside of immediate collapse • Risk to health if drinking water is contaminated due to sinkhole encroaching into the aquifer • Low impact to emergency workers
Continuity of Operations and Program Operations	• Minimal effect on the county's COOP
Property, Facilities, and Infrastructure	• Minimal impact overall, but isolated homes or businesses may be affected • Sinkholes can affect the infrastructure by draining unfiltered water from streams, lakes, and wetlands directly into the aquifer. If a sinkhole directly affects a structure, it could be extremely costly to repair
Delivery of Services	• Low impact on delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county
Economic Condition	• Low impact to all industries
Environment	• Moderate impact to the environment; sinkholes can affect the environment by threatening water supplies by draining water from streams, lakes, and wetlands directly into the aquifer; this could affect wildlife habitats

Hazard Summary

Hazard	*Frequency of Occurrence*
Tsunami	☐Annual event ☐Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☒Greater than 30 years

Although the chances of a tsunami impacting the east coast of Florida are extremely remote, computer modeling for a large tsunami originating from the Puerto Rico trench could inundate the Indian River County beaches to the dune line. Modeling results from a tsunami triggered by a large Portugal earthquake suggest more significant tsunami impacts locally.

Impacts	
Public and Responders	• High risk to loss of life and injury, displacement, increased distress • Public health and safety: increased rates of diarrhea (including cholera and dysentery), respiratory infections, hepatitis A and E, typhoid fever, leptospirosis, and diseases borne by insects; • Risk to life and safety while responding to populations affected by tsunami
Continuity of Operations and Program Operations	• Minimal effect on the county's COOP
Property, Facilities, and Infrastructure	• Extensive impact on property near or on the coastline • Facilities and infrastructure near the coast could be impacted
Delivery of Services	• Low impact on delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Extensive impact to industries in the affected area, most notably tourism; other industries will be indirectly impacted depending on where the tsunami strikes.
Environment	• Extensive impact to the coastlines and nearby areas

Hazard Summary

Hazard	*Frequency of Occurrence*
Agricultural Pests and Diseases	☐Annual event ☐Every 5 years or less ☒Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

Florida is among the top three agriculture-producing states in the nation. Agriculture generates farm cash receipts of nearly $6 billion annually, of which citrus and vegetable crops contribute more than 40%. The industry is susceptible to many hazards including freezes, droughts, and exotic pests or diseases. Agricultural crops are grown throughout the state, and every region is vulnerable to the effects of an exotic pests or disease infestation.

Impacts	
Public and Responders	• Low impact • Risk to health and safety from pesticides
Continuity of Operations and Program Operations	• Low impact
Property, Facilities, and Infrastructure	• Low impact
Delivery of Services	• Any and all coastal services may be interrupted depending on the severity of the tsunami
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• High impact on overall economic condition if Indian River County's crops are suffering the effects of an exotic pest or disease infestation. • High impact of export of citrus to other countries is prohibited.
Environment	• High impact possible with uses of pesticides

Hazard Summary

Hazard	*Frequency of Occurrence*
Epidemics	☐ Annual event ☐ Every 5 years or less ☐ Every 10 years or less ☒ Every 30 years or less ☐ Greater than 30 years

Infectious diseases emerging throughout history have included some of the most feared plagues of the past. New infections continue to emerge today, while many of the old plagues are still with us. As demonstrated by influenza epidemics, under suitable circumstances, a new infection first appearing anywhere in the world could travel across entire continents within days or weeks. Due to the potential of complex health and medical conditions that can threaten the general population, Florida's vulnerability to an epidemic is continually being monitored. With millions of tourists arriving and departing the state annually, disease and disease exposure (airborne, vector, and ingestion) are constantly evaluated and analyzed.

Impacts	
Public and Responders	• High impact on majority of public • Increased demand on emergency transport and hospitals
Continuity of Operations and Program Operations	• Low impact
Property, Facilities, and Infrastructure	• Low impact to government
Delivery of Services	• Low Impact • Impacted services would include medical facilities, nursing homes, public health, and assisted living facilities
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• High impact to tourism, health care providers, and other industries tasked with caring for the population or providing services for comfort
Environment	• No impact to environment

Hazard Summary

Hazard	*Frequency of Occurrence*
Radiological Accidents	☐Annual event ☐Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☒Greater than 30 years

The St. Lucie nuclear power generation plant is located 12 miles southeast of the City of Ft. Pierce on Hutchinson Island in St. Lucie County. The facility contains two reactors and is owned and operated by the Florida Power & Light Company. Counties within the 50-mile EPZ include all or portions of St. Lucie, Indian River, Glades, Osceola, Okeechobee, Brevard, Highlands, Palm Beach, and Indian River. No nuclear power plant event has reached the General or Site Area classification in Florida.

Impacts	
Public and Responders	• Low impact to the health and safety of personnel in the 10-mile emergency planning zone or 50-mile ingestion pathway zones • Moderate impact • Protective actions required to protect responders from radiation exposure
Continuity of Operations and Program Operations	• Low impact to COOP
Property, Facilities, and Infrastructure	• Low impact to property, facilities, and infrastructure
Delivery of Services	• Low impact to the delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Low impact to the economic and financial community of the impacted area
Environment	• Moderate impact to the areas of highest concentration of radiological particulate

Hazard Summary

Hazard	*Frequency of Occurrence*
Communications/Power Failure	☐Annual event ☐Every 5 years or less ☒Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years
An emerging threat with potential impacts to the electric grid, satellites, and technology.	

Impacts	
Public and Responders	• Responders may have difficulty due to widespread telecommunications system outage • Communications system failures in residential and retirement communities may put more human lives at risk • Psychological hardship
Continuity of Operations and Program Operations	• Low impact to COOP • Major communications failures would severely disrupt COOPs because of widespread disruptions to the electric grid, and communications
Property, Facilities, and Infrastructure	• Lack of communications could severely affect Infrastructure if there are disruptions to the electric grid • Potable water system loss or disruption • Sewer system outage
Delivery of Services	• Low impacts to deliver of services • Potential for high impact on delivery of services if wide spread disruption to power. • Communications, and GPS services could also be disrupted leading to difficulties in delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Communications failures have a greater potential to produce adverse economic impacts in business-based rather than residential communities • Unsold goods and services, and spoiled food products
Environment	• Low impact to the environment overall

Hazard Summary

Hazard	*Frequency of Occurrence*
Hazardous Materials	☒Annual event ☐Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years
A large volume of hazardous materials is transported to and through the County by railroad and highway, air, water, and pipeline daily. Within Indian River County, there are a number of both public and private fixed facilities that produce or use hazardous materials.	

Impacts	
Public and Responders	• High impact to the health and safety of people living in the impacted area • May require shelter-in-place • Protective actions required for responders • Critical Incident Stress Debriefing may be required
Continuity of Operations and Program Operations	• Low impact to COOP
Property, Facilities, and Infrastructure	• High impact to property, facilities, and infrastructure
Delivery of Services	• Low impact to the delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Low impact to the economic and financial community of the impacted area
Environment	• High impact to the areas of highest concentration

Hazard Summary

Hazard	*Frequency of Occurrence*
Technological Hazards	☒Annual event ☐Every 5 years or less ☐Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years
Technological hazards include radiological accidents, power failures, hazardous materials accidents, transportation system accidents, wellfield contaminations, communication failures, and unexploded military ordnance.	

Impacts	
Public and Responders	• Low impact on the overall population. Risk to health and safety in areas of occurrence • Shelter-in-place may cause distress and fatigue • Low impact to health and safety of responders as long as training and PPE are up-to-date and meet specifications • Critical Incident Stress Debriefing may be required
Continuity of Operations and Program Operations	• Low impact to COOP • Operations within the vicinity areas affected
Property, Facilities, and Infrastructure	• Facilities near the affected areas may have to shut down • Properties may have to undergo decontamination • Infrastructure on a regional level could be severely affected if shut down
Delivery of Services	• Low impact on delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Low impact on the overall economic condition
Environment	• Low impact to the environment overall; however, the areas affected could have moderate impact depending on the type of hazard

Hazard Summary

Hazard	*Frequency of Occurrence*
Military Ordnance from WWII	☐Annual event ☐Every 5 years or less ☒Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

Unexploded military ordnance is a hazard unique to Indian River County. The military used the Fort Pierce Naval Amphibious Training Base, an area of about 19,000 acres between Vero Beach and Jensen Beach, during World War II for amphibious training and to develop and test procedures for breaching and removing beach fortifications expected to be encountered in Europe and Japan. A variety of ordnance was tested against these fortifications. Training at the base included testing of bombs, rockets, and mines. Several explosive devices left over from these training missions have been found along the shores of Vero Beach and Ft. Pierce.

Impacts	
Public and Responders	• Public exposure from building construction, pool construction, recreational diving, and use of beach areas • May require shelter-in-place • Protective actions required for responders • Toxic release • Psychological hardship
Continuity of Operations and Program Operations	• Low impact to COOP
Property, Facilities, and Infrastructure	• High impact to property, facilities, and infrastructure
Delivery of Services	• Low impact to the delivery of services
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Low impact to the economic and financial community of the impacted area
Environment	• High impact to the areas of highest concentration • Damage to critical environmental resources

Hazard Summary

Hazard	*Frequency of Occurrence*
Terrorism/sabotage	☐Annual event ☐Every 5 years or less ☐Every 10 years or less ☒Every 30 years or less ☐Greater than 30 years

On September 11, 2001, the United States was attacked by terrorists. Florida has many targets of opportunity for terrorists—political, industrial, historical, and military. South Florida experienced an Anthrax outbreak in 2001. In addition, several terrorist plots directed at Florida residents have been thwarted in recent years.

Impacts	
Public and Responders	• Moderate impact to the health and safety of people as the result of a CBRNE dispersal • Low impact if a result from a cyber-attack on an industry (identity theft or banking attack) • This could increase stress and fatigue • Localized higher impacts near any attacks involving explosives • Protective actions required to protect responders from hazardous exposure • Increase in stress and fatigue
Continuity of Operations and Program Operations	• High impact on the COOP if CBRNE dispersal is in vicinity
Property, Facilities, and Infrastructure	• High impact to property, facilities, and infrastructure depending on what is targeted
Delivery of Services	• High impact to the delivery of services if either form of terrorism is conducted; a cyber-attack on the mail system could result in delays; a delay in receiving mail financially affects the state
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• High impact to the economic condition of the impacted area, since terrorism attempts to change the operations of a target • Industries, infrastructure, and/or the delivery of services could be shut down from the incident
Environment	• High impact to environment if CBRNE dispersal • Florida's aquifer system is close to the surface, which results in extremely low tolerances for the notification of spills

Hazard Summary

Hazard	*Frequency of Occurrence*
Mass Migration	☐Annual event ☐Every 5 years or less ☒Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

The Atlantic shore of Indian River County is the frequent scene of the arrival of undocumented aliens, usually Haitian or Cuban. The County has both the history and the potential for the unannounced arrival of a large number of aliens. Until relieved of the responsibility by the State and Federal governments, Indian River County must be capable of providing mass refugee care to include shelter, food, water, transportation, medical, police protection, and other social services.

Impacts	
Public and Responders	• Mass influx to population density will affect the public, most likely in the southern part of the state and along major transit routes • Possible increase in crime rate • Civil disturbances may occur if presence of migrating population upsets the current residents of the area • Moderate impact on responders • Responders may be overwhelmed by increased calls to service
Continuity of Operations and Program Operations	• Civil unrest could lead to disruption in operations in affected areas
Property, Facilities, and Infrastructure	• Moderate impact to property, facilities, and infrastructure • Influx in population could overtax these resources
Delivery of Services	• Moderate impact on services due to overwhelming demand caused by population influx • Medical services, in particular, may be unable to meet the demand
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• Moderate impact • Increased demands of deliverable goods • Increased crime in the affected areas could affect the tourism industry
Environment	• Massive increase in population could strain environment

Hazard Summary

Hazard	*Frequency of Occurrence*
Civil Disturbance	☐Annual event ☐Every 5 years or less ☒Every 10 years or less ☐Every 30 years or less ☐Greater than 30 years

As in any other area, Indian River County is subject to civil disturbances in the form of riots, mob violence, and a breakdown of law and order in a focalized area. Communities with racial mixtures, gang violence, and drug trafficking are increasingly aware of the need to plan for civil disturbance emergencies. Although they can occur at any time, civil disturbances are often preceded by periods of increased tension caused by questionable social and/or political events such as controversial jury trials or law enforcement actions.

Impacts	
Public and Responders	• Moderate impact to health and safety • This could increase stress and fatigue • Protective actions required to protect responders
Continuity of Operations and Program Operations	• Moderate impact on the COOP
Property, Facilities, and Infrastructure	• High impact to property, facilities, and infrastructure depending on what area is targeted
Delivery of Services	• High impact to the delivery of services in affected areas
Public's Confidence in Jurisdiction's Governance	• Direction and control of all emergency management activities remain under the Indian River County Board of County Commissioners at all times (the line of succession is established in county ordinance 91-17). Their approval will fluctuate when the county constituents provide feedback on the response of the county.
Economic Condition	• High impact to the economic condition of the impacted area • Industries, infrastructure, and/or the delivery of services could be shut down from the incident
Environment	• High impact to environment if CBRNE dispersal